TECHNICAL SPECIFICATIONS FOR THE CONSTRUCTION OF THE

RADIO AVENUE RECLAIMED WATER GROUND STORAGE TANK AND PUMP STATION

BID SET

JEA PROJECT NO. 8004751

MARCH 2021

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SUMMARY OF WORK

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Work to be performed under this Contract shall consist of furnishing and installation of all tools, equipment, materials, supplies, manufactured articles, transportation and services, including fuel, power, water, and essential communications, for the performance of all labor, work, and/or other operations as required at the Radio Avenue Reclaimed Water Pump Station in strict accordance with the Contract Documents. The Work shall be complete, and all work, materials, and services not expressly shown or called for in the Contract Documents which may be necessary for the complete and proper construction of the Work in good faith shall be performed, furnished, and installed by the CONTRACTOR as though originally so specified or shown, at no increase in cost to JEA.

B. Wherever the Contract Documents address a third party, i.e., subcontractor, manufacturer, etc., it is to be considered as the CONTRACTOR through the third party.

C. Only qualified subcontractors can bid this project; see JEA solicitation document for additional information.

D. Wherever a reference to number of days is noted, it shall be construed to mean calendar days.

E. The Contract Documents are intended to be complimentary in describing the Work and the responsibilities of the Contractor and JEA and any requirements stipulated in one part of the Contract Documents is as binding on the parties as though occurring in all. In the event there are any conflicting provisions or requirements among the Contract Documents, the provisions and requirements of the Contract Documents shall take the following order of precedence:

1. JEA Standards, conforming to the latest edition and revision of the JEA publications, including but not limited to:

    a. Water and Wastewater Standard Manual and Checklist

    b. Facilities Standards Manual

2. General Conditions, JEA Solicitation Document

3. Technical Specifications

4. Construction Plans/Drawings

In case of discrepancy concerning dimension, quantity, and location, graphic drawings will take precedence over the specifications; explanatory notes on the drawings will take precedence over conflicting drawn indications; and large-scale details will take

precedence over smaller scaled drawings. In case of discrepancy concerning quality and/or quantity within the documents, the Contractor shall include the better quality and/or the greater quantity, unless otherwise determined in writing by JEA.

Interpretations and resolution of discrepancies within the Contract Documents shall be made solely by JEA and issued in writing upon receipt of the Contractor's written request.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. The principal features of the Work to be performed under this Contract include, but are not limited to, the following:

1. One 1.5 Million Gallon Ground Storage Tank with space for three future 1.5-MG GST's.
2. Pump station with two horizontal split case pumps with space for two future pumps.
3. Reinforced concrete building with concrete masonry walls to house the pumps in one room and electrical equipment in another room.
4. Site work including a storm water / drainage pond and sub-grade work for one future GST.
5. Enclosed back-up power generator.
6. Loop around driveway access to site equipment.
7. Yard piping including an influent control valve.
8. Above ground effluent flow meter.
9. Perimeter fencing with manual sliding entrance gates.

B. The foregoing description(s) shall not be construed as a complete description of all work required.

C. The Work set forth within these bid documents includes the furnishing of all labor, materials, equipment, services and incidentals for the construction of the improvements, as noted in the total bid including all mechanical, electrical, structural, and all appurtenant work, complete, tested and ready for operation, including temporary facilities required, all in conformance with Contract Document requirements.

D. All work shall be in compliance with all applicable federal, state and local laws and regulations, including those for materials that contain lead. All work shall meet OSHA compliance.

E. The Work shall be performed at the Radio Avenue Reclaimed Water Pump Station project site located in Yulee, Florida.

F. Contract Dates

1. Substantial completion shall be achieved within 270 calendar days after Notice to Proceed.

2. All Work shall be completed including all punch-list items resolved within 330 calendar days after Notice to Proceed.

1.03 CONTRACTOR'S USE OF PROJECT SITE

A. The CONTRACTOR's use of the project site shall be limited to its construction operations, including on-site storage of materials, on-site fabrication facilities as noted in the Contract Drawings.

B. Disposal of Debris: All debris shall be disposed of in accordance with the JEA Water and Sewer Standards Manual (latest edition) and the requirements called for in the Contract Terms and Conditions. Debris shall be disposed of in accordance with applicable federal, state, and local regulations. The CONTRACTOR is responsible for determining these regulations and shall bear all costs or retain any profit associated with disposal of these items.

C. The CONTRACTOR shall provide a daily log of deliveries to the project site for the project as described in Section 01550, Site Access and Storage.

1.04 JEA USE OF THE PROJECT SITE

A. JEA may utilize all or part of the facilities during the entire period of construction for the conduct of JEA's normal operations. The CONTRACTOR shall cooperate with JEA to minimize interference with the CONTRACTOR's operations and to facilitate JEA's operations.

1.05 PROJECT MEETINGS

A. Pre-Construction Meeting: A Pre-Construction meeting shall be held in accordance with the Contract.

1. Unless previously submitted to JEA, the CONTRACTOR shall bring to the conference one copy each of the following:

    a. JEA-approved schedule, previously submitted in accordance with the Contract.

    b. Preliminary procurement schedule of major equipment and materials and items requiring long lead time.

    c. Preliminary Shop Drawing/Sample/Substitute or "Or Equal" submittal schedule.

    e. Schedule of Values (lump sum price breakdown) for progress payment purposes.

    f. Preliminary Cash flow.

2. The purpose of the meeting is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

    a. CONTRACTOR's tentative schedules.

    b. Transmittal, review, and distribution of CONTRACTOR's submittals.

    c. Processing applications for payment.

    d. Maintaining record documents.

e. Critical work sequencing.

f. Field decisions and Change Orders.

g. Use of project site, office and storage areas, security, housekeeping and JEA's needs.

h. Major equipment deliveries and priorities.

3. JEA will preside at the Pre-Construction meeting and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

B. Progress Meetings: JEA will schedule and hold on-site progress meetings, conducted monthly and as necessary and/or requested by JEA. JEA designated representatives, CONTRACTOR, and all subcontractors active on the site shall be represented at each meeting. CONTRACTOR may at its discretion request attendance by representatives of its suppliers, manufacturers, and other subcontractors.

1. JEA will preside at the meetings and provide for keeping and distribution of the minutes. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

2. The CONTRACTOR shall attend meetings held to coordinate work between other contracts that may be on-going on the project site. The General Superintendent, Job Superintendent, and/or other key representatives of each prime CONTRACTOR shall attend these meetings, at JEA's request.

1.06 PERMITS

A. JEA is currently obtaining permits from FDEP and Nassau County which will be provided to the CONTRACTOR.

B. The CONTRACTOR shall pay for and secure all other permits for the work including but not limited to the FDEP National Pollutant Discharge Elimination System (NPDES) General Permit for Construction Activities.

C. Costs for obtaining permits shall be included in the bid price. JEA will not compensate the CONTRACTOR for permit fees charged by regulatory agencies having jurisdiction over the work.

D. The CONTRACTOR shall furnish to JEA copies of all permits prior to commencement of work requiring permits.

E. The CONTRACTOR shall obtain, keep current and pay all fees for any necessary construction permits from those authorities, agencies, or municipalities having jurisdiction over land areas, utilities, or structures which are located within the Contract limits and which will be occupied, encountered, used, or temporarily interrupted by the CONTRACTOR's operations unless otherwise stated. Record copies of all permits shall be furnished to JEA.

F. When construction permits are accompanied by regulations or requirements issued by a particular authority, agency or municipality, it shall be the CONTRACTOR's

responsibility to familiarize himself and comply with such regulations or requirements as they apply to his operations on this Project.

G. The CONTRACTOR shall obtain and comply with all trade permits and building permits required. The CONTRACTOR will pay for trade and building permits.

H. The CONTRACTOR shall provide any required Performance and Indemnity Bond(s).

I. Onsite Environmental Consulting LLC, (904) 384-7020 office, is under contract to handle gopher tortoise relocations. CONTRACTOR shall plan schedule around gopher tortoise relocation; relocations cannot be done in January or February. See Appendix D for burrow locations in June 2018.

J. CONTRACTOR is also responsible for the following requirements of FM Global

1. Submit shop drawings via ENGAtlantaPlanReview@fmglobal.com for review when ready. Shop drawings include roofing system, roof mounted equipment (ie. fans, roll-up door, etc.

2. Complete FM Global Form 2688, Checklist for Roofing System, as well as “contractors package” from RoofNav for each roof area and receive acceptance prior to installation. RoofNav can be accessed at www.RoofNav.com.

1.07 FIELD ENGINEERING

A. Provide Field Engineering Services: Establish elevations, lines, and levels, utilizing recognized engineering survey practices in accordance with Section 01541.

B. If dimensions of equipment or piping locations are not shown on the Drawings, the CONTRACTOR shall coordinate such accordingly with JEA.

1.08 SITE CONDITIONS

A. The CONTRACTOR acknowledges that it has investigated prior to bidding and satisfied itself as to the conditions affecting the Work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides, water tables or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during execution of the Work. The CONTRACTOR further acknowledges that it has satisfied itself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, or any contiguous site, as well as from information presented by the Drawings and Specifications made a part of this Contract, or any other information made available to it prior to receipt of Bids. Any failure by the CONTRACTOR to acquaint itself with the available information will not relieve the CONTRACTOR from responsibility for estimating properly the difficulty or cost of successfully performing the Work. JEA assumes no responsibility for any conclusions or interpretations made by the CONTRACTOR on the basis of the information made available by JEA.

1.09 DIMENSIONS OF EXISTING FACILITIES

A. Where the dimensions and locations of existing improvements are of critical importance in the installation or connection of new work, the CONTRACTOR shall verify such dimensions and locations in the field prior to the fabrication and/or installation of materials or equipment which are dependent on the correctness of such information.

1.10 CONTRACT DOCUMENTS

A. The Work to be done is shown on the Drawings entitled Radio Avenue Ground Storage Tank and Pump Station. The numbers and titles of all Drawings appear on the index sheet of the Drawing: G-1. All drawings so enumerated shall be considered an integral part of the Contract Documents as defined herein.

B. Certain Document Sections refer to Divisions of the Contract Specifications. Sections are each individually numbered portions of the Specifications (numerically) such as 08110, 13206, 15111, etc. The term Division is used as a convenience term meaning all Sections within a numerical grouping. For example, Division 16 would thus include Sections 16000 through 16999 and would mean all electrical specifications.

1.11 GENERAL ARRANGEMENT

A. Drawings indicate the extent and general arrangement of the work. If any departures from the Drawings are deemed necessary by the CONTRACTOR to accommodate the materials and equipment the CONTRACTOR proposes to furnish, details of such departures and reasons therefore shall be submitted as soon as practicable to JEA for approval. No such departures shall be made without the prior written approval of JEA. Approved changes shall be made without additional cost to JEA for this work or related work under other Contracts of the Project.

B. The specific equipment proposed for use by the CONTRACTOR on the project may require changes in structures, auxiliary equipment, piping, electrical, mechanical, controls or other work to provide a complete satisfactory operating installation. The CONTRACTOR shall submit to JEA, for approval, all necessary Drawings and details showing such changes to verify conformance with the overall project structural and architectural requirements and overall project operating performance. The Bid Price shall include all costs in connection with the preparation of new drawings and details and all changes to construction work to accommodate the proposed equipment, including increases in the costs of other Contracts.

1.12 ADDITIONAL ENGINEERING SERVICES

A. In the event that the Engineer is required to provide additional engineering services as a result of substitution of materials or equipment which are not "or equal" by the CONTRACTOR, or changes by the CONTRACTOR in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Engineer is required to examine and evaluate any changes proposed by the CONTRACTOR for the convenience of the CONTRACTOR, then the Engineer's charges in connection with such additional services shall be charged to the CONTRACTOR by JEA.

B. Structural design shown on the Contract Drawings is based upon typical weights for major items of equipment as indicated on the Contract Drawings and specified. If the equipment furnished differs from that specified in the Contract Documents such that

actual weight exceeds the weight of specified equipment, the CONTRACTOR shall assume the responsibility for all costs of redesign and for any construction changes required to accommodate the equipment furnished, including the Engineer's expenses in connection therewith, provided that the original weight assumptions were correct.

C. In the event that the Engineer is required to provide additional engineering services as a result of CONTRACTOR’s errors, omissions, or failure to conform to the requirements of the Contract Documents, or if the Engineer is required to examine and evaluate any changes proposed by the CONTRACTOR solely for the convenience of the CONTRACTOR, then the Engineer's charges in connection with such additional services shall be charged to the CONTRACTOR by JEA.

1.13 SUBSURFACE DATA

A. Subsurface data are offered in good faith solely for placing the Bidder in receipt of all information available to JEA and in no event is to be considered as part of the Contract Documents.

B. The Bidder must interpret such subsurface data according to his own judgment and acknowledge that he is not relying upon the same as accurately describing the subsurface conditions, which may be found to exist.

1. The test boring logs present factual information of the subsurface conditions at the specific test boring location only. The Bidder should not consider, or conclude, that the subsurface conditions will be consistent between test boring locations.

C. In making this data available, JEA makes no guarantee, either expressed or implied, as to their accuracy or to the accuracy of any interpretation thereof.

1.14 CHEMICALS

A. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, or reactant of other classification, must show approval of either the EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with all applicable rules and regulations.

1.15 FIRST AID FACILITIES AND ACCIDENTS

A. First Aid Facilities: The CONTRACTOR shall provide at the site such equipment and facilities as are necessary to supply first aid to any of his personnel who may be injured in connection with the work.

B. Accidents

1. The CONTRACTOR shall promptly report, in writing, to JEA all accidents whatsoever out of, or in connection with, the performance of the work, whether on or adjacent to the site, which cause death, personal injury or property damage, giving full details and statements of witnesses.

2. If death, serious injuries, or serious damages are caused, the accident shall be reported immediately by telephone or messenger to JEA.

3. If any claim is made by anyone against the CONTRACTOR or a Subcontractor on account of any accidents, the CONTRACTOR shall promptly report the facts, in writing, to JEA, giving full details of the claim.

1.16 WEATHER CONDITIONS

A. No work shall be done when the weather is unsuitable. The CONTRACTOR shall take necessary precautions (in the event of impending severe weather, including hurricanes, tropical storms or major rain/wind storms) to protect all work, materials, or equipment from damage or deterioration due to floods, driving rain, and/or wind. JEA reserves the right, to order that additional protection measures over and beyond those proposed by the CONTRACTOR, be taken to safeguard all components of the Project.

B. The mixing and placing of concrete or pavement courses, the laying of masonry, and installation of sewers and water mains shall be stopped during rainstorms, if ordered by JEA; and all freshly placed work shall be protected by canvas or other suitable covering in such manner as to prevent running water from coming in contact with it. Sufficient coverings shall be provided and kept ready at hand for this purpose. The limitations and requirements for mixing and placing concrete, or laying of masonry, in cold weather shall be as described elsewhere in these Specifications.

1.17 PERIODIC CLEANUP: BASIC SITE RESTORATION

A. During construction, the CONTRACTOR shall regularly remove from the site of the work all accumulated debris and surplus materials of any kind which result from his operations. Unused equipment and tools shall be stored at the CONTRACTOR’s yard or base of operations for the Project.

B. When the work involves installation of sewers, drains, water mains, manholes, underground structures, or other disturbance of existing features in or across streets, rights-of-way, easements, or private property, the CONTRACTOR shall (as the work progresses) promptly backfill, compact, grade, and otherwise restore the disturbed area to the basic condition which will permit resumption of pedestrian or vehicular traffic and any other critical activity or functions consistent with the original use of the land. The requirements for temporary paving of streets, walks, and driveways are specified elsewhere. Unsightly mounds of earth, large stones, boulders, and debris shall be removed so that the site presents a neat appearance.

C. The CONTRACTOR shall perform the cleanup work on a regular basis and as frequently as ordered by JEA. Basic site restoration in a particular area shall be accomplished immediately following the installation or completion of the required facilities in that area. Furthermore, such work shall also be accomplished, when ordered by JEA, if partially completed facilities must remain incomplete for some time period due to unforeseen circumstances.

D. Upon failure of the CONTRACTOR to perform periodic cleanup and basic restoration of the site to JEA's satisfaction, JEA may, upon five days prior written notice to the CONTRACTOR, without prejudice to any other rights or remedies of JEA, cause such work for which the CONTRACTOR is responsible to be accomplished to the extent deemed necessary by JEA, and all costs resulting therefrom shall be charged to the CONTRACTOR and deducted from the amounts of money that may be due him.

1.18 USE OF FACILITIES BEFORE COMPLETION

A. JEA reserves the right to enter and use any portion of the constructed facilities before final completion of the whole work to be done under this Contract. However, only those portions of the facilities which have been completed to JEA's satisfaction, as evidenced by his issuing a Certificate of Substantial Completion to the CONTRACTOR covering that part of the work, shall be placed in service.

B. It shall be JEA's responsibility to prevent premature connections to or use of any portion of the installed facilities by private or public parties, persons or groups of persons, before JEA issues his Certificate of Substantial Completion covering that portion of the work to be placed in service.

C. Consistent with the approved progress schedule, the CONTRACTOR shall cooperate with JEA to accelerate completion of those facilities, or portions thereof, which have been designated for early use by JEA.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION –

SECTION 01020

CONSTRUCTION SEQUENCING/CONSTRAINTS

PART 1 -- GENERAL

1.01 OVERALL SEQUENCE OF CONSTRUCTION

A. Work under the Contract shall be scheduled and performed in such a manner as to result in the least possible disruption to the operation of the existing treatment facilities. Process control modifications shall not be made without first obtaining written permission from the Engineer.

B. Critical events in the sequence of construction are specified herein. The outline sequence of construction does not include all items necessary to complete the work, but is intended to identify the sequence of critical events necessary to minimize disruption to the on-going treatment plant process and to ensure compliance with discharge requirements. It shall be understood by the CONTRACTOR that the critical events identified are not all inclusive and that additional items of work not shown may be required. The sequence of construction is a precedence requirement and does not attempt to schedule the CONTRACTOR's work. It is intended only to indicate which activities must precede other activities in order to minimize interferences and disruptions.

1. Stage I - Mobilization and Preliminary Site Work

a. Mobilize for work - set up field offices and staging area, obtain permits, develop and submit construction schedule, shop drawing schedule and begin shop drawing submittals.

2. Stage II – Construction and Start-Up of Facilities

3. Stage III - Project Closeout

a. Complete project closeout in accordance with Section 01700, "Project Closeout".

b. Final acceptance of the project.

C. The existing facilities shall be maintained in an operable condition by the CONTRACTOR during construction (excluded from this requirement are all normal and emergency maintenance functions normally performed by JEA with JEA's staff or by Contract.)

D. At no time shall the CONTRACTOR undertake to close off any pipelines, or open valves, or take any other action which would affect the operation of the existing treatment plant.

E. The following items are subject to construction sequence and time constraint in order to maintain a fully operational plant. The CONTRACTOR shall note that each item of work is subject to the Engineer's review and acceptance.

F. Temporary mechanical, electrical and instrumentation installations/connections may be

required to complete a particular aspect of work. All such subject temporary installations shall be subject to review and acceptance by the Engineer. All such temporary work shall be provided at no change in the Contract time or price.

1.02 DETAILED SEQUENCE OF CONSTRUCTION AND CONSTRAINTS

A. The CONTRACTOR shall schedule and perform the work so that the plant and its individual process facilities are maintained in continuous operation during the construction period except during approved plant or process interruptions. All short-term system or partial system shutdowns or diversions shall be submitted to JEA/Engineer in writing. No shutdowns or diversions shall be allowed without written approval from JEA/Engineer.

B. The CONTRACTOR shall submit a detailed, written plan of operation for each work item related to proposed shutdowns to JEA/Engineer for their review and approval. The plan of operation shall be submitted at least 14 days prior to the scheduled commencement date for that work. JEA/Engineer will review and return the plan with comments within 7 days. The CONTRACTOR shall schedule a meeting between the CONTRACTOR, JEA and Engineer to incorporate JEA/Engineer comments and finalize scheduling of the work. A final (revised) written plan of operation shall then be submitted to JEA/Engineer. The final plan shall be submitted to JEA/Engineer at least 3 days prior to the scheduled commencement date for that work. All work shall then be conducted in accordance with this final written plan of operation, unless agreed to in writing between the CONTRACTOR, JEA and Engineer. The written plan of operation shall address the following items:

1. Step-by-step detailed sequence for performing the work.

2. Anticipated duration of each activity.

3. Documentation on all temporary flow diversion equipment to be utilized by the CONTRACTOR, including tapping saddles, line stops, temporary bypass pumps and piping.

4. If temporary bypass pumping is required, submit the following:

   a. Quantity, manufacturer and model. Provide sufficient number of pumps to provide standby capacity equal to at least 50 percent of required pumping capacity.

   b. System and certified performance curves to demonstrate that pumps are sized correctly. Where multiple pumps shall be operated simultaneously, provide combined pump curves.

   c. Type of drive units. For electric drives, submit details on CONTRACTOR's temporary electrical power source. For fuel-driven units, provide details on fuel storage and manpower to ensure that adequate fuel supply is maintained.

5. Plan and/or schematic drawings to clearly identify work to be performed. Sequence steps shall be identified on drawings using a keynote legend or similar means.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

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SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Payment for the various items in the Schedule of Payment items, as further specified herein, shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, taxes, materials, commissions, transportation and handling, bonds, permit fees, insurance, overhead and profit, and incidentals appurtenant to the items of Work being described, as necessary to complete the various items of the Work all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). Such compensation shall also include payment for any loss or damages arising directly or indirectly from the Work.

B. The CONTRACTOR's attention is called to the fact that the quotations for the various items of Work are intended to establish a total price for completing the Work in its entirety. Should the CONTRACTOR feel that the cost for any item of Work has not been established by the Schedule of Payment items or this Section, it shall include the cost for that Work in some other applicable bid item, so that its proposal for the project does reflect its total price for completing the Work in its entirety.

1.02 SCHEDULE OF VALUES

A. The CONTRACTOR shall submit a Schedule of Payment Values in accordance with the instructions to bidders and as specified in Section 01370 entitled “Schedule of Values”.

B. The schedule shall be given in sufficient detail for proper identification of Work accomplished. The Schedule of Values shall directly correlate to each activity outlined in the construction progress schedule (specified in the Section 01300, Submittals) unless otherwise specified by JEA to accurately relate construction progress to the requested payment. Each item shall include its proportional share of all costs including the CONTRACTOR's overhead, contingencies and profit. The sum of all scheduled items shall equal the total value of the Contract.

C. The CONTRACTOR shall submit monthly applications for payment using JEA’s prescribed forms and format in accordance with this contract.

1.03 UNIT QUANTITIES SPECIFIED

A. Any tabulated quantities for the various items of work and materials are approximate only and are given solely to be used as a uniform basis for the comparison of bids. JEA and Engineer make no guarantee that the estimated quantities listed are equal or will be equal to final accepted quantities.

B. Quantities actually required to complete the work will be calculated in accordance with applicable Sections of the Specifications for the specific work items. Payment will be made based on the acceptable quantities submitted by the CONTRACTOR and approved by the Engineer multiplied by the Contract Unit Price for each Item.

1.04 MEASUREMENT OF QUANTITIES

A. Measurement of quantities for the various items of work will be in the units found in the applicable or referenced Specification Sections.

PART 2 -- PRODUCTS

2.01 LUMP SUM CONTRACT ITEMS

A. Contract Payment Item Nos. 1 through 7 and 10 have been provided in the Proposal (Bid Form) for the Contract as a lump sum price bid as listed below.

B. Where the Specifications and/or Contract Drawings are silent on Payment for work specified under an individual Specification Section or on the Drawings, it is understood that Payment will be made as part of the lump sum price bid.

1. Contract Item No. 1 – Site Work: Included in this item is the Work of the Contract for furnishing, delivering, and installing all materials, equipment, supplies and appurtenances necessary for site development, and all other civil/site improvements as required, including but not limited to, clearing and grubbing, leveling of terrain inside and outside of the limits of construction, necessary trimming and landscaping work that is incidental to the Contract work, storm pond development, sodding and irrigation requirements, stormwater improvements, driveways, site equipment pads, and stabilized roadways.

   The measurement of this item shall be made on a lump sum basis. Payment shall be made upon a percent completion basis, and final payment shall be dependent on substantial completion.

2. Contract Item No. 2 – Yard Piping: Included in this item is the Work of the Contract for furnishing, delivering, installing, testing and startup of all materials, equipment, services and incidentals associated with the yard piping, including but not limited to, all associated piping, pipe supports, painting and coatings, mixer, control valve, couplings, fittings, valves, and castings. The Item shall include tie-in operations, pressure testing, flushing, erosion and sediment control, and transportation of all material.

   Work includes all labor, unclassified excavation, backfill and compaction, noise abatement, disposal of all excess materials, trenching, exploratory excavations, protection of existing utilities, utility locates, backfill, disposal of soil, flushing, hydrostatic testing and disinfection procedures, pigging, dewatering activities, staging, pipe coupling connection, poly-wrapping, detection wire, materials and equipment necessary to install pipe specified herein.

   The measurement of this item shall be made on a lump sum basis. Payment shall

be made upon a percent completion basis, and dependent on satisfactorily bacterial and pressure testing of the percentage claimed.

3. Contract Item No. 3 – Flow Meter: Included in this item is the Work of the Contract for furnishing, delivering, installing, testing and startup of all materials, equipment, services and incidentals associated with the flow meter.

   The measurement of this item shall be made on a lump sum basis. Payment shall be made upon a percent completion basis, and final payment shall be dependent on substantial completion.

4. Contract Item No. 4 – Storage Tank: Included in this item is the Work of the Contract for furnishing, delivering, installing, testing and startup of all materials, equipment, services and incidentals associated with the 1.5 Million Gallon Ground Storage Tank, including but not limited to, all associated piping, pipe supports, complete design and construction of the tank structure with concrete floor, prestressed concrete wall and concrete dome, fiberglass accessories include dome ventilator, dome access hatch cover, interior ladder, liquid level indicator and 16" vortex breaker, aluminum accessories include exterior ladder and dome handrail around the access hatch cover, stainless steel access wall manholes, precast overflow vents with stainless steel screen mesh, PVC pipe cast in concrete dome curb, 12" stainless steel pipe cast into concrete dome for future infill line, stainless steel pipe brackets for overflow and inlet pipe, fall protection in compliance with OSHA requirements for the exterior and interior ladders, perimeter curbing, and interior and exterior coating system per standard JEA specifications.

   The measurement of this item shall be made on a lump sum basis. Payment shall be made upon a percent completion basis, and final payment shall be dependent on substantial completion.

5. Contract Item No. 5 – Pump Station: Included in this item is the Work of the Contract for furnishing, delivering, installing, testing and startup of all materials, equipment, services and incidentals associated with the pump station, including but not limited to, the foundation slab and trench, concrete columns, concrete beams, concrete equipment pads, precast concrete hollowcore planks, concrete roof topping concrete masonry, trench covers, single and double doors, overhead rollup door, louvers, exhaust fans, HVAC, pumps, sodium hypochlorite pumps, skid and associated equipment, sodium hypochlorite storage tanks, painting and coatings, fill station, containment and enclosure, all associated piping, pipe supports, couplings, fittings, valves, castings, pressure testing, flushing, mobile gantry crane, and transportation of all material.

   The measurement of this item shall be made on a lump sum basis. Payment shall be made upon a percent completion basis, and final payment shall be dependent on substantial completion.

6. Contract Item No. 6 – Generator: Included in this item is the Work of the Contract for furnishing, delivering, installing, testing and startup of all materials, equipment, services and incidentals associated with the generator, including but not limited to, sub base tank, generator, atmospheric and emergency vents, fuel level and leak switches, internal conduits and stub ups, exterior fill with spill containment, painting

systems, radiator, solar gauge, access stairs and handrails, generator enclosure, sound attenuation insulation and liners, and associated electrical package.

The measurement of this item shall be made on a lump sum basis. Payment shall be made upon a percent completion basis, and final payment shall be dependent on substantial completion.

7. Contract Item No. 7 – Electrical and Instrumentation and Controls (I&C): Included in this item is the Work of the Contract for furnishing, delivering, installing, testing and startup of all materials, equipment, services and incidentals associated with the electrical and I&C, including but not limited to, all associated conduit runs, modifications to the motor control centers, grounding, required support systems, wire pulls, conductors, re-wiring, duct banks, installation of VFD's, interior and exterior lighting, megger testing, relays, all sensors, system integration, signal coordination, PLC's and associative programing, network integration, cabinets, surge protection, control gauges and switches, transducers, analyzers, fiber optical cables, I/O schedules, conduits, and uninterruptible power systems, and required testing, including all labor and appurtenant work as indicated in the Contract Documents

   The measurement of this item shall be made on a lump sum basis. Payment shall be made upon a percent completion basis, and final payment shall be dependent on substantial completion.

9. Contract Item No. 10 – Deductive Alternate Bid Item: All Work associated with the pump station roof fall protection system in lieu of a roof parapet. Shall include, but not be limited to all materials, equipment, labor, appurtenances, and all other work necessary for a complete and fully functioning system, as specified and show in the Contract Documents whether specifically mentioned or implied, except that Work specifically included for payment under any other Bid Item. It is mandatory to include a value on the bid form for this alternate bid item.

2.02 UNIT PRICE CONTRACT ITEMS

A. Contract Payment Item Nos. 8 through 9 have been provided in the Proposal (Bid Form) for the Contract as unit priced items as listed below.

1. Contract Item No. 8 – Offsite structural fill: Payment for structural fill will be made at the unit price bid per cubic yard. This price shall constitute full compensation for providing all labor, equipment and material to perform the required work when ordered by the Engineer. The quantity to be measured for payment under this Contract Item will be the actual volume; measurement shall be approved by the Engineer and JEA. If suitable fill is available onsite per Section 02200, that will be given priority over of offsite structural fill. If onsite structural fill is inadequate, offsite structure fill can be used.

   Contract Item No. 8 estimated quantity: 90 cy

2. Contract Item No. 9 – Unsuitable material: Payment for unsuitable material per 02200 will be made at the unit price bid per cubic yard. This price shall constitute

full compensation for providing all labor, equipment and material to perform the required work when ordered by the Engineer including excavate, remove and dispose offsite. The quantity to be measured for payment under this Contract Item will be the actual volume; measurement shall be approved by the Engineer and JEA.

Contract Item No. 9 estimated quantity: 90 cy

2.03 ALLOWANCE CONTRACT ITEMS

B. The following allowances have been provided in the Proposal (Bid Form) for the Contract.

1. Testing Allowance: JEA will provide funds as specified on the bid sheet to reimburse the CONTRACTOR at cost for hiring one or more testing laboratory(ies) to perform sampling, field testing and laboratory testing not specified herein but required, or as directed by the JEA Engineer. The testing allowance is to be used for first tests only. Any retesting due to failed first tests shall be at the CONTRACTOR's expense. The CONTRACTOR shall clearly mark on its invoices costs associated with testing services identifying the cost to the CONTRACTOR of the testing service. The CONTRACTOR agrees to invoice JEA for testing services at its cost with no markup.

2. Supplemental Work Authorization (SWA): The JEA Representative will issue a written SWA to incorporate cost or schedule changes into the Contract. The SWA shall be used for increases and decreases in the Contract price, within the SWA amount set forth in the Bid, or to make changes in schedule for performance of the Work. An SWA work shall authorize the CONTRACTOR to perform changes in the Work. The CONTRACTOR shall not start on SWA work until the CONTRACTOR receives a fully authorized, written SWA form, signed by the appropriate JEA personnel – the CONTRACTOR shall not consider verbal statements as authorization to proceed with the changes. The CONTRACTOR should not expect that any SWAs will be issued. JEA shall have no obligation to pay for SWA work unless the same is performed pursuant to a written SWA form signed before the SWA work is commenced.

2.04 OTHER CONTRACT ITEMS

A. The following items shall be included in the Proposal (Bid Form) for the Contract.

1. Mobilization/Demobilization (Limited to 5% of Grand Total): Payment will be made at the aggregate sum price bid, which aggregate sum shall be full compensation for the CONTRACTOR'S mobilization on site, including but not limited to, scheduling, site preparation, silt fence and erosion control, protection of existing utilities during construction, installing construction entrances, fencing, construction trailer, pre-construction video, site preparation, establishing health, safety, and or other required plans, procurement of required temporary utilities, and preparing and acquiring bonds, insurance, and permits, and all other activities necessary to prepare to complete the Contract work. The Item will also cover attendance of pre-construction meeting and activities required to be completed prior to construction commencement. The Item shall also include

contract close out, development of as-builts, and demobilization activities.

The measurement for this item shall not be made separately but it shall be paid on a lump sum basis. Demobilization and contract close out shall not be paid as a separate item. A payment of 50% of the total mobilization unit cost will be made as an initial progress payment, and 50% shall be paid upon substantial completion of the Contract.

2. General Conditions (Limited to 10% of Grand Total): Payment will be made at the aggregate sum price bid, which aggregate sum shall be full compensation for the CONTRACTOR'S general conditions, including but not limited to preparing and acquiring bonds, insurance, and permits.

PART 3 -- EXECUTION

3.01 PAYMENT

A. The Total Bid Price for the Contract shall include, as applicable, the following items:

1. Lump Sum Contract Item Nos. 1-7, 10
2. Unit Price Contract Item Nos. 8-9
3. Allowances for Testing and Supplemental Work
4. Mobilization/Demobilization (not to exceed 5% of subtotal)
5. General Conditions (not to exceed 10% of subtotal)

B. Payment for the total bid price shall be in accordance with the requirements of the Contract Documents.

- END OF SECTION -

SECTION 01040

COORDINATION

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall allow JEA or their agents, and other project CONTRACTORS or their agents, to enter upon the work for the purpose of constructing, operating, maintaining, removing, repairing, altering, or replacing such pipes, sewers, conduits, manholes, wires, poles, or other structures and appliances which may be required to be installed at or in the work. The CONTRACTOR shall cooperate with all aforesaid parties and shall allow reasonable provisions for the prosecution of any other work by JEA, or others, to be done in connection with the CONTRACTORS work, or in connection with normal use of the facilities.

B. Each CONTRACTOR shall cooperate fully with JEA and all other CONTRACTORS employed on the work, to effect proper coordination and progress to complete the project on schedule and in proper sequence. Insofar as possible, decisions of all kinds required from JEA shall be anticipated by the CONTRACTOR to provide ample time for inspection, or the preparation of instructions.

C. Each CONTRACTOR shall assume full responsibility for the correlation of all parts of their work with that of other CONTRACTORS. Each CONTRACTOR's superintendent shall correlate all work with other CONTRACTORS in the laying out of work. Each CONTRACTOR shall lay out their own work in accordance with the Drawings, Specifications, and instructions of latest issue and with due regard to the work of other CONTRACTORS.

PART 2 -- PRODUCTS

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PART 3 -- EXECUTION

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SECTION 01070

ABBREVIATIONS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Wherever in these specifications references are made to the standards, specifications, or other published data of the various national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these specifications, the following acronyms or abbreviations which may appear in these specifications shall have the meanings indicated herein.

1.02 ABBREVIATIONS AND ACRONYMS

AAMA	Architectural Aluminum Manufacturer's Association
AASHTO	American Association of the State Highway and Transportation Officials
ACI	American Concrete Institute
ACIFS	American Cast Iron Flange Standards
ACOE	Army Corps of Engineers
ACPA	American Concrete Pipe Association
AFBMA	Anti-Friction Bearing Manufacturer's Association, Inc.
AGMA	American Gear Manufacturer's Association
AHGDA	American Hot Dip Galvanizers Association
AI	The Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute, Inc.
APA	American Plywood Association
API	American Petroleum Institute
APHA	American Public Health Association
APWA	American Public Works Association
ASA	Acoustical Society of America
ASAE	American Society of Agriculture Engineers
ASCE	American Society of Civil Engineers

ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASLE	American Society of Lubricating Engineers
ASME	American Society of Mechanical Engineers
ASMM	Architectural Sheet Metal Manual
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
CEMA	Conveyor Equipment Manufacturer’s Association
CMA	Concrete Masonry Association
CRSI	Concrete Reinforcing Steel Institute
DIPRA	Ductile Iron Pipe Research Association
EIA	Electronic Industries Association
ETL	Electrical Test Laboratories
FBC	Florida Building Code
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FS	Federal Specifications
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Systems and Automation
ISO	International Organization for Standardization
MBMA	Metal Building Manufacturers Association
MMA	Monorail Manufacturers Association
MTI	Marine Testing Institute
NAAM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association

NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health
NIST	National Institute of Standards and Testing
NRCA	National Roofing Contractors Association
NSF	National Science Foundation
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCM	Program Construction Manager
PMT	Program Management Team
SMACCNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
SFWMD	South Florida Water Management District
SJRWMD	St. Johns River Water Management District
UL	Underwriters Laboratories, Inc.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

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SECTION 01090

REFERENCE STANDARDS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Wherever reference is made to any published standards, codes, or standard specifications, it shall mean the latest standard code, specification, or tentative specification of the technical society, organization, or body referred to, which is in effect at the date of invitation for Bids.

B. All materials, products, and procedures used or incorporated in the work shall be in strict conformance with applicable codes, regulations, specifications, and standards.

C. A partial listing of codes, regulations, specifications, and standards includes the following:

Air Conditioning and Refrigeration Institute (ARI)

Air Diffusion Council (ADC)

Air Moving and Conditioning Association (AMCA)

The Aluminum Association (AA)

American Architectural Manufacturers Association (AAMA)

American Concrete Institute (ACI)

American Gear Manufacturers Association (AGMA)

American Hot Dip Galvanizers Association (AHDGA)

American Institute of Steel Construction, Inc. (AISC)

American Iron and Steel Institute (AISI)

American National Standards Institute (ANSI)

American Society of Civil Engineers (ASCE)

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)

American Society of Mechanical Engineers (ASME)

American Society for Testing and Materials (ASTM)

American Standards Association (ASA)

American Water Works Association (AWWA)

American Welding Society (AWS)

American Wood-Preserver's Association (AWPA)

Anti-Friction Bearing Manufacturers Association (AFBMA)

Building Officials and Code Administrators (BOCA)

Consumer Product Safety Commission (CPSC)

Factory Mutual (FM)

Federal Specifications

Florida Building Code

Instrument Society of America (ISA)

Institute of Electrical and Electronics Engineers (IEEE)

National and Local Fire Codes

Lightning Protection Institute (LPI)

National Electrical Code (NEC)

National Electrical Manufacturer's Association (NEMA)

National Electrical Safety Code (NESC)

National Electrical Testing Association (NETA)

National Fire Protection Association (NFiPA)

Regulations and Standards of the Occupational Safety and Health Act (OSHA)

Southern Building Code Congress International, Inc. (SBCCI)

Sheet Metal & Air Conditioning Contractors National Association (SMACCNA)

Standard Building Code

Standard Mechanical Code

Standard Plumbing Code

Uniform Building Code (UBC)

Underwriters Laboratories Inc. (UL)

D. Contractor shall, when required, furnish evidence satisfactory to the Engineer that materials and methods are in accordance with such standards where so specified.

E. In the event any questions arise as to the application of these standards or codes, copies shall be supplied on-site by the Contractor.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

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SECTION 01300

SUBMITTALS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. This section specifies the means of all submittals. All submittals, whether their final destination is to JEA, or other representatives of JEA, shall be directed through JEA. A general summary of the types of submittals and the number of copies required is as follows:

Hard Copies to JEA	Type of Submittal
3*	Progress Schedule
3*	Construction Schedule
See 01370	Schedule of Values
1	Application for Payment
10**	Shop Drawings
See 01730	O&M Manuals
2	Certificates of Compliance
2	Warranties
2***	Product Samples

** Unless otherwise required in the instructions to bidders.*
*** Unless electronically submitted.*
**** Unless otherwise required in the specific Section where requested.*

For electronically submitted documents, if used, provide access to a file sharing system for transmission of large files (system paid for by the Contractor) and make all submittals in searchable pdf format. Utilize the file sharing system for all files regardless of size and provide a link to the posted files via email sent to the designated representative with the engineers and the Owner.

1.02 SUBMITTAL PROCEDURES

A. Transmit each submittal with a form acceptable to JEA, clearly identifying the project CONTRACTOR, the enclosed material and other pertinent information specified in other parts of this section. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

B. Revise and resubmit submittals as required, identify all changes made since previous submittals. Resubmittals shall be noted as such.

C. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.03 CONSTRUCTION PROGRESS SCHEDULE

A. The CONTRACTOR shall prepare the construction progress schedule in accordance with JEA standards. The schedule shall be developed in the Primavera P6 format. At least 10 days prior to the Preconstruction meeting, the proposed work schedule shall be submitted by the CONTRACTOR.

B. If the CONTRACTOR desires to make changes in its method of operating which affect the construction progress schedule and related items, it shall notify JEA in writing stating what changes are proposed and the reason for the change. If JEA accepts these changes, in writing, the CONTRACTOR shall revise and submit, without additional cost to JEA, all of the affected portions of the construction progress schedule and associated reports. The construction progress schedule and related items shall be adjusted by the CONTRACTOR only after prior acceptance, in writing by JEA. Adjustments may consist of changing portions of the activity sequence, activity durations, division of activities, or other adjustments as may be required. The addition of extraneous, nonworking activities and activities which add restraints to the construction progress schedule shall not be accepted.

C. Except where earlier completions are specified, schedule dates which show completion of all Work prior to the contract completion date shall, in no event, be the basis for claim for delay against JEA by the CONTRACTOR.

D. Construction progress schedules and related items which contain activities showing negative float or which extend beyond the contract completion date will be accepted only upon the condition that the CONTRACTOR will comply with recovery schedule requirements in accordance with the Contract.

E. If the completion of any activity, whether or not critical, falls more than 100 percent behind its previously scheduled and accepted duration, the CONTRACTOR shall submit for approval a schedule adjustment showing each such activity divided into two activities reflecting completed versus uncompleted work.

F. Shop drawings which are not approved on the first submittal or within the time scheduled, and equipment which does not pass the specified tests and certifications shall be immediately rescheduled.

G. From time to time it may be necessary for the contract schedule of completion time to be adjusted by JEA in accordance with the Contract and other portions of the Contract Documents as may be applicable. Under such conditions, JEA will direct the CONTRACTOR to reschedule the Work or contract completion time to reflect the changed conditions, and the CONTRACTOR shall revise the construction progress schedule and related items accordingly, at no additional cost to JEA.

H. Available float time may be used by JEA.

I. JEA controls the float time and, the before, without obligation to extend either the overall completion date or any intermediate completion dates, JEA may initiate changes that absorb float time only. JEA initiated changes that affect the critical path on the network diagram shall be the sole grounds for extending the completion dates. CONTRACTOR

initiated changes that encroach on the float time may be accomplished only with JEA's concurrence. Such changes, however, shall give way to JEA initiated changes competing for the same float time.

J. To the extent that the construction project schedule, or associated report or any revision thereof shows anything not jointly agreed upon or fails to show anything jointly agreed upon, it shall not be deemed to have been accepted by JEA. Failure to include on a schedule any element of Work required for the performance of this Contract shall not excuse the CONTRACTOR from completing all Work required within any applicable completion date, notwithstanding the review of the schedule by JEA.

K. Review and acceptance of the construction progress schedule, and related reports, by JEA is advisory only and shall not relieve the CONTRACTOR of the responsibility for accomplishing the Work within the contract completion date. Omissions and errors in the construction progress schedule, and related reports shall not excuse performance less than that required by the Contract and in no way make JEA an insurer of the CONTRACTOR's success or liable for time or cost overruns flowing from any shortcomings in the construction progress schedule, and related reports.

L. Three hard copies and one electronic copy shall be submitted with the Application for Payment.

1.04 SCHEDULE OF VALUES

A. The CONTRACTOR shall submit a Schedule of Values for review within the time frame referenced in the instructions to bidders and Section 01370. The schedule shall directly correlate on an item by item basis (unless otherwise accepted/directed by JEA) to each individual activity detailed in the construction progress schedule. The sum of all scheduled items shall equal the total value of the Contract. Reference Section 01025, Measurement and Payment, for further details.

B. The CONTRACTOR shall expand or modify the above schedule and materials listing as required by JEA's initial or subsequent reviews.

1.05 APPLICATION FOR PAYMENT

A. The CONTRACTOR shall submit Application for Payment to JEA monthly for review in accordance with the Contract. The Application shall be submitted on the day of the month directed by JEA for the preceding month’s work.

B. The Application for Payment shall include a listing of monthly labor hours spent on site in electronic format (pdf), updated as-built drawings, invoices for stored material, stored material log and updated EAM worksheets. JEA to provide Application for Payment excel workbook to be used for compiling data necessary for each Application for Payment.

1.06 SHOP DRAWINGS

A. The CONTRACTOR shall submit for review shop drawings for concrete reinforcement, structural details, piping layout and appurtenances, wiring, color selection charts, materials and equipment fabricated especially for this Contract, and materials and

equipment for which such Drawings are specified or specifically requested by JEA. Shop drawings shall be submitted in accordance with the Contract, except where the number of shop drawings to be submitted is specifically stated in the technical specification.

B. Shop drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the Drawings.

C. When so specified, or if considered by JEA to be acceptable, the manufacturer's specifications, catalog data, descriptive matter, illustrations, etc. may be submitted for review in place of shop drawings. In such case, the requirements shall be as specified for shop drawings, insofar as applicable.

D. The CONTRACTOR shall be responsible for the prompt submittal of all shop drawings so that there shall be no delay to the Work due to the absence of such Drawings. JEA/Engineer will review the shop drawings within 21 calendar days of receipt of such Drawings. Reviewed shop drawings will be returned to the CONTRACTOR by electronic format, posted no later than 21 days after receipt.

E. Time delays caused by rejection of submittals are not cause for extra charges to JEA or time extensions.

F. Requirements: All shop drawings shall be submitted to JEA/Engineer through the CONTRACTOR. The CONTRACTOR is responsible for obtaining shop drawings from his subcontractors and returning reviewed shop drawings to them. All shop drawings shall be prepared on standard size, 18-inch by 24-inch sheets. JEA standard title block from the JEA website shall be used for all shop drawings. All Drawings shall be clearly marked with the name of the project, JEA project number, Engineer project number, JEA, CONTRACTOR, Engineer and building, equipment, or structure to which the drawing applies. Drawings shall be suitably numbered and contain the review stamp by the CONTRACTOR. Each shipment of shop drawings shall be accompanied by a letter of transmittal giving a list of the drawing/specification numbers and the names mentioned above. In addition to the number of copies specified, the CONTRACTOR shall submit one electronic copy in pdf format.

G. Product Data: Where manufacturer's publications in the form of catalogs, brochures, illustrations, or other data sheets are submitted in lieu of prepared shop drawings, such submission shall specifically indicate the particular item offered. Identification of such items and relative pertinent information shall be made with indelible ink. Submissions showing only general information will not be accepted. JEA will reject documents that are not legible copies shall be originals or legible for review.

H. Product data shall include materials of construction, dimensions, performance characteristics, capacities, wiring diagrams, piping and controls, etc.

I. Warranties: When warranties are called for, a sample of the warranty shall be submitted with the shop drawing. The sample warranty shall be the same form that will be used for the actual warranty. Actual warranties shall be originals and notarized. Warranty shall commence at JEA acceptance and shall be in effect for one year unless otherwise specified.

J. Work Prior to Review: No material or equipment shall be purchased, fabricated especially for this Contract, or delivered to the project site until the required shop drawings have been submitted, processed and marked either "FURNISH AS SUBMITTED" or "FURNISH AS CORRECTED". All materials and Work involved in the construction shall be as represented by said Drawings.

K. The CONTRACTOR shall not proceed with any portion of the Work (such as the construction of foundations) for which the design and details are dependent upon the design and details of equipment for which submittal review has not been completed.

L. CONTRACTOR's Review: Only submittals which have been checked and corrected should be submitted to the CONTRACTOR by its subcontractors and vendors. Prior to submitting shop drawings to JEA/Engineer, the CONTRACTOR shall check thoroughly all such shop drawings to satisfy itself that the subject matter thereof conforms to the Drawings and Specifications in all respects. Shop drawings which are correct shall be marked with the date, checker's name and indications of the CONTRACTOR's approval, and then shall be submitted to JEA/Engineer. Other Drawings submitted to JEA/Engineer will be returned to the CONTRACTOR unreviewed.

M. CONTRACTOR's Responsibility: JEA's review of shop drawings will be general and shall not relieve the CONTRACTOR of the responsibility for details of design, dimensions, etc., necessary for proper fitting and construction of the Work required by the Contract and for achieving the specified performance.

N. CONTRACTOR's Modifications: For submissions containing departures from the Contract Documents, the CONTRACTOR shall include proper explanation in his letter of transmittal and shall identify in the relevant specification to which the exception is taken. Should the CONTRACTOR submit for review equipment that requires modifications to the structures, piping, layout, etc. detailed on the Drawings, he shall also submit for review details of the proposed modifications. If such equipment and modifications are accepted, the CONTRACTOR, at no additional cost to JEA, shall do all Work necessary to make such modifications.

O. Substitutions: Substitutions may be submitted in accordance with the Contract.

P. Complete Submittals: Each submittal shall be complete in all aspects incorporating all information and data required to evaluate the products' compliance with the Contract Documents. Partial or incomplete submissions shall be returned to the CONTRACTOR without review.

1.07 WARRANTIES

A. Warranties called for in the Contract Documents shall be originals and submitted to JEA. When warranties are required they shall be submitted prior to request for payment. Warranties shall be original copies and shall be notarized.

1.08 CERTIFICATES

A. Two hard copies and one electronic copy of certificates of compliance and test reports shall be submitted for requested items to JEA prior to request for payment.

1.09 PRODUCT SAMPLES

A. CONTRACTOR shall furnish for review all product samples as required by the Contract Documents or requested by JEA to determine compliance with the specifications.

B. Samples shall be of sufficient size or quantity to clearly illustrate the quality, type, range of color, finish or texture and shall be properly labeled to show complete project identification, the nature of the material, trade name of manufacturer and location of the Work where the material represented by the sample will be used.

C. Samples shall be checked by the CONTRACTOR for conformance to the Contract Documents before being submitted to JEA and shall bear the CONTRACTOR's stamp certifying that they have been so checked. Transportation charges on samples submitted to JEA shall be prepaid by the CONTRACTOR.

D. JEA's review will be for compliance with the Contract Documents, and its comments will be transmitted to the CONTRACTOR with reasonable promptness.

E. Acceptable samples will establish the standards by which the completed Work will be judged.

1.10 OPERATION AND MAINTENANCE MANUALS

A. General: In accordance with Section 01730, the CONTRACTOR shall furnish and deliver to JEA complete Operation and Maintenance (O&M) Manuals for the substantial, complete systems including instructions, technical bulletins, and any other printed matter such as diagrams, prints or drawings, containing full information required for the proper operations, maintenance, and repair of all CONTRACTOR furnished equipment. These requirements are a prerequisite to the operation and acceptance of equipment. Ten (10) weeks prior to the CONTRACTOR's substantial completion date, all O&M manuals shall be submitted in its final form.

B. All O&M manuals shall also be furnished in an electronic file format suitable for downloading into JEA's O&M database system. All manuals and drawings for the vendor provided equipment, sub-system or system shall be in Adobe Portable Document Format (PDF) format, in conformance with the latest version. They shall be PDF Formatted Text and Graphics (formerly Normal) or PDF Searchable Image (formerly Image+Text). If submitted in Searchable Image format, they shall be Optical Character Recognized (OCR'ed) at a 95% confidence level, using Adobe Acrobat Capture or an equivalent product. There shall be links from all Table of Contents entries to the actual occurrence in the body of the manual. Bookmarks shall be created for all linked Table of Contents entries. This requirement applies to all equipment to be furnished on this project.

1.11 RECORD DRAWINGS

A. Record drawings shall be prepared in accordance with "As-Built Drawings" as detailed in the Contract and the JEA Water and Sewer Standards Section 501 and Section 01720 of the Contract Documents.

B. The CONTRACTOR shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Said Record Drawings shall be supplemented by detailed sketches as necessary or directed to indicate, fully, the Work as actually constructed. These master Record Drawings of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by addenda and change orders shall be maintained up-to-date during the progress of the Work.

C. At a minimum the Record Drawings shall be reviewed on the 20th working day of every third month after the month of Award, as well as on completion of Work. Failure to maintain the Record Drawings up-to-date shall be grounds of withholding monthly progress payments until such time as the Record Drawings are brought up-to-date.

D. Record Drawings shall be accessible to JEA/Engineer at all times during the construction period.

PART 2 -- PRODUCTS

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PART 3 -- EXECUTION

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SECTION 01370

SCHEDULE OF VALUES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The apparent low bidder will prepare and submit a preliminary schedule of values within the time frame referenced in the instructions to bidders. Each item in the schedule includes the complete structure; piping and valves; equipment furnished by equipment manufacturers. All electrical work will be included in the electrical item unless noted otherwise. All field instruments will be included in the instrumentation item unless noted otherwise.

B. Upon request of the Engineer, the apparent low bidder will prepare and submit supporting data which will substantiate the correctness of the Schedule of Values.

C. The Schedule of Values, unless objected to by the Engineer, shall be used as the basis for the CONTRACTOR's Applications for Payment.

1.02 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Type Schedule of Values on 8-1/2 inch x 11 inch or 8-1/2 inch x 14 inch white paper furnished by JEA, CONTRACTOR's standard forms and automated printout will be considered for approval by the Engineer upon CONTRACTOR's request. Identify schedule with:

1. Title of Project and Location.

2. Engineer and Project number.

3. Name and Address of CONTRACTOR.

4. Contract Designation.

5. Date of Submission.

B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.

C. For each major line item list sub-values of major products or operations under the item and include material and equipment costs. Identify each line item with the number and title of the respective major section of the specifications. The breakdown shall be done in accordance with a form established by the CONTRACTOR and acceptable to the JEA.

D. For the various portions of the Work:

1. Each item shall include a directly proportional amount of the CONTRACTOR's overhead and profit.

2. For items on which progress payments will be requested for stored materials, break down the value into:

   a. The cost of the materials, delivered and unloaded, with taxes paid. Paid invoices are required for materials upon request by the Engineer.

   b. The total installed value.

E. The sum of all values listed in the schedule shall equal the total Contract Sum.

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

A. The attached Table 01370-1 includes the assets to be accounted for in the Schedule of Values.

B. For each asset or group of assets listed, provide a constructed cost which will include an allocation of construction activities including but not limited to, demolition, sitework, specialties, materials, labor, general conditions, and overhead and profit associated with the construction of the asset.

C. The combined value of the assets will equal the bid price for the project and will require adjustments as necessary due to change orders. The schedule of values will be updated on a monthly basis and will be included in the monthly pay request application for approval.

D. JEA reserves the right to edit this list prior to the first pay application and may add up to 10 percent more items than have been identified in the list.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

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Table 01370-1 Schedule of Assets

AIR RELEASE VALVE, AT ALTITUDE CONTROL VALVE PIPING
AIR RELEASE VALVE, AT PUMP SUCTION HEADER
AIR RELEASE VALVE, ON PUMP 01
AIR RELEASE VALVE, ON PUMP 02
AIR RELEASE VALVE, AT FLOW METER PIPING
ISOLATION UTILITY MAIN BREAKER - RADIO AVENUE RECLAIMED WATER
VENDOR CONTROL PANEL
2 TON MOBILE GANTRY CRANE
200 KW ENCLOSED GENERATOR
POWER DISTRIBUTION PANELBOARD - RADIO AVENUE RECLAIMED WATER
44 A MAIN BREAKER
400 A AUTOMATIC TRANSFER SWITCH
225 A LIGHTING PANELBOARD
45 Kva TRANSFORMER
DISCHARGE PIPING, 10" FLOW METER AND TRANSMITTER, FE/FIT-2151
PRESSURE INDICATING TRANSMITTER, PIT-1001
PRESSURE INDICATING TRANSMITTER, PIT-2101
PRESSURE INDICATING TRANSMITTER, PIT-2151
GST LEVEL INDICATOR, LIT-1011
PUMP 1, MOTOR
PUMP 2, MOTOR
16” DIP, DISCHARGE PIPING
PUMP 1, 8” DIP, DISCHARGE PIPING
PUMP 1, 8” DIP, SUCTION PIPING
PUMP 2, 8” DIP, DISCHARGE PIPING
PUMP 2, 8” DIP, SUCTION PIPING
GST, 16” DIP, BYPASS
GST, 16” DIP, DRAIN / OVERFLOW
GST, 16” DIP, EFFLUENT PIPING
GST, 16” DIP, FILL PIPING
YARD HYDRANT, 6" DIP, SUPPLY PIPING
PUMP 1, PUMP P-2011
PUMP 2, PUMP P-2021
HYPO PUMP 1
HYPO PUMP 1
PLC-XXX CONTROL CABINET
TBD------POWER MONITOR UTILITY - RADIO AVENUE RECLAIMED WATER

PUMP 1, MOTOR DISCONNECT SWITCH
PUMP 2, MOTOR DISCONNECT SWITCH
1.5 MG RECLAIMED WATER STORAGE TANK
990 GALLON GENERATOR FUEL TANK
250 GALLON SODIUM HYPOCHLORITE FUEL TANK
250 GALLON SODIUM HYPOCHLORITE FUEL TANK
PUMP 1, SUCTION VALVE, 8" FLG GATE VALVE AND OPERATOR
PUMP 1, DIS VALVE, 8" FLG GATE VALVE AND OPERATOR
PUMP 1, CHECK VALVE, 8" FLG CHECK VALVE
PUMP 2, SUCTION VALVE, 8" FLG GATE VALVE AND OPERATOR
PUMP 2, DIS VALVE, 8" FLG GATE VALVE AND OPERATOR
PUMP 2, CHECK VALVE, 8" FLG CHECK VALVE
PUMP SUCTION HEADER, 16" FLG GATE VALVE AND OPERATOR
PUMP SUCTION HEADER TO FUTURE PUMPS, 16" FLG GATE VALVE NO OPERATOR
FUTURE PUMP 3, DIS VALVE, 8" FLG GATE VALVE NO OPERATOR
FUTURE PUMP 4, DIS VALVE, 8" FLG GATE VALVE NO OPERATOR
TANK BYPASS, 16" MJ GATE VALVE
TANK BYPASS, 16" MJ GATE VALVE
TANK FILL, 16" MJ GATE VALVE
INFLUENT PIPING, CONTROL VALVE, 16"
TANK FILL, 16" MJ GATE VALVE
TANK FILL, 16" MJ GATE VALVE
TANK FILL, 16" MJ GATE VALVE
TANK FILL, 16" MJ GATE VALVE
TANK FILL, 16" MJ GATE VALVE
TANK DRAIN, 16" MJ GATE VALVE
TANK DRAIN, 16" MJ GATE VALVE
TANK EFFLUENT, 16" MJ GATE VALVE
TANK EFFLUENT, 16" MJ GATE VALVE
FLOW METER STATION 10" FLG GATE VALVE AND OPERATOR
FLOW METER STATION 10" FLG GATE VALVE AND OPERATOR
FLOW METER STATION 10" FLG GATE VALVE AND OPERATOR
YARD HYDRANT, 6" MJ GATE VALVE
PUMP 1, VFD
PUMP 2, VFD

TRANSFORMER [ID, 480V-208Y/120V]
AIR CONDITIONING SYSTEM 1 ELEC ROOM
AIR CONDITIONING SYSTEM 2 ELEC ROOM
AIR PRESSURIZATION SYSTEM ELEC ROOM
ROOF MOUNTED EXHAUST FAN 1 PUMP ROOM
ROOF MOUNTED EXHAUST FAN 2 PUMP ROOM
CHEMICAL AREA EXHAUST FAN
ALTERNATE BID ITEM

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SECTION 01400

QUALITY CONTROL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall develop and maintain a Quality Control Program in accordance with the Contract and as specified herein to ensure that the Work strictly conforms to all requirements of the Contract Documents. CONTRACTOR shall submit a weekly conformance report on quality control to JEA. The non-conformance report shall indicate deviations of the quality of work from the Quality Control program.

B. The CONTRACTOR shall be responsible for and shall supervise the work of all subcontractors, providing instructors to each when their work does not conform to the requirements of the Quality Control Program and the Contract Documents.

1.02 OBSERVATION AT PLACE OF MANUFACTURE

A. Unless otherwise specified, all products, materials, and equipment shall be subject to observation by JEA at the place of manufacture.

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

1.03 SAMPLING AND TESTING

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

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

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

1.04 SITE INVESTIGATION AND CONTROL

A. The CONTRACTOR shall verify all dimensions in the field and shall check field conditions continuously during construction. The CONTRACTOR shall be solely responsible for any inaccuracies built into the Work due to its failure to comply with this requirement.

B. The CONTRACTOR shall inspect related and appurtenant Work and shall report in writing to JEA any conditions which will prevent proper completion of the Work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the CONTRACTOR within the scope of the Contract.

1.05 INSPECTION AND TESTING

A. Unless otherwise specified, the CONTRACTOR shall employ and pay for the services of an independent testing laboratory for inspection and testing specified in the Contract Documents and for all other inspections and tests required by any permits, codes, or regulations. Copies of all test reports shall be submitted to JEA by the CONTRACTOR within 7 days of receipt of such reports from the testing lab.

B. The work or actions of the testing laboratory shall in no way relieve the CONTRACTOR of its obligations under the Contract. The laboratory testing work will include such inspections and testing required by the Contract Documents, existing laws, codes, ordinances, etc. The testing laboratory will have no authority to change the requirements of the Contract Documents, nor perform, accept or approve any of the CONTRACTOR's Work.

C. The CONTRACTOR shall allow JEA ample time and opportunity for field inspection and testing materials and equipment to be used in the Work. The CONTRACTOR shall advise JEA promptly upon placing orders for materials and equipment so that arrangements may be made, if desired, for inspection before shipment from the place of manufacture. The CONTRACTOR shall at all times furnish JEA and its representatives, facilities including labor, and allow proper time for inspecting and testing materials, equipment, and workmanship. The CONTRACTOR must anticipate that possible delays may occur in the execution of its work due to the necessity of materials and equipment being inspected and accepted for use. The CONTRACTOR shall furnish, at its own expense, all samples of materials required by JEA for testing, and shall make its own arrangements for providing water, electric power, or fuel for the various inspections and tests of structures and equipment.

D. The cost of all tests during construction will be borne by the CONTRATOR. When such tests, inspections, or investigations are not specifically required by the Contract Documents and/or when ordered by JEA, JEA will provide funds as specified on the bid sheet to reimburse the CONTRACTOR at cost to perform tests, inspections or investigations. Whenever nonconformance is determined by JEA as a result of such tests, inspections, or investigations, the CONTRACTOR shall bear the full cost of any additional tests, inspections, and investigations, which are ordered by JEA to ascertain subsequent conformance with the Contract Documents.

1.06 RIGHT OF REJECTION

A. JEA shall have the right, at all times and places, to reject any articles or materials to be furnished hereunder which, in any respect, fail to meet the requirements of the Contract Documents, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the Work at the site. If JEA or its representative, through an oversight or otherwise, has accepted materials or Work which is defective or which is contrary to the Contract Documents, such materials, no matter in what stage or condition of manufacture, delivery, or erection, may be subsequently rejected by JEA.

B. The CONTRACTOR shall promptly remove rejected articles or materials from the site of the Work after notification of rejection. All costs of removal and replacement of rejected articles or materials as specified herein shall be borne by the CONTRACTOR.

C. An inspection protocol shall be developed between the CONTRACTOR and JEA which shall include inspection criteria, equipment to be inspected, at which point to be inspected, notification time to JEA inspection, etc.

1.07 OTHER CONSTRUCTION CONSIDERATIONS

A. Cutting and Patching: The CONTRACTOR shall perform all cutting and patching of the Work that may be required to make its several parts come together properly and fit it to receive or be received by such other work. The CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and shall only cut or alter work with the written consent of JEA and of the other CONTRACTOR's whose work will be affected.

B. Sleeves and Openings: The CONTRACTOR shall provide all openings, chases, etc., to fit its own work and that of any other subcontractors and CONTRACTOR's. All such openings or chases shown on the Contract Drawings, or reasonably implied thereby, or as confirmed or modified by acceptable shop, setting or erecting drawings, shall be provided by the CONTRACTOR.

C. The CONTRACTOR shall in consultation with JEA develop an inspection protocol which shall include but not be limited to inspection criteria, equipment/work element to be inspected, schedule for inspections, notification schedule to JEA inspectors and other inspection related protocol necessary for the acceptance of the work by JEA.

D. Where pipes or conduits are to pass through slabs or walls, or where equipment frames or supports are to be installed as integral part of an opening, the sleeves, openings, forms or frames shall be furnished by the installer of the pipes, conduits or equipment, but shall be placed by the CONTRACTOR. Where hanger inserts, anchor bolts and similar items are to be embedded in concrete as an integral part of a slab or wall, they shall be furnished by the installer of the pipe or other equipment requiring the hanger, etc, but shall be placed by the CONTRACTOR.

E. Any cost resulting from correction of defective, ill-timed, or mislocated work or for subsequent work which becomes necessary because of omitted openings, chases, sleeves, frames, inserts, etc., shall be borne by the CONTRACTOR or subcontractor responsible therefore. The CONTRACTOR shall not arbitrarily cut, drill, alter, damage,

or otherwise endanger the work of another contractor. In no case shall beams, lintels, or other structural members be cut without the proper authorization of JEA. The nature and extent of any corrective or additional work shall be subject to the acceptance of JEA following consultation with the affected parties.

F. Weather Conditions: Weather protection and storm preparedness shall be undertaken in accordance with the Contract.

G. Fire Protection: The CONTRACTOR shall take all necessary precautions to prevent fires at or adjacent to the Work, including its own buildings and trailers. Adequate fire extinguisher and hose line stations shall be provided throughout the work area. The CONTRACTOR shall procure Burning Permits when required.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

3.01 BUOYANCY

A. The CONTRACTOR shall be completely responsible for any tanks, pipelines, manholes, foundations or similar improvements that may become buoyant during the construction operations due to groundwater levels. Should there be any possibility of buoyancy, the CONTRACTOR shall take the necessary steps to prevent damage due to floating or flooding, and shall repair or replace said improvements at no additional cost to JEA.

- END OF SECTION -

SECTION 01510

TEMPORARY UTILITIES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. It shall be the CONTRACTOR's responsibility to provide equipment that is adequate for the performance of the Work under this Contract within the time specified. All equipment shall be kept in satisfactory operating condition, shall be capable of safely and efficiently performing the required Work, and shall be subject to review by JEA at any time within the duration of the Contract. All Work hereunder shall conform to the applicable requirements of the OSHA Standards for Construction.

B. The CONTRACTOR shall provide for utilities and services for its own operations, in accordance with the Contract. The CONTRACTOR shall furnish, install and maintain all temporary utilities during the contract period including removal upon completion of the Work.

1.02 POWER AND LIGHTING

A. Power: The CONTRACTOR shall provide all necessary power required for its operations under the Contract at no additional cost to JEA, and shall provide and maintain all temporary power lines required to perform the Work in a safe and satisfactory manner.

B. Construction Lighting: All Work conducted at night or under conditions of deficient daylight shall be suitably lighted to insure proper Work and to afford adequate facilities for inspection and safe working conditions. Temporary lighting shall be maintained during nonworking periods if the area is subject to access by the public or JEA's personnel.

C. Electrical Connections: All temporary connections for electricity shall be subject to review by JEA and shall be removed in like manner at the CONTRACTOR's expense prior to final acceptance of the Work.

D. Separation of Circuits: Unless otherwise permitted by JEA, circuits separate from lighting circuits shall be used for all power purposes.

E. Construction Wiring: All wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. All electrical facilities shall conform to the requirements of Subpart K of the OSHA Safety and Health Standards for Construction.

1.03 WATER SUPPLY

A. General: The project site has no access to potable water. Except as noted otherwise, the CONTRACTOR shall make arrangements for and pay for all costs for all water used for construction and testing. The CONTRACTOR shall provide and maintain all meters, piping, fittings, adapters, and valving required in accordance with the Contract.

B. Water Connections: The CONTRACTOR shall not make connection to, or draw water

from, any fire hydrant or pipeline without first obtaining permission from JEA. For each such connection made, the CONTRACTOR shall first attach to the fire hydrant or pipeline a valve and a meter, of a size and type acceptable to JEA.

C. Removal of Water Connections: Before Final Acceptance of the Work on the project, all temporary connections and piping installed by the CONTRACTOR shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of JEA and to the agency owning the affected utility.

D. Fire Protection: The construction and all other parts of the Work shall be connected with the CONTRACTOR's water supply system and shall be adequately protected against damage by fire. Hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the temporary structures and other portions of the Work, and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The CONTRACTOR's fire protection program shall conform to the requirements of Subpart F of the OSHA Standards for Construction and all local Fire Department Requirements.

1.04 TEMPORARY SANITARY FACILITIES

A. The CONTRACTOR shall provide and maintain adequate and clean sanitary facilities for the construction work force and visitors. The facilities shall comply with local codes and regulations and be situated in an acceptable location.

B. Fixed or portable chemical toilets shall be provided by the CONTRACTOR wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.

C. Such facilities shall be made available when the CONTRACTOR’s first employees arrive on the Work, shall be properly secluded from public observation, and shall be constructed and maintained in suitable numbers and at such points and in such manner as may be required.

D. The CONTRACTOR shall maintain the sanitary facilities in a satisfactory and sanitary condition at all time and shall enforce their use. It shall rigorously prohibit the committing of nuisances on the site of the Work, on the property of JEA, or on adjacent property.

E. JEA shall have the right to inspect any building or other facility erected, maintained, or used by the CONTRACTOR, to determine whether or not the sanitary regulations have been complied with.

F. Sanitary and Other Organic Wastes: The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the JEA REPRESENTATIVE and in accordance with all laws and regulations pertaining thereto.

1.05 CONFINED SPACES

A. The CONTRACTOR shall provide and maintain a safe working environment in confined spaces. The CONTRACTOR shall follow the applicable requirements of the OSHA Standards for Construction and NIOSH Publications for working in confined spaces.

1.06 TEMPORARY VENTILATION

A. The CONTRACTOR shall provide and maintain adequate ventilation for a safe working environment. In addition, forced air ventilation shall be provided for the curing of installed materials, humidity control and the prevention of hazardous accumulations of dust, gases or vapors.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

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SECTION 01541

FIELD ENGINEERING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surveying services required for proper layout of work and record information.

1.02 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01400 – Quality Control

C. Section 01700 – Project Closeout

C. Section 01720 – Project Record Drawings

1.03 QUALITY CONTROL

A. A Land Surveyor Registered in the State of Florida shall be used for verifying existing control points and establishing new control points. CONTRACTOR shall be responsible to verify the accuracy of the established control points prior to performing layout.

1.04 SUBMITTALS

A. Submit name, address, and telephone number of Registered Land Surveyor to the Engineer before starting work.

B. On request, submit documentation verifying accuracy of survey work for project boundary and vertical and horizontal control.

C. Submit certificate signed by Surveyor with Project Record Documents certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.

1.05 PROJECT RECORD DOCUMENTS

A. Maintain complete, accurate log of control and survey work as it progresses.

B. Maintain one set of plans that all record drawing information is kept on. These plans shall show the record information within one week of installation of work or information being made available. CONTRACTOR's record drawing markups will be available for review by JEA at any time during the normal workday.

C. Submit record drawing markups as specified in Section 01700 entitled "Project Closeout" and Section 01720 entitled "Project Record Drawings".

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

3.01 INSPECTION

A. Verify locations of survey control points prior to starting work.

B. Promptly notify JEA of any discrepancies discovered.

3.02 SURVEY REFERENCE POINTS

A. Protect survey control points prior to starting site work; preserve permanent reference points during construction. Make no changes without prior written notice to JEA.

B. Promptly report to JEA the loss or destruction of any reference point or relocation required because of changes in grades or other reasons. Replace dislocated survey control points based on original survey control.

3.03 SURVEY REQUIREMENTS

A. JEA shall provide one bench mark for vertical and horizontal control during construction. CONTRACTOR shall be responsible for laying out the work, shall protect and preserve the established bench mark and shall make no changes or relocations without prior approval of JEA. CONTRACTOR shall report to JEA whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

B. CONTRACTOR shall establish line and levels, locate and lay out by instrumentation and similar appropriate means:

1. Site improvements, including pavements, stakes for grading, fill and topsoil placement, utility locations, slopes, and invert, or centerline, elevations. Submit cut sheets for gravity sewers to JEA three days prior to construction.

2. Grid or axis for structures.

3. Building foundation, column locations, and ground floor elevations.

4. Piping locations, slopes, and invert, or centerline, elevations.

C. Periodically verify layouts by same means.

D. CONTRACTOR shall provide and incorporate into record drawing markups the horizontal and vertical record locations of improvements, including the following:

1. Corner coordinates of rectangular or square buildings, structures, and tanks.

2. Center coordinates of circular buildings, structures, and tanks.

3. Building floor elevations.

4. Floor elevations of structures and tanks as required to define floor slope.

5. Top elevations of structures and tanks.

6. Channel floor elevations at each change in slope.

7. Channel top elevations.

8. Manhole center coordinates for sanitary sewers, storm sewers, and electrical duct banks.

9. Pipe coordinates at changes in direction.

10. Coordinates of buried valves, tees and fittings.

11. All underground piping invert or centerline elevations including at changes in slope.

12. All underground pipe invert or centerline elevations at tees and crosses.

13. Pipe invert, or centerline, elevations at crossing with other pipe.

14. Invert, or centerline, elevations and coordinates of existing pipe at crossing with underground pipe installed under this project.

15. Invert elevations of manhole pipe inlets and outlets.

16. Duct bank coordinates at changes in direction.

17. Top and bottom elevations of duct banks at manholes and handholes.

18. Other horizontal and vertical record data pertinent to completed Work.

E. Ground surface record/information shall include the following:

1. Spot elevations should be shown at a minimum 100-foot rectangular grid, sufficient to show all the important topographic features.

2. All elevations shown on the construction drawings shall be confirmed or amended on the record drawing markups if finished elevations are different.

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SECTION 01550

SITE ACCESS AND STORAGE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Access Roads

1. The CONTRACTOR shall construct and maintain such temporary access roads as required to perform the work of this Contract.

2. Access roads, where possible, shall be located over the areas of the future road system.

3. Access roads shall be located within the property lines of JEA unless the CONTRACTOR independently secures easements for his use and convenience. CONTRACTOR shall submit written documentation to JEA for any CONTRACTOR secured easements across privately held property. Easement agreement shall specify terms and conditions of use and provisions for site restoration. A written release from the property owner certifying that all terms of the easement agreement have been complied with the CONTRACTOR shall be furnished to JEA prior to final payment.

4. Existing access roads used by the CONTRACTOR shall be suitably maintained by the CONTRACTOR at his expense during construction. CONTRACTOR shall not be permitted to restrict JEA access to existing facilities. JEA may direct CONTRACTOR to perform maintenance of existing access roads when JEA determines that such work is required to insure all weather access by JEA.

B. Parking Areas: Each CONTRACTOR shall construct and maintain suitable parking areas for his construction personnel on the project site where approved by JEA.

C. Restoration: At the completion of the work, the surfaces of land used for access roads and parking areas shall be restored by each CONTRACTOR to its original condition and to the satisfaction of JEA. At a minimum, such as restoration shall include establishment of a permanent ground cover adequate to restrain erosion for all disturbed areas.

D. Traffic Regulations: CONTRACTOR shall obey all traffic laws and comply with all the requirements, rules and regulations of the Florida Department of Transportation and other local authorities having jurisdiction to maintain adequate warning signs, lights, barriers, etc., for the protection of traffic on public roadways.

E. Storage of Equipment and Materials

1. CONTRACTOR shall store his equipment and materials at the job site in accordance with the requirements of the General Conditions, the Supplemental

Conditions, Section 01600 and as hereinafter specified. All equipment and materials shall be stored in accordance with manufacturer's recommendations and as directed by JEA, and in conformity to applicable statutes, ordinances, regulations and rulings of the public authority having jurisdiction. Where space or strip heaters are provided within the enclosure for motors, valve operators, motor starters, panels, instruments, or other electrical equipment, the CONTRACTOR shall make connections to these heaters from an appropriate power source and operate the heaters with temperature control as necessary until the equipment is installed and being operated according to its intended use.

2. CONTRACTOR shall enforce the instructions of JEA regarding the posting of regulatory signs for loadings on structures, fire safety, and smoking areas.

3. CONTRACTOR shall not store materials or encroach upon private property without the written consent of the owners of such private property.

4. CONTRACTOR shall not store unnecessary materials or equipment on the job site, and shall take care to prevent any structure from being loaded with a weight which will endanger its security or the safety of persons.

5. Materials shall not be placed within ten (10) feet of fire hydrants. Gutters, drainage channels and inlets shall be kept unobstructed at all times.

6. CONTRACTOR shall provide adequate temporary storage buildings/facilities, if required, to protect materials or equipment on the job site.

7. JEA shall not be responsible for the unloading or receipt of materials delivered to the project site. CONTRACTOR shall retain full responsibility to coordinate and schedule the delivery, unloading and placement of equipment in storage during the normal time of work.

8. If the CONTRACTOR requires additional staging area than shown on the Drawings, the CONTRACTOR shall obtain such areas from off-site sources at no additional cost to JEA.

9. Upon completion of the Contract, the CONTRACTOR shall remove from the storage areas all of its equipment, temporary fencing, surplus materials, rubbish, etc., and restore the areas.

F. JEA's Facilities

1. The CONTRACTOR shall not enter any of JEA's existing facilities without the expressed written authorization from JEA or JEA's project representative.

2. Except for the CONTRACTOR's superintendent, no CONTRACTOR's personnel shall enter the Operations Building.

3. Where the CONTRACTOR is required to perform work in an existing JEA's facility, the CONTRACTOR's superintendent shall notify JEA and request a meeting to discuss the limits of work.

4. The CONTRACTOR, subcontractors, suppliers, and others shall park only in the CONTRACTOR's project staging area.

1.02 CONTRACTOR'S SITE ACCESS

A. The Work is located at the Radio Avenue project site, CONTRACTOR to coordinate with JEA for all delivery and employee access to the project site.

CONTRACTOR shall coordinate with JEA

1.03 SAFETY AND PROTECTION DEVICES

A. It shall be the sole responsibility of the CONTRACTOR to protect persons from injury and to avoid property damage. Adequate barricades, construction signs, torches, red lanterns, and guards as required shall be placed and maintained during the progress of the construction work for the protection of the public in compliance with the Contract and all Federal, OSHA and local ordinances.

B. The CONTRACTOR shall have unit responsibility for and be required to make good, at its own expense, all damage to property or adjacent properties caused in the execution of this Contract.

C. The CONTRACTOR shall take all necessary precautions for the safety of its employees on the job and shall comply with all applicable provisions of Federal, State, County, and municipal safety laws and regulations to prevent accidents or injury to persons on, about, or adjacent to the premises where the Work is being performed.

D. In the event the CONTRACTOR's tools or materials delivered to the premises are stolen or damaged, it shall be responsible for such theft.

1.04 SECURITY BADGE IDENTIFICATION SYSTEM

A. The CONTRACTOR shall have a security badge identification system only for its Superintendent(s).

B. The I.D. badges shall be made of plastic or laminated plastic material. A recent photo of the employee shall be visible on the badge. Badges shall be issued and retrieved daily by the CONTRACTOR. All text shall be typewritten or printed by computer. The badges shall include the following information:

First Line: The words CONTRACTOR (or VISITOR for vendors etc.) shall be printed in all caps across the top of the badge.

Second Line: The name of the CONTRACTOR.

Third Line: The name and phone number (preferably a cell phone number) of the CONTRACTOR's on-site manager or superintendent for the project.

Fourth Line: Employee Name.

Fifth Line: A unique badge control number for each badge.

C. CONTRACTOR shall obtain separate site access privileges and ID for Superintendent(s) from JEA.

1.05 CONTRACTOR DELIVERY LOGS

A. The CONTRACTOR shall provide a daily log of deliveries to the site for the project. The daily log shall include deliveries received each day with the driver's name and truck license number, in addition to expected deliveries for the following day. The log shall be submitted to JEA at the end of each week. This log will be used by JEA at its discretion for security purposes at the site. The CONTRACTOR shall receive deliveries only at designated locations, in accordance with the Contract.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 01560

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall provide temporary environmental controls in accordance with the Contract and as specified herein.

1.02 EXPLOSIVES AND BLASTING

A. The use of explosives on the Work will not be permitted.

1.03 DUST ABATEMENT

A. The CONTRACTOR shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary, as determined by the JEA REPRESENTATIVE, to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The CONTRACTOR shall be responsible for any damage resulting from any dust originating from its operations. The dust abatement measures shall be continued until the CONTRACTOR is relieved of further responsibility by the JEA REPRESENTATIVE. No separate payment will be allowed for dust abatement measures and all costs thereof shall be included in the CONTRACTOR's bid price.

1.04 RUBBISH CONTROL

A. During the progress of the Work, the CONTRACTOR shall keep the site of the Work and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The CONTRACTOR shall dispose of all rubbish and waste materials of any nature occurring at the Work site, and shall establish regular intervals of collection and disposal of such materials and waste. The CONTRACTOR shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

1.05 CHEMICALS

A. All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, paint, fuel, solvent or reactant of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. The handling, storage, use and disposal of all such chemicals and disposal of residues shall be in

strict accordance with the contract, all applicable rules and regulations of Federal, State and local jurisdictional agencies and the printed instructions of the manufacturer and all regulatory requirements. Copies of antidote literature shall be kept at the storage site and at the CONTRACTOR's job site office. A supply of antidotes shall be kept at the CONTRACTOR's office.

1.06 NOISE CONTROL

A. Noise resulting from the CONTRACTOR's work shall not exceed the noise levels and other requirements stated in local ordinances. The CONTRACTOR shall be responsible for curtailing noise resulting from its operation. It shall, upon written notification from the JEA REPRESENTATIVE or noise control officers, make any repairs, replacements, adjustments, additions and furnish mufflers when necessary to fulfill requirements.

1.07 EROSION ABATEMENT AND WATER POLLUTION

A. It is imperative that any CONTRACTOR dewatering operation not contaminate or disturb the environment of the properties adjacent to the Work. The CONTRACTOR shall, therefore, schedule and control its operations to confine all runoff water from disturbed surfaces, water from dewatering operations that becomes contaminated with silt, muck and other deleterious matter, fuels, oils, bitumens, calcium chloride, chemicals and other polluting materials.

B. The CONTRACTOR shall construct temporary stilling basin(s) of adequate size and provide all necessary temporary materials, operations and controls including, but not limited to, filters, coagulants, screens, and other means necessary to attain the required discharge water quality.

C. The CONTRACTOR shall be responsible for providing, operating and maintaining materials and equipment used for conveying the clear water to the point of discharge. All pollution prevention procedures, materials, equipment and related items shall be operated and maintained until such time as the dewatering operation is discontinued. Upon the removal of the materials, equipment and related items, the CONTRACTOR shall restore the area to the condition prior to its commencing work.

D. The CONTRACTOR shall be responsible for acquiring all applicable permits for discharge of waters as necessary, except as may have otherwise been provided in other sections of these specifications.

1.08 PRECAUTIONS DURING ADVERSE WEATHER

A. During adverse weather, and against the possibility thereof, the CONTRACTOR shall take all necessary precautions so that the Work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building paper shelters, or other acceptable means. The CONTRACTOR shall be responsible for all changes caused by adverse weather.

B. The JEA REPRESENTATIVE may suspend construction operations at any time when, in its judgment, the conditions are unsuitable or the proper precautions are not being

taken, whatever the weather conditions may be, in any season.

1.09 HURRICANE AND STORM WARNINGS

A. The CONTRACTOR shall take all precautions necessary to protect the job site during hurricane and storm watches and warnings.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

(NOT USED)

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SECTION 01590

FIELD OFFICE, EQUIPMENT AND SERVICES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide an air-conditioned field office with equipment and services for the Contractor's use and the use of the Engineer/JEA as specified herein

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01510 – Temporary Utilities

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings and other information as required to the Engineer for review in accordance with Section 01300 entitled "Submittals".

1.04 GENERAL FIELD OFFICE REQUIREMENTS

A. Contractor shall provide steps and platforms to permit entry to the offices. This work shall conform to the Florida Building Code and OSHA requirements.

B. Trailers shall be blocked up and hurricane straps installed conforming to the applicable building codes.

C. Contractor retains responsibility for procuring all necessary permits for the installation of the field offices at the location noted.

D. Air-conditioning shall be available throughout the trailer to maintain internal temperatures to at least 75^{o}F throughout the working day.

PART 2 -- PRODUCTS

2.01 CONTRACTOR'S FIELD OFFICE

A. Contractor's Field Office: Contractor shall furnish, equip and maintain a field office at the site. Field office shall be of a size required for the joint use of the Engineer and Contractor. Contractor shall provide one (1) private office (minimum 12' x 12') for the exclusive use of the Engineer and/or JEA. Engineer/JEA's office shall be, at a minimum, provided with the following features at each site:

1. Entry door with cylinder lock, keyed differently from exterior door locks and two (2) sets of keys

2. Two (2) desks with adjustable computer chairs
3. Two (2) two drawer file cabinets

4. Two (2) bookshelves, 36” wide by 48” high.

5. Access to printer/copier with maintenance agreement for the duration of the contract. Printer/copier shall be equipped with 11-inch x 17-inch and 8 ½-inch by 11-inch paper trays. Printer/copier shall be capable of scanning, copying, enlarging, reducing, and printing in color and in black and white.

B. Equipment furnished shall be new or like new in appearance and function.

C. Contractor shall have readily accessible at the field office the following documents: copies of the Contract Documents, addenda, latest approved Shop Drawings, all field project related correspondence, change orders, etc.

D. Field offices shall be provided with a central meeting room for the joint use of the Contractor and the Engineer/JEA. The central meeting room shall be furnished with the following:

1. One conference room table with seating and chairs for eight people.

2. Two paper towel dispensers with paper towels

3. One rack for handling drawings

4. One electric water cooler with bottle water supply and disposable drink cups

5. One first aid cabinet conforming to OSHA requirements for an office up to 15 persons

6. One four cubic ft capacity refrigerator with ice making section

7. One dry erase board (24-inch by 36-inch)

2.02 UTILITY SERVICES

A. The project site has no access to potable water. The Contractor shall pay all costs for water for the Contractor’s field office over the duration of the project.

B. Power: The Contractor shall provide all necessary power required for its operations under the Contract, and shall provide and maintain all temporary power lines required to perform Work in a safe and satisfactory manner. The Contractor shall pay all costs for installation, maintenance and removal for the work and power.

PART 3 -- EXECUTION

(NOT USED)

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 -- GENERAL

1.01 THE REQUIREMENT

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

B. The CONTRACTOR shall supply materials and equipment in accordance with the Contract, JEA Water and Sewer Standards and as specified herein.

1.02 QUALITY ASSURANCE

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

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

C. JEA Standards: Products, materials, and equipment shall conform and meet the criteria as specified in the latest edition and revision of the JEA publications, including but not limited to the following:

- Water and Wastewater Standard Manual and Checklist - JEA’s most recent publication can be found at their website:

  https://www.jea.com/Engineering_and_Construction/Water_and_Wastewater_Standards/Water_and_Wastewater_Standard_Manual_and_Checklist/

- Facilities Standards Manual - JEA’s most recent publication can be found at their website:

https://www.jea.com/Engineering_and_Construction/Facilities_Standards_Manual.aspx

1.03 DESIGN

A. Equipment and appurtenances shall be designed in conformity with the ASME, AIEE, NEMA and other generally accepted applicable standards and shall be rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation and all conditions of operation. All bearings and moving parts shall be adequately protected by bushings or other acceptable means against wear, and provision shall be made for adequate lubrication by readily accessible devices. Details shall be designed for appearance as well as utility. Protruding members, joints, corners, gear covers, etc., shall be finished in appearance.

B. All exposed welds on machinery shall be ground smooth and the corners of structural shapes shall be rounded or chamfered.

1.04 PRODUCT DELIVERY-STORAGE-HANDLING

A. The CONTRACTOR shall deliver, handle, and store products in accordance with supplier's written recommendations and by means and methods that will prevent damage, deterioration, and loss including theft. Delivery schedules shall be coordinated with JEA to minimize long-term storage of products at site and overcrowding of construction spaces. In particular, the CONTRACTOR shall notify JEA in advance of deliveries and provide delivery/installation coordination to ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other sources of loss.

B. The CONTRACTOR shall provide a daily log of deliveries to the Radio Avenue project site for the project per Section 01550.

1.05 TRANSPORTATION AND HANDLING

A. Products shall be transported by methods to avoid product damage and shall be delivered in undamaged condition in supplier's unopened containers or packaging, dry.

B. The CONTRACTOR shall provide equipment and personnel to handle products, materials, and equipment including those provided by JEA, by methods to prevent soiling and damage.

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

1.06 STORAGE AND PROTECTION

A. Products shall be stored in accordance with supplier's written instructions, with seals and labels intact and legible. Sensitive products shall be stored in weather-tight enclosures and temperature and humidity ranges shall be maintained within tolerances

required by supplier's written instructions.

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

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

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

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

1.07 MAINTENANCE OF STORAGE

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

B. The CONTRACTOR shall verify that storage facilities comply with supplier's product storage requirements.

C. The CONTRACTOR shall verify that supplier-required environmental conditions are maintained continually.

D. The CONTRACTOR shall verify that surfaces of products exposed to the elements are not adversely affected and that any weathering of finishes is acceptable under requirements of Contract Documents.

1.08 MAINTENANCE OF EQUIPMENT STORAGE

A. For mechanical and electrical equipment in long-term storage, the CONTRACTOR shall provide a copy of the supplier's service instructions to accompany each item, with notice on enclosed instruction shown on exterior of package.

B. Equipment shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document to JEA. JEA representative shall witness services provided by CONTRACTOR.

1.09 LUBRICANTS

A. During testing and prior to acceptance, the CONTRACTOR shall furnish all lubricants necessary for the proper lubrication of all equipment furnished under this Contract. CONTRACTOR shall conform to JEA standards and JEA approved sources for lubricants.

1.10 SPECIAL TOOLS

A. For each type of equipment furnished by it, the CONTRACTOR shall provide a complete set of all special tools (including calibration and test equipment) which may be necessary for the adjustment, operation, maintenance and disassembly of such equipment.

B. Special tools shall be delivered at the same time as the equipment to which they pertain. The CONTRACTOR shall properly store and safeguard such special tools until completion of the Work, at which time they shall be delivered to JEA.

1.11 PROTECTION AGAINST ELECTROLYSIS

A. Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjoining surfaces to eliminate direct contact and any resultant electrolysis. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other acceptable materials.

1.12 FASTENERS

A. All necessary bolts, anchor bolts, nuts, washers, plates and bolt sleeves shall be furnished by the CONTRACTOR in accordance herewith. Bolts shall have suitable washers and, where so required, their nuts shall be hexagonal.

B. All bolts, anchor bolts, nuts, washers, plates and bolt sleeves shall be Type 316 Stainless Steel unless otherwise specified on the Drawings.

C. Unless otherwise specified, stud, tap, and machine bolts shall be of the best quality refined bar iron. Hexagonal nuts of the same quality of metal as the bolts shall be used.

1.13 SALVAGED AND EXCAVATED MATERIALS

A. In the absence of special provisions in other Sections of the Specifications, salvage materials, equipment or supplies that occur are the property of JEA and shall be cleaned and stored as directed by JEA.

B. All excavated materials needed for backfilling operation shall be stored on site. Where additional area is needed for stockpiling, it shall be obtained by the CONTRACTOR.

1.14 EQUIPMENT AND MATERIALS

A. All equipment, materials, instruments or devices incorporated in this project shall be new and unused, unless indicated otherwise in the Contract Documents. Equipment and materials to be incorporated into the work shall be delivered sufficiently in advance of their installation and use to prevent delay in the execution of the work, and they shall be delivered as nearly as feasible in the order required for executing the work.

B. The Contractor shall protect all equipment and materials from deterioration and damage, including provisions for temporary storage buildings as needed and as specified in Section 01550 entitled "Site Access and Storage". Storage of equipment and materials shall be in locations completely protected from flooding, standing water,

excessive dust, falling rock, brush fire, etc. Storage areas shall be located sufficiently distant from all construction activities and the movement of construction vehicles to minimize the potential for accidental damage. Any equipment or materials of whatever kind which may have become damaged or deteriorated from any cause shall be removed and replaced by good and satisfactory items at the Contractor's expense for both labor and materials.

1.15 INSTALLATION OF EQUIPMENT

A. Equipment and materials shall be installed in accordance with the requirements of the General Conditions, Supplemental Conditions and the respective Specification Sections.

B. Concrete foundations for equipment shall be of approved design and shall be adequate in size, suitable for the equipment erected thereon, properly reinforced, and tied into floor slabs by means of reinforcing bars or dowels. Foundation bolts of ample size and strength shall be provided and properly positioned by means of suitable templates and secured during placement of concrete. Foundations shall be built and bolts installed in accordance with the manufacturer's certified drawings.

C. Before mounting equipment on a foundation, the Contractor shall clean the top surface; if necessary, rough it with a star chisel and clean again; and clean out all foundation bolt sleeves. The Contractor shall provide a sufficient number of stainless steel plate shims about 2-inches wide and 4-inches long, and of a varying thickness from 1/8 to 1/2 inch. A combination of these shims shall be placed next to each foundation bolt to bring the bottom of the bedplate or frame about 1/8 inch above the final setting. The equipment shall be lowered by changing the combination of shims. Using stainless steel shim stock of various thicknesses, continue to level the equipment a little at a time and in rotation until it is at the correct elevation in both directions. When the equipment is level, tighten down on the foundation bolts a little at a time in rotation to make certain the equipment remains level and does not shift on the shims. A preliminary alignment check shall be made before grout is placed.

D. Equipment shall be set, aligned and assembled in conformance with manufacturer's drawings or instructions. Run out tolerances by dial indicator method of alignment shall be plus or minus .002 inches, unless otherwise directed by JEA.

E. All blocking and wedging required for the proper support and leveling of equipment during installation shall be furnished by the Contractor. All temporary supports shall be removed, except stainless steel wedges and shims, which may be left in place with the approval of JEA.

F. Each piece of equipment or supporting base, bearing on concrete foundations, shall be bedded in grout. The Contractor shall provide a minimum of 1-1/2-inch thick grouting under the entire baseplate supporting each pump, motor drive unit and other equipment. Grout shall be non-shrink grout, as specified under Section 03315 entitled "Grout".

G. When motors are shipped separately from driven equipment, the motors shall be received, stored, meggered once a month, and the reports submitted to JEA. After driven equipment is set, the motors shall be set, mounted, shimmed, millrighted, coupled and connected complete. Motors shall then be turned once per month and documented by the Contractor to JEA.

1.16 CONNECTIONS TO EQUIPMENT

A. Connections to equipment shall follow manufacturer's recommendations as to size and arrangement of connections and/or as shown in detail on the Drawings or approved Shop Drawings. Piping connections shall be made to permit ready disconnection of equipment with minimum disturbance of adjoining piping and equipment.

B. The Electrical Contractor or Contractor if no electrical contract exists shall be responsible for bringing proper electrical service to each item of equipment requiring electrical service as shown on the Drawings or approved Shop Drawings. Electrical connections to equipment requiring electrical service shall be made by the Electrical Contractor, unless otherwise indicated on the Drawings or in the Technical Specifications.

C. The HVAC Contractor or Contractor if no HVAC Contract exists shall bring and connect HVAC service to all equipment items requiring same as shown on the Drawings. Electrical connections to equipment requiring electrical service shall be made by the Electrical Contractor, unless otherwise indicated on the Drawings or in the Technical Specifications.

D. The Plumbing Contractor or Contractor if no plumbing contract exists shall bring and connect plumbing service to all equipment items requiring same as shown on the Drawings.

1.17 IDENTIFICATION TAGS FOR EQUIPMENT AND INSTRUMENTS

A. All process equipment, pumps, blowers, valves, gates and process instruments that are identified by a tag number on the Process and Instrumentation Diagrams (P&IDs on Instrumentation contract drawings) shall have an identification tag at the device.

B. The identification tag shall show a unique tag number for the device (e.g., MOG-101), and the common name of the device (e.g., Screenings Channel Isolation Gate No. 1).

C. The identification tag shall be either lamacoid tag with white background and black core letters, or non-corrosive metal tags, ASTM A240 Grade 430 stainless steel with a bright annealed finish.

D. Characters on identification tags shall be 3/16” high and surface cut deep unless otherwise noted. Characters shall be cut into the lamacoid tags with a hardened steel router bit and into stainless steel tags with a diamond tip cutter.

E. Identification tags shall be buffed around the perimeter to remove any sharp edges or corners.

F. Identification tags shall be attached to the equipment item, valve, or instrument with 0.9 mm diameter wire or stainless steel screws.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 01660

EQUIPMENT TESTING AND PLANT STARTUP

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Equipment testing and startup are requisite to satisfactory completion of the contract and, therefore, shall be completed within the time specified for substantial completion.

B. The CONTRACTOR shall allow sufficient time in his construction schedule to complete equipment testing, troubleshooting, corrections, and startup based upon the general sequence set forth in Section 01020 entitled "Construction Sequencing/Constraints".

C. As construction of the project proceeds through the final stages of completion associated with each construction phase, the CONTRACTOR shall, in accordance with the requirements set forth in the Contract Documents, attend to the following items for the equipment and facilities scheduled to be placed into service:

1. Schedule equipment manufacturer's visits to site.

2. Calibrate instruments, controls and controlled equipment.

3. Perform required testing, adjusting, and balancing of project components.

4. Schedule start-up and initial operation.

5. Furnish skilled personnel during initiation operation.

6. Perform JEA operation and maintenance training.

D. Refer to other Divisions for further requirements regarding this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01020 – Construction Sequencing/Constraints

1.03 EQUIPMENT TESTING

A. The CONTRACTOR shall provide the services of an experienced and authorized representative of the supplier of each item of equipment (excluding minor items of equipment specifically exempted by JEA in writing), who shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation prior to startup. In each case, the CONTRACTOR shall arrange to have the supplier's representative revisit the job site as often as necessary until any and all trouble is corrected, and the equipment installation and operation is satisfactory to JEA.

B. The CONTRACTOR shall require that each supplier's representative test performance

of his equipment and furnish to JEA a written report addressed to JEA, certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts, and has been tested, operated satisfactorily under full-load conditions, is ready for operation, and JEA's operating personnel have been instructed in the operation, maintenance and lubrication of the equipment.

C. The CONTRACTOR shall be responsible for scheduling all operations testing. The CONTRACTOR is advised that JEA and JEA's operating personnel will witness operations testing.

D. The CONTRACTOR shall furnish all personnel, chemicals, fuel, oil, grease, and all other necessary equipment, facilities, and services required for conducting tests.

1.04 EQUIPMENT START-UP SERVICES

A. Equipment start-up period, for the training of plant personnel, shall begin after satisfactory completion and acceptance of the field tests and coincidentally with the completion date for the part of the work for which the equipment is included in accordance with the construction schedule. If the equipment is not covered by a certificate of substantial completion for a part of the work, the period shall begin upon substantial completion of the project.

B. During the equipment start-up period and in accordance with the sequence of construction and schedule, the CONTRACTOR shall furnish, at no additional cost to JEA the services of factory trained representatives of the equipment manufacturers for the equipment designated in the Specifications to:

1. Assist in the start-up and operations of the equipment.

2. Assist in the training of plant personnel, designated by JEA in the proper operation and maintenance of the equipment.

C. JEA shall:

1. Provide the necessary plant personnel to be instructed in the operation and maintenance of the equipment. JEA's personnel shall operate all equipment.

2. Pay for all fuel, power and chemicals consumed beyond quantities specified in the Contract Documents. The CONTRACTOR shall pay for fuel, power, and chemicals consumed up to the date of "certified substantial completion" except as otherwise specified herein.

D. CONTRACTOR shall be available to promptly repair all work during the equipment startup so as to cause minimum disruption to the plant operation.

E. Upon completion of a minimum of ten (10) consecutive and continuous days of satisfactory operation, or the number of days called for in the Technical Specifications, JEA will assume operation and operating cost of the equipment associated with the completed phase of work. If the equipment malfunctions during this start-up period, the

start-up period will be repeated until satisfactory operation is achieved.

F. In the event a system, equipment or component proves defective or is unable to meet specified performance criteria, the CONTRACTOR shall replace the defective item and the guarantee period called for in the Contract Documents for the item shall start after satisfactory replacement and testing of the item.

1.05 PLANT STARTUP

A. The startup of a treatment plant is a highly complex operation requiring the combined technical expertise of the CONTRACTOR, suppliers, subcontractors, and JEA. The CONTRACTOR shall provide the effective coordination of all parties necessary for the successful startup during each phase of the sequence of work.

B. It is not the intent of JEA to instruct the CONTRACTOR in the startup of equipment for the plant; however, JEA will be available prior to and during startup to provide technical support to the CONTRACTOR. Treatment process startup shall be provided by JEA personnel.

C. Not less than 3 months prior to startup of facilities associated with each phase of the work, the CONTRACTOR shall submit to JEA for review, a detailed schedule of operations which will be necessary to effect a successful initial operation and sustained period of operation for the duration of the required startup period.

D. Startup of completed work shall not commence until all required leakage tests, disinfection, and equipment tests have been completed to the satisfaction of JEA.

E. The control system startup shall be coordinated with process startup activities and shall be extended as required until all plant processes are fully operational and to satisfy JEA that all control system contract requirements have been fulfilled in accordance with the Contract Documents. Refer to Section 17070 entitled "Control and Information System Testing – General" for additional requirements.

F. All defects in materials or workmanship which appear during this test period shall be immediately corrected by the CONTRACTOR. Time lost for equipment repairs, wiring corrections, control point settings, or other reasons which interrupt the startup may, at the discretion of JEA, be justifiable cause for extending the startup test duration.

G. During the startup, the CONTRACTOR shall provide the services of authorized representatives of the suppliers, in addition to those services required under operations testing, as necessary, to correct faulty equipment operation.

1.06 DEMONSTRATION AND INSTRUCTION

A. The supplier's representative shall instruct JEA's operating personnel in correct operation and maintenance procedures. The instruction shall demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment. Such instruction shall be scheduled in accordance with the sequence of each phase of the work at times arranged with JEA at least 2 weeks in

advance and shall be provided while the respective representative's equipment is fully operational. On-site instruction shall be given by qualified persons who have been made familiar in advance with the equipment and systems in the plant. Training shall not commence until O&M Manuals have been accepted by JEA as specified in Sections 01300 and 01730.

B. The CONTRACTOR shall notify and distribute training session agenda and training material to JEA at least 14 days in advance of each equipment test or JEA training session.

C. Training shall be provided to four (4) separate shifts of JEA's personnel between the hours of 6:00 A.M. and 6:00 P.M. as necessary.

D. Provide professional video recording of all training sessions. Completed, labeled DVDs or USB shall be provided to JEA for each type of training session.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 01700

PROJECT CLOSEOUT

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Final Cleaning

1. At the completion of each phase of the work and prior to startup, as scheduled the CONTRACTOR shall remove all rubbish from and about the site of the completed work, and all temporary structures, construction signs, tools, scaffolding, materials, supplies and equipment which he or any of his Subcontractors may have used in the performance of the work. CONTRACTOR shall broom clean paved surfaces and rake clean other surfaces of grounds.

2. CONTRACTOR shall thoroughly clean all materials, equipment and structures; all marred surfaces shall be touched up to match adjacent surfaces; dirty filters and burned out lights replaced as required; all glass surfaces cleaned and floors cleaned and polished so as to leave work in a clean and new appearing condition.

3. CONTRACTOR shall maintain cleaning until project, or portion thereof, is occupied by JEA.

B. Spare Parts and Special Tools

1. As soon as practicable after approval of the list of equipment, the CONTRACTOR shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies, with current unit prices and source or sources of supply.

2. Prior to equipment startup, CONTRACTOR shall also furnish a list of parts, and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified to be furnished as part of the Contract and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 120 days for the particular installation.

3. All parts shall be securely boxed, tagged and clearly marked on the box for identification, including the name of manufacturer or supplier, applicable equipment, part number, description and location in the equipment. All parts shall be protected and packaged for a shelf life of at least ten (10) years.

4. CONTRACTOR shall furnish at no additional cost to JEA with each piece of equipment as a minimum, one (1) complete set, or the number of sets called for in the Technical Specifications, of suitably marked special tools and appliances which may be needed to adjust, operate, maintain, or repair the equipment prior to equipment startup.

5. Any special tools (including grease guns or other lubricating devices) which may be necessary for the adjustment, operation, and maintenance of any equipment shall be furnished with the respective equipment. CONTRACTOR shall submit, for approval by JEA, a complete list of the special tools and appliances to be furnished and instructions for their use. Such tools and appliances shall be furnished in approved painted steel cases properly labeled and equipped with good grade cylinder locks and duplicate keys prior to equipment startup.

6. Spare parts for startup of equipment shall be furnished and provided by the CONTRACTOR. The forms appended to this Section shall be submitted to list spare parts to be supplied during startup.

7. It is the intent of JEA to purchase spare parts for normal operation of the equipment delivered under this contract via normal maintenance operations.

C. Final Cleanup; Site Rehabilitation

1. Before final acceptance, the CONTRACTOR shall wash and clean all exposed surfaces which have become soiled or marked, and shall remove from the site of work all accumulated debris and surplus materials of any kind which result from his operation, including construction equipment, tools, sheds, sanitary enclosures, etc. The CONTRACTOR shall leave all equipment, fixtures, and Work, which he has installed, in a clean condition. The completed project shall be turned over to JEA in a neat and orderly condition.

2. The site of the work shall be rehabilitated or developed in accordance with other sections of the Specifications and the Drawings. In the absence of any portion of these requirements, the CONTRACTOR shall completely rehabilitate the site to a condition and appearance equal or superior to that which existed just prior to construction, except for those items whose permanent removal or relocation was required in the Contract Documents or ordered by JEA.

3. The CONTRACTOR shall:

   a. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

   b. Use each type of cleaning material on only those surfaces recommended by the cleaning material manufacturer.

   c. Use only materials which will not create hazards to health or property.

D. Final Inspection

1. Final cleaning and repairing shall be so arranged as to be finished upon completion of the construction work. The CONTRACTOR will make his final cleaning and repairing, and any portion of the work finally inspected and accepted by JEA shall be kept clean by the CONTRACTOR, until the final acceptance of the entire work.

2. When the CONTRACTOR has finally cleaned and repaired the whole or any portion of the work, he shall notify JEA that he is ready for final inspection of the whole or a portion of the work, and JEA will thereupon inspect the work. If the work is not found satisfactory, JEA will order further cleaning, repairs, or replacement.

3. When such further cleaning or repairing is completed, JEA, upon further notice, will again inspect the work. The "Final Payment" will not be processed until the CONTRACTOR has complied with the requirements set forth, and JEA has made his final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents.

E. Project Close Out

1. As construction of the project enters the final stages of completion, the CONTRACTOR shall, in concert with accomplishing the requirements set forth in the Contract Documents, attend to or have already completed the following items as they apply to his contract:

   a. Scheduling equipment manufacturers' visits to site.

   b. Required testing of project components.

   c. Scheduling start-up and initial operation.

   d. Scheduling and furnishing skilled personnel during initial operation.

   e. Correcting or replacing defective work, including completion of items previously overlooked or work which remains incomplete, all as evidenced by JEA's "Punch" Lists.

   f. Attend to any other items listed herein or brought to the CONTRACTOR's attention by JEA.

2. Just before JEA's Certificate of Final Completion is issued, the CONTRACTOR shall accomplish the cleaning and final adjustment of the various building components as specified in the Specifications and as follows:

   a. Clean all glass and adjust all windows and doors for proper operation.

   b. Clean all finish hardware after adjustment for proper operation.

   c. Touch up marks or defects in painted surfaces and touch up any similar defects in factory finished surfaces.

   d. Wax all resilient flooring materials.

   e. Remove bitumen from gravel stops, fascias, and other exposed surfaces.

f. Remove all stains, marks, fingerprints, soil, spots, and blemishes from all finished surfaces, tile, stone, brick, and similar surfaces.

3. Final Submittals: In addition, and before the Certificate of Final Completion is issued, the CONTRACTOR shall submit to JEA certain records, certifications, etc., which are specified elsewhere in the Contract Documents. A partial list of such items appears below, but it shall be the CONTRACTOR's responsibility to submit any other items which are required in the Contract Documents:

a. Test results of project components.

b. Performance Affidavits for equipment.

c. Certification of equipment or materials in compliance with Contract Documents.

d. Operation and maintenance instructions or manuals for equipment.

e. One set of neatly marked-up drawings showing as-built changes and additions to the work under his Contract.

f. Any special guarantees or bonds (Submit to JEA).

4. The CONTRACTOR's attention is directed to the fact that required certifications and information under Item 3 above, must be submitted earlier in accordance with the sequence of construction and other Sections of the Specifications.

F. Grease, Oil, Chemicals and Fuel

1. All grease, oil, chemicals and fuel required for testing of the equipment shall be furnished by the CONTRACTOR.

G. Maintenance and Guarantee

1. The CONTRACTOR shall comply with all maintenance and guarantee requirements of the Contract Documents.

2. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the CONTRACTOR shall have obtained a statement in writing from the affected private or public agency releasing JEA from further responsibility in connection with such repair or resurfacing.

3. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from JEA. If the CONTRACTOR fails to make such repairs or replacements promptly, JEA reserves the right to do the Work and the

CONTRACTOR and its surety shall be liable to JEA for the cost thereof.

H. Punch Lists

1. JEA will make its final inspection whenever the CONTRACTOR has notified JEA that the work is ready for the inspection. Any work not found acceptable and requiring cleaning, repair and/or replacement will be noted on the punch list. Work that has been inspected and accepted by JEA shall be maintained by the CONTRACTOR, until final acceptance of the entire project.

2. Whenever the CONTRACTOR has completed the items on the punch list, it shall again notify JEA that it is ready for final inspection. This procedure will continue until the entire project is accepted by JEA. The final Application for Payment will not be processed until the entire project has been accepted by JEA and all requirements in previous Article E.3 “Final Submittals” have been satisfied.

I. Closeout Timetable: The CONTRACTOR shall establish dates for equipment testing, acceptance periods, and on-site instructional periods (as required under the Contract). Such dates shall be established not less than one week prior to beginning any of the foregoing items, to allow JEA, and their authorized representatives sufficient time to schedule attendance at such activities.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01660 - Equipment Testing and Plant Startup

B. Section 01720 - Project Record Drawings

C. Section 01730 - Operations and Maintenance Manuals

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

(NOT USED)

START-UP SPARE PARTS INVENTORY

SUMMARY SHEET

EQUIPMENT NO. _____ DATE _____

LOCATION _____ REV. _____

NAME _____

ADDRESS _____

_____ PHONE (___) _____

SPARE PARTS INVENTORY:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

- END OF SECTION -

SECTION 01720

PROJECT RECORD DRAWINGS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall keep and maintain, at the job site, one record copy of all drawings, specifications, addenda, change orders, and other modifications to the Contract, approved shop drawings, and field test records.

B. The CONTRACTOR shall mark the drawings to indicate all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Drawings. Said record drawing markups shall be supplemented by any detailed sketches as necessary or directed to indicate, fully, the Work as actually constructed. These master record drawing markups of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by addenda and change orders shall be maintained up-to-date during the progress of the Work.

C. Project record drawing markups shall be maintained and updated by the CONTRACTOR on a month-to-month basis.

D. Record drawing markups shall be accessible to JEA at all times during the construction period.

E. Periodic payments shall not be processed prior to JEA's review and acceptance of record drawing markups development for the pay period submitted.

F. Final payment will not be acted upon until the CONTRACTOR has prepared and delivered record drawing markups to JEA. Said up-to-date record drawing markups shall be in the form of a set of prints 22 x 34 inch in size with carefully plotted information overlaid in red ink.

G. Upon substantial completion of the Work and prior to final acceptance, the CONTRACTOR shall finalize and deliver a complete set of record drawing markups to JEA conforming to the construction records of the CONTRACTOR. This set of drawings shall consist of corrected drawings showing the reported location of the Work. The information submitted by the CONTRACTOR and incorporated by JEA into the Record Drawings will be assumed to be correct, and the CONTRACTOR shall be responsible for the accuracy of such information, and shall bear the costs resulting from the correction of incorrect data furnished to JEA.

1.02 RELATED REQUIREMENTS

A. Section 01300 - Submittals

B. Section 01700 - Project Closeout.

C. All record “as-built” documents shall be prepared in accordance with and shall include all information required by JEA and any additional requirements listed herein.

1.03 RECORDING

A. Label each document "PROJECT RECORD" in neat large printed letters.

B. Record information concurrently with the progress of construction.

C. Legibly mark drawings to record actual construction

1. Incorporate changes made by Field Order, Change Order, or Construction Change Directive.

2. Incorporate details generated during the construction phase not shown on the original Contract Drawings.

1.04 SUBMITTAL

A. Prior to Final Completion, submit Record Documents to JEA.

B. Accompany submittal with a 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 its authorized representative.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 01730

OPERATION AND MAINTENANCE MANUALS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Description

B. Quality Assurance

C. Format and Contents

1.02 SUBMITTALS

A. Written operations and maintenance instructions are required for all equipment items supplied for this project. The amount of detail shall be commensurate with the complexity of the equipment item. Pictorial cuts of equipment are required for operator reference in servicing.

B. Information not applicable to the specific piece of equipment installed on this project shall be struck from the Manual by the CONTRACTOR. Information provided shall include a source of replacement parts and names of service representatives, including addresses and telephone numbers.

C. In accordance with the provisions of Section 01300 submit the following:

1. Preliminary Operation and Maintenance Manuals: The CONTRACTOR shall submit one (1) electronic searchable PDF copy complete preliminary Operations and Maintenance (O&M) Manuals for each item of equipment at the same time the equipment is delivered to the project site.

2. Final Operation and Maintenance Manuals: Furnish to JEA five (5) printed copies and five (5) electronic searchable PDF copies of an Operation and Maintenance Manual for all substantially complete equipment and associated control systems furnished and installed. The final manuals shall incorporate all JEA's review comments associated with the preliminary operation and maintenance Manual.

D. Operating and Maintenance Data shall be prepared and submitted in accordance with the requirements as listed in ***JEA Water & Wastewater Standards Manual – Pump Station Operation and Maintenance Data Submission Requirements Section 445***.

E. Periodic payments shall not be processed prior to JEA's review and acceptance of EAM Worksheet development for the pay period submitted.

1.03 FORMAT AND CONTENTS

A. Each operations and maintenance manual shall contain the following information:

1. Storage instructions and requirements (short term and long term)

2. Installation instructions

3. Assembly and erection drawings/details

4. Dimensional drawings

5. Wiring diagrams including all control and lightning systems

6. Equipment data summary table (see sample form at the end of this section)

7. Equipment preventative maintenance data summary (see sample form at the end of this section)

8. Manufacturer's operating manual/instructions including equipment start-up, normal operation, shutdown, and emergency operation

9. Manufacturer's maintenance instructions including equipment calibration and adjustment, preventive and repair maintenance, and lubrication instructions

10. Trouble shooting guide

11. Parts diagram/list

12. Spare parts list (these are parts that the manufacturer recommends having readily available for use during preventative maintenance or are normal wear items)

13. Recommended lubricant types (lubrication schedule shall be included with the preventative maintenance data summary)

14. Tools list (any tools that will be required for preventative maintenance, disassembly, or re-assembly of the equipment)

15. Single line schematic

16. List of electrical relay settings and control and alarm contact settings.

17. Applicable software (if required)

18. Software manuals (if required)

19. Warranty

20. Contact information for the contractor, manufacturer, manufacturer's representative and nearest service representative

B. Any equipment that contains multiple components (for example a pump and motor), the above information shall be provided for each component.

C. For valve operation and maintenance manuals, provide one valve schedule giving valve number, location, fluid, and fluid destination for each valve installed. Group all valves in same piping systems together in the schedule. Obtain a sample of the valve numbering system from JEA.

D. All operation and maintenance manual material shall be printed on 8-1/2”x11” or 11”x17” paper.

E. Each manual shall be bound together in appropriate three-ring binders. Each binder shall be provided with front cover with the following information, as a minimum:

1. JEA logo
2. Project name
3. Date (Month / Year)
4. Equipment name
5. Applicable specification section
6. Manufacturer’s name
7. Contractor’s name

F. Each manual shall also be provided with a binder edge cover that contains, at a minimum, the project name, date and equipment name.

G. Each manual shall be divided into sufficient sections to facilitate ease of use and reference of the manual. Sections shall be identified using heavy section dividers with reinforced holes and numbered plastic index tabs; tabs with section titles shall be acceptable. A detailed table of contents shall be provided. At a minimum, the following sections shall be provided:

1. Equipment technical data summary
2. Storage / installation instructions
3. Operation instructions
4. Maintenance instructions
5. Dimensional/assembly drawings, diagrams, and parts lists
6. Wiring drawings and diagrams
7. Contact information

8. Warranty

H. All operating and maintenance material that comes bound by the equipment manufacturer shall be left in its original bound state. Cross-reference the appropriate sections of the Contractor's operations and maintenance manual to the manufacturers' bound manuals.

I. Label binders Volume 1, 2, and so on, where more than one binder is required. Include the table of contents for the entire set, identified by volume number, in each binder.

J. When manufacturer's manuals and diagrams contain information applicable to multiple models or configurations, the information not applicable to this specific installation shall be stricken.

K. The final operations and maintenance manual shall reflect the most current edition of the shop drawing accepted by the Engineer. Any field changes or modifications shall also be included.

L. An easily searchable electronic file for each operation and maintenance manual shall also be submitted in accordance with Article 1.03 of this Section entitled "Format and Contents", as applicable.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

(NOT USED)

Equipment Data Summary	
Item	**Information**
Equipment Name	
Equipment Tag	
Model Number	
Serial Number	
Manufacture Date	
Purchase Date	
Purchase Price	
Date Placed In Service	
Warranty Period (Days)	
Life Expectancy (Months)	
Capacity / Units (if applicable)	
Motor Type (if applicable)	
Motor Size / HP (if applicable)	
Drive Type (if applicable)	
Lubrication Type	
Expected Date of Replacement / Rebuild	
Current Replacement Cost	
Current Rebuild Cost	
Preventive Maintenance (PM) Rpl. Part 1	
PM Rpl. Part 1 Interval (Days)	
PM Rpl. Part 1 Units of Measure	
PM Rpl. Part 1 Purchase Price	
PM Rpl. Part 1 Target Inventory	
PM Rpl. Part 1 Units Per Package	
PM Rpl. Part 1 Minimum Order	
PM Rpl. Part 1 Purchase Units of Measure	
Preventive Maintenance (PM) Rpl. Part 2	
PM Rpl. Part 2 Interval (Days)	
PM Rpl. Part 2 Units of Measure	
PM Rpl. Part 2 Purchase Price	
PM Rpl. Part 2 Target Inventory	
PM Rpl. Part 2 Units Per Package	
PM Rpl. Part 2 Minimum Order	
PM Rpl. Part 2 Purchase Units of Measure	

Equipment Data Summary	
Item	**Information**
Preventive Maintenance (PM) Rpl. Part 3	
PM Rpl. Part 3 Interval (Days)	
PM Rpl. Part 3 Units of Measure	
PM Rpl. Part 3 Purchase Price	
PM Rpl. Part 3 Target Inventory	
PM Rpl. Part 3 Units Per Package	
PM Rpl. Part 3 Minimum Order	
PM Rpl. Part 3 Purchase Units of Measure	
Manufacturer Name	
Manufacturer Address	
Manufacturer District	
Manufacturer State	
Manufacturer Zip	
Manufacturer Country	
Manufacturer Phone	
Manufacturer Fax	
Manufacturer Pager	
Vendor Name	
Vendor Address	
Vendor District	
Vendor State	
Vendor Zip	
Vendor Country	
Vendor Phone	
Vendor Fax	
Vendor Pager	

Preventive Maintenance Summary

Equipment Name:		Location:	
Manufacturer:			
	Name:		
	Address:		
	Telephone:		
Model No:		Serial No:	
Maintenance Task	Lubricant/Part	D W M Q SA A	O&M Manual Reference
NOTES:			

**D-Daily W-Weekly M-Monthly Q-Quarterly SA-Semi-Annual A-Annual*

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SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials and equipment required and perform all site preparation, complete as specified herein. The CONTRACTOR shall clear and grub all of the area within the limits of construction as shown on the plans and approved by the ENGINEER and OWNER prior to the beginning of any work. All site work shall conform to the applicable last edition of JEA's Water & Wastewater Standards Manual.

B. The CONTRACTOR shall obtain all permits required for site preparation work prior to proceeding with the work, including clearing and tree removal.

1.02 RELATED WORK

A. Earthwork is included in Section 02200, and Section 408 in JEA's Water & Wastewater Standards Manual.

B. Erosion and Sedimentation Control in Section 02270.

C. Grassing is included in Section 02936.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, copies of all permits required prior to clearing, grubbing, and stripping work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CLEARING

A. The surface of the ground, for the area to be cleared and grubbed shall be completely cleared of all timber, trees, stumps, brush, shrubs, roots, grass, weeds, rubbish and any other objectionable material resting on or protruding through the surface of the ground. Clearing operations shall be conducted so as to prevent damage to existing structures and utilities and to structures and utilities under construction, and also to provide for the safety of employees and others.

B. Preserve and protect trees and other vegetation designated on the Drawings and in Paragraph 3.05 or as directed by the ENGINEER or OWNER to remain.

C. Clearing operations shall be conducted so as to prevent damage to existing fencing, structures, and utilities.

3.02 GRUBBING

A. Grub and remove all stumps, roots in excess of 1-1/2-in in diameter, matted roots, brush, timber, logs, concrete rubble and other debris encountered to a depth of 18-in below original grade or 18-in beneath the bottom of foundations, whichever is deeper.

B. Refill all grubbing holes and depressions excavated below the original ground surface with suitable materials and compact to a density conforming to the surrounding ground surface in accordance with Section 02200.

3.03 STRIPPING

A. Strip topsoil from all areas to be occupied by buildings, structures, and roadways and all areas to be excavated or filled.

B. Topsoil shall be free from brush, trash, large stones and other extraneous material. Avoid mixing topsoil with subsoil.

C. Stockpile and protect topsoil until it is used in landscaping, loaming and seeding operations. Dispose of surplus topsoil after all work is completed.

3.04 DISPOSAL

A. Dispose of material and debris from site preparation operations by hauling such materials and debris to an approved offsite disposal area at the expense of the CONTRACTOR. No rubbish or debris of any kind shall be buried on the site.

3.05 PROTECTION AND CONTROL

A. Trees and other vegetation designated on the Drawings or directed by the ENGINEER to remain shall be protected from damage by all construction operations by erecting suitable barriers, guards and enclosures, or by other approved means. Conduct clearing operations in a manner to prevent falling trees from damaging trees and vegetation designated to remain and to the work being constructed and so as to provide for the safety of employees and others.

B. Maintain protection until all work in the vicinity of the work being protected has been completed.

C. Do not operate heavy equipment or stockpile materials within the branch spread of existing trees.

D. Immediately repair any damage to existing tree crowns, trunks, or root systems. Roots exposed and/or damaged during the work shall immediately be cut off cleanly inside the exposed or damaged area. Treat cut surfaces with an acceptable tree wound paint and topsoil spread over the exposed root area.

E. Restrict construction activities to those areas within the limits of construction designated on the Drawings, within public rights-of-way, and within easements provided by the OWNER. Adjacent properties and improvements thereon, public

or private, which become damaged by construction operations, shall be promptly restored to their original condition, to the full satisfaction of the property owner.

F. CONTRACTOR shall control dust resulting from clearing and grubbing operations to prevent nuisance to adjacent property owners and the general public.

END OF SECTION

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SECTION 02140

DEWATERING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall design, furnish, install, operate, monitor, maintain and remove a temporary dewatering system as required and lower and control water levels at least 2-feet below subgrades of excavations and to permit construction to proceed in-the-dry.

B. The CONTRACTOR shall furnish, maintain and remove temporary surface water control measures adequate to drain and remove surface water entering excavations.

C. The CONTRACTOR shall retain the services of a professional engineer registered in the State of Florida to prepare dewatering and drainage system designs and submittals described herein.

D. Work shall include the design, equipment, materials, installation, protection, and monitoring of geotechnical instrumentation required to monitor the performance of the dewatering and drainage system as required herein.

E. The CONTRACTOR shall collect and properly dispose of all discharge water from the dewatering and drainage systems in accordance with all Federal, State and local agency requirements.

F. The CONTRACTOR shall obtain and pay for all permits required for temporary dewatering and drainage systems. Original permits shall be prominently displayed on the site prior to constructing dewatering and drainage systems.

G. The CONTRACTOR shall repair damage caused by dewatering and drainage system operations.

H. The CONTRACTOR shall perform all work in accordance with current applicable regulations and codes of all Federal, State and local agencies.

1.02 RELATED WORK

A. Submittals are included in Section 01300.

B. Site preparation is included in JEA's Water & Wastewater Standards Manual, Section 406 – Site Preparation, Cleanup and Restoration, and Section 02100.

C. Excavation and Earthwork are included in JEA's Water & Wastewater Standards Manual, Section 408 – Excavation and Earthwork, and Section 02200.

D. Trenching, Backfilling and Compaction is included in JEA's Water & Wastewater Standards Manual, Section 408- Excavation and Earthwork, and Section 02221.

E. Granular Materials is included in Section 02230.

F. Erosion and Sedimentation control is included in Section 02270.

G. Grassing is included in JEA's Water & Wastewater Standards Manual, Section 441 – Grassing, and Section 02936.

H. Paving is included in JEA's Water & Wastewater Standards Manual, Section 490 – Paving, and Section 02510.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit, in accordance with Section 01300, detailed plans of the proposed dewatering methods. Dewatering and drainage system designs shall be prepared by a Professional Engineer licensed in the State of Florida, and retained by the CONTRACTOR, and having a minimum of five (5) years of professional experience in the design and construction of dewatering and drainage systems.

B. The plan shall include a description of the proposed dewatering system and include the proposed installation methods to be used for dewatering and drainage system elements and for observation wells. The plan shall include equipment, drilling methods, hole sizes, filter sand placement techniques, sealing materials, development techniques, the number and location of dewatering points and observations wells, etc. Include the dewatering system design calculations in the plan.

C. Submittal will be for information only. The CONTRACTOR shall remain responsible for adequacy and safety of construction means, methods and techniques.

D. The CONTRACTOR shall coordinate dewatering and drainage submittals with the excavation and support of excavation submittals. The submittal shall show the areas and depths of excavation to be dewatered. Sheet piles may be used for the advantage for reducing groundwater flow into the excavation if they can be embedded in confining or semi-confining layer(s). The plan shall also include detailed plans for settlement monitoring of existing structures within 150 feet of dewatering activities before and during construction, and provisions to address settlement of existing structures, should it occur, resulting from dewatering activities.

E. The CONTRACTOR shall not proceed with any excavation or dewatering activities until the dewatering submittals have been provided to the Engineer and permits have been obtained.

1.04 DESIGN AND PERFORMANCE RESPONSIBILITY

A. The CONTRACTOR is responsible for the proper design and implementation of methods for controlling surface water and groundwater.

B. The primary purpose of the groundwater control system is to preserve the natural undisturbed condition of the subgrade soils in the areas of the proposed excavations. Prior to excavation, the CONTRACTOR shall lower the groundwater to at least 2-ft below the lowest excavation subgrade elevation. Additional groundwater lowering may be necessary beyond the 2-ft requirement, depending on construction methods and equipment used and the prevailing groundwater and soil conditions. The CONTRACTOR is responsible for lowering the groundwater as necessary to complete construction in accordance with the plans and specifications at no additional cost to the OWNER.

C. The CONTRACTOR shall be responsible for damage to properties, buildings or structures, sewers and other utility installations, pavements and work that may result from dewatering of surface water control operations.

D. Design review and field monitoring activities by the OWNER or of the ENGINEER shall not relieve the CONTRACTOR of his/her responsibilities for the work.

1.05 DEFINITIONS

A. Where the phrase "in-the-dry" is used in this Section, it shall be defined as an excavation subgrade where the groundwater level has been lowered to at least 2-ft below the lowest level of the excavation, is stable with no ponded water, mud, or muck, is able to support construction equipment without rutting or disturbance and is suitable for the placement and compaction of fill material, pipe or concrete foundations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe for observation wells, if required, shall consist of minimum 2-in I.D., Schedule 40 PVC pipe and machine slotted PVC wellpoints, maximum slot size 0.0.010-in.

B. The CONTRACTOR shall provide piping, pumping equipment and all other materials required to provide control of surface water and groundwater in excavation, and equipment provided shall be suitable for the intended purpose.

C. The CONTRACTOR shall maintain at all sites standby pumping systems and a source of standby power.

PART 3 EXECUTION

3.01 GENERAL

A. The CONTRACTOR shall control surface water and groundwater such that excavation to final grade is made in-the-dry, the bearing soils are maintained undisturbed and softening and/or instability or disturbance due to the presence or seepage of water does not occur. All construction and backfilling shall proceed in-the-dry and flotation of completed portions of work shall be prohibited.

B. Methods of groundwater control may include but not be limited to perimeter trenches and sump pumping, perimeter groundwater cutoff, well points, ejectors, deep wells, and combinations thereof.

C. All work included in this Section shall be done in a manner which will protect adjacent structures and utilities and shall not cause loss of ground or disturbance to the pipe bearing soils or to soils which support overlying or adjacent structures.

D. Provide protection against flotation for all work.

E. The impact of anticipated subsurface soil/water conditions shall be considered when selecting methods of excavation and temporary dewatering and drainage systems. Where groundwater levels are above the proposed bottoms of excavations, a pumped dewatering system is expected for pre-drainage of the soils prior to excavation to final grade and for maintenance of the lowered groundwater level until construction has been completed to such an extent that the foundation, structure, pipe, conduit, or fill will not be floated or otherwise damaged. Type of dewatering system, spacing of dewatering units and other details of the work are expected to vary with soil/water conditions at a particular location.

F. Discharge water shall be clear, with no visible soil particles. Discharge from dewatering shall be disposed of in such a manner that it will not interfere with the normal drainage of the area in which the work is being performed, create a public nuisance, or form ponding. The operations shall not cause injury to any portion of work completed, or in progress, or to the surface of streets, or to private property. The dewatering operation shall comply with the requirements of appropriate regulatory agencies. Additionally, where private property is involved, advance permission shall be obtained by the CONTRACTOR.

3.02 SURFACE WATER CONTROL

A. The CONTRACTOR shall construct water control measures, including dikes, ditches, sumps and other methods to prevent, as necessary, flow of surface water into excavations and to allow construction to proceed without being delayed.

3.03 EXCAVATION DEWATERING

A. At all times during construction, the CONTRACTOR shall furnish and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations. Excavations shall be maintained in-the-dry, so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

B. Pipe and masonry shall not be laid in water or submerged within 24 hours after being placed. Water shall not flow over new masonry within 4 days after placement.

C. In no event shall water rise to cause unbalanced pressure on structures until the concrete or mortar has set at least 24 hours. Prevent flotation of the pipe by promptly placing backfill.

D. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed capacity of the subgrade soils at proposed bottom of excavation. If the subgrade of the trench bottom or excavation becomes disturbed due to inadequate drainage, The CONTRACTOR shall excavate below normal grade as directed by the OWNER's representative and refill with screened gravel at the CONTRACTOR's expense.

E. It is expected that the initial dewatering plan may have to be modified to suit the variable soil/water conditions to be encountered during construction. The CONTRACTOR shall dewater and excavate, at all times, in a manner which does not cause loss of ground or disturbance to the pipe bearing soil or soil which supports overlying or adjacent structures.

F. If the method of dewatering does not properly dewater the trench as specified, the CONTRACTOR shall install groundwater observation wells as directed by the state certified Geotechnical Engineer and shall not place any pipe or structure until the readings obtained from the observation wells indicate that the groundwater has been lowered a minimum of 6-in below the bottom of the final excavation within the trench limits.

G. Dewatering units used in the work shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from the dewatering system shall be continuous until pipe or structure is adequately backfilled. Stand-by pumps shall be provided.

H. Water entering the excavation from precipitation or surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sump and pumped from the excavation to maintain a bottom free from standing water.

I. Drainage shall be disposed of in an approved area, and shall be coordinated with the OWNER. All water discharged from temporary dewatering and drainage systems shall be disposed in accordance with the sedimentation and erosion control plans as specified in Section 02270.

3.04 REMOVAL OF SYSTEMS

A. At the completion of the excavation and backfilling work, and when approved by the OWNER's representative, all pipe, deep wells, well points, pumps, generators, observation wells, other equipment and accessories used for the groundwater and surface water control systems shall be removed from the site. All materials and equipment shall become the property of the CONTRACTOR. All areas disturbed by the installation and removal of groundwater control systems and observation wells shall be restored to their original condition.

B. The CONTRACTOR shall leave in place any casings for deep wells, well points or observation wells located within the plan limits of structures or pipelines or

within the zone below 1H:1V planes extending downward and out from the edges of foundation elements or from the downward vertical footprint of the pipe, or where removal would otherwise result in ground movements causing adverse settlement to adjacent ground surface, utilities or existing structures.

C. Where casings are pulled, holes shall be filled with sand. Where left in place, casings should be filled with cement grout and cut off a minimum of 3-ft below finished ground level or 1-ft below foundation level so as not to interfere with finished structures or pipelines.

D. When directed by the ENGINEER, or OWNER, observation wells should be left in place for continued monitoring. When so directed, cut casings flush with final ground level and provide protective lockable boxes with locking devices. The protective boxes shall be suitable for the traffic and for any other conditions to which the observation wells will be exposed.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 STATUTORY REQUIREMENTS

A. All excavation, trenching, sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and State of Florida and local requirements. Where conflict between OSHA, State and local regulations exists, the most stringent requirement shall apply.

1.02 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required and perform all excavation, backfill, fill and grading required to complete the work as shown on the Drawings and as specified herein.

B. If required, the CONTRACTOR shall provide the services of licensed professional engineer registered in the State of Florida to prepare temporary excavation support system, and dewatering system designs and submittals.

C. The CONTRACTOR shall furnish and install temporary excavation support systems, if required, including sheeting, shoring and bracing, to insure the safety of personnel and protect adjacent structures, piping, etc. in accordance with Federal, State, and local laws, regulations and requirements. Temporary excavation support systems shall be in accordance with JEA's Water & Wastewater Standards Manual, Section 408 – Excavation and Earthwork, and Section 02221.

D. The CONTRACTOR shall furnish and install temporary dewatering and surface water control systems and operate to dewater and maintain excavations in a dry condition. The CONTRACTOR shall control drainage into excavations and remove seepage water and rainwater. Dewatering and surface water control shall be in accordance with Section 02140.

E. The CONTRACTOR shall examine the site and review the available geotechnical report prior to submitting his proposal, taking into consideration all conditions that may affect his work. The OWNER and ENGINEER do not assume responsibility for variations of subsurface conditions at locations other than places shown and at the time the investigations were made.

F. No extra work shall be initiated without notification to the ENGINEER and OWNER in writing and the written approval of the OWNER in response.

G. Protection of existing structure and utilities shall be the responsibility of the CONTRACTOR.

1.03 RELATED WORK

A. Site Preparation is included in Section 406 in JEA's Water & Wastewater Standards Manual, and Section 02100.

B. Dewatering is included in Section 02140.

C. Trenching, Backfilling and Compaction is included in Section 02221, and in Section 408 in JEA's Water & Wastewater Standards Manual.

D. Granular Fill Materials are included in Section 02230.

E. Excavation and Backfill for Structures included in Section 02224.

F. Paving and Surfacing is included in Section 02510

G. Loaming and grassing included in Section 441 in JEA's Water & Wastewater Standards Manual.

H. Grassing included in Section 02936

1.04 SUBMITTALS

A. Excavation support system designs shall be prepared by a licensed professional engineer, registered in the State of Florida, having a minimum of 5 years of professional experience in the design and construction of excavation support systems. Submit an original and three copies of the licensed professional engineer's certification, on the P.E. form specified in Section 01300, stating that the excavation support systems designs have been prepared by the professional engineer and that the professional engineer will be responsible for their execution.

B. The CONTRACTOR shall submit, in accordance with Section 01300, an Excavation Work Plan that includes the proposed methods of construction, including, earthwork operations, excavation limits, slopes, ramp access, fill material moisture conditioning and handing, compaction equipment, and material sources for the various portions of the work.

C. The CONTRACTOR shall coordinate this submittal with the requirements of dewatering and support of excavation submittals.

1.05 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM C 33 – Specification for Concrete Aggregates.

2. ASTM D 1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu ft (2,700kN-m/cu m)).

3. ASTM D 2487 – Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

4. ASTM D 4751 – Standard Test Method for Determining the Apparent Opening Size of a Geotextile.

5. ASTM D 5034 – Standard Test Methods for Breaking Strength and Elongation of Textile Fabrics.

B. Four (4) Geotechnical Exploration and Evaluation Reports prepared by Meskel & Associates Engineering, two (2) entitled “Nassau WRF Improvements Phase 1B”, Nassau County, Florida, dated July 19, 2018 and October 1, 2019; one (1) entitled “JEA Radio Avenue Storage & Repump Station: Stormwater Pond and Access Road”, dated April 2, 2019; and one (1) entitled “Radio Avenue Access Road and Future Expansion”, dated May 1, 2020.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.06 PROTECTION

A. Sheeting and Bracing (if necessary)

1. The CONTRACTOR shall furnish, put in place and maintain such sheeting and bracing as may be required by Federal, State and local safety requirements; to support the sides of excavations; to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction; and to protect adjacent structures from undermining or other damage. If the ENGINEER is of the opinion that at any points sufficient or proper supports have not been provided, he/she may order additional supports put in, and compliance with such order shall not relieve or release the CONTRACTOR from his/her responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting. If voids are formed, they shall be immediately filled and rammed. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill.

2. The CONTRACTOR shall construct the sheeting outside the neat lines of the foundation, unless indicated otherwise, to the extent deemed desirable for the method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressures to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected to provide the necessary clearances and dimensions.

3. Where sheeting and bracing is required to support the sides of excavations for structures, engage a professional engineer, licensed by the State of Florida to design the sheeting and bracing. The CONTRACTOR shall provide detailed submittals of the sheeting and bracing design for review and comments. The sheeting and bracing installed shall be in conformity with the design and certification provided by the professional engineer. The CONTRACTOR shall submit P.E. Certification Form contained in Section 01300 to show compliance with this requirement.

4. The CONTRACTOR shall leave in place to be embedded in the backfill all

sheeting and bracing not shown on the Drawings but which the ENGINEER may direct in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The ENGINEER may direct that timber used for sheeting and bracing be cut off at any specified elevation. All timber sheeting to be left in place within the limits of the structure shall be treated.

5. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed by the ENGINEER.

6. The right of the ENGINEER to order sheeting and bracing left in place shall not be construed as creating any obligation on his/her part to issue such orders and his/her failure to exercise his/her right to do so shall not relieve the CONTRACTOR from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the CONTRACTOR to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

7. No sheeting is to be withdrawn if driven below mid-diameter of any pipe and under no circumstances shall any sheeting be cut off at a level lower than 1 foot above the top of any pipe.

B. Pumping and Drainage

1. The CONTRACTOR shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations and keep such excavation dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. The CONTRACTOR shall submit to the ENGINEER for review the design of the dewatering system prior to commencing work.

2. The CONTRACTOR shall take all precautions to prevent uplift of any structure during construction.

3. Flotation shall be prevented by maintaining a positive and continuous operation of the dewatering system. The CONTRACTOR shall be fully responsible and liable for all damages which may result from failure of this system.

4. The dewatering system shall be designed by a professional engineer registered in the State of Florida employed by the CONTRACTOR. The CONTRACTOR shall provide detailed submittals of the dewatering design for review and comments.

5. Dewatering and drainage systems shall be in accordance with Section

02140.

1.07 COMPACTION REQUIREMENTS

A. Refer to Section 02224 for excavation and backfill for structures.

B. Sidewalks: Compact the top 6-in of existing subgrade (and each 12-in layer of fill if applicable) to at least 95 percent modified Proctor maximum dry density (ASTM D1557) at or near optimum moisture content (minus 2 to plus 3 percent).

C. Stabilized Access Road: Compact the top 12-in of existing subgrade and each layer of fill or backfill to at least 98 percent modified Proctor maximum dry density (ASTM D1557) at or near optimum moisture content (minus 2 to plus 3 percent).

D. Roads, paved areas and roadway embankments: Compact the top 12-in of existing subgrade and each layer of fill or backfill to at least 98 percent modified Proctor maximum dry density (ASTM D1557) at or near optimum moisture content (minus 2 to plus 3 percent).

1.08 COMPACTION TESTING

A. Prior to the general placement of the fill and during placement and compaction operations, the ENGINEER may select areas within the limits of the fill for testing the degree of compaction. CONTRACTOR shall cooperate fully in obtaining the information desired.

B. The cost of all tests during construction will be borne by the CONTRACTOR. If test results are unsatisfactory, all costs involved in the testing and correcting deficiencies in compacted materials shall be borne by the CONTRACTOR. All deficiencies shall be corrected to the satisfaction of the ENGINEER.

C. For paved parking/drive areas, density tests shall be performed at a frequency of at least one test for every 5,000 square feet per 12 inch lift or a minimum of one test per lift.

D. For pipelines, density testing shall be performed as specified in Section 02221, Part 3.11.

E. At the request of the ENGINEER, additional testing shall be performed under the testing allowance. CONTRACTOR shall cooperate fully with the ENGINEER's request for additional testing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill materials are specified under Section 02230.

PART 3 EXECUTION

3.01 EXCAVATION BELOW GRADE

A. If the bottom of any excavation is excavated below the limits shown on the Drawings, specified, or directed by the ENGINEER, it shall be refilled at the CONTRACTOR's expense with compacted layers of Structural Fill, or other material satisfactory to the ENGINEER.

B. If, in the opinion of the ENGINEER, the material in its undisturbed natural condition, at or below the normal grade of the excavation as indicated on the Drawings, is unsuitable, it shall be removed to such depth and width as approved by the ENGINEER and be replaced with suitable compacted material as directed by the ENGINEER for which compensation will be made in accordance with the Contract.

C. The excavation shall be backfilled in a controlled manner with Structural Fill. Excavated material that meets the requirements of Structural Fill may be reused to backfill the excavation.

3.02 MISCELLANEOUS EXCAVATION

A. Perform all miscellaneous excavation. Make all excavations necessary to permit the placing of loam and plants, for constructing roadways and any other miscellaneous earth excavation required under this Contract.

3.03 BACKFILLING - COMMON FILL

A. Common fill may be used in below roadways, parking lots, landscape areas and areas beyond those designated for select fill unless shown or specified otherwise. Common Fill may be used as trench backfill; fill against exterior walls of structures (except water and retention structures) as indicated on the Drawings; as embankment fill; or in other areas as designated by the ENGINEER. Material conforming to the requirements of Common Fill shall be placed in layers having a maximum thickness of 8 inches measured before compaction.

B. Common Fill shall be compacted to at least 98 percent of the soil’s maximum dry density beneath roadways and at least 95 percent of the soil’s maximum dry density in all other areas. Maximum dry density shall be as determined by ASTM D1557.

C. Materials placed in fill areas shall be deposited to the lines and grades shown on the Drawings making due allowance for settlement of the material and for the placing of loam thereon.

D. The surfaces of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the grading plan and no soft spots or un-compacted areas will be allowed in the work.

E. No compacting shall be done when the material is too wet either from rain or from excess application of water. At such times, work shall be suspended until the previously placed and new materials have dried sufficiently to permit proper compaction.

3.04 DISPOSAL OF UNSUITABLE, WASTE AND/OR SURPLUS MATERIAL

A. Unsuitable, waste and surplus excavated material shall be removed and disposed of off-site. Materials may be temporarily stockpiled in an area within the limits of construction that does not disrupt construction activities, create any nuisances or safety hazards, or otherwise restrict access to the work site.

B. Suitable excavated material shall be used for fill or backfill on the different parts of the work as required.

C. Surplus fill shall become the property of the CONTRACTOR and shall be removed and disposed off site.

3.05 GRADING

A. Grading in preparation for placing of fill shall be performed at all places that are indicated on the Drawings, to the lines, grades and elevations shown and otherwise as directed by the ENGINEER and shall be performed in such a manner that the requirements for formation of embankments can be followed. All material encountered, of whatever nature, within the limits indicated, shall be removed and disposed of as directed. During the process of grading, the subgrade shall be maintained in such condition that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or condition of the work.

B. If at the time of grading it is not possible to place any material in its final location, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.

C. The ENGINEER reserves the right to make minor adjustments or revisions to the lines or grades if found necessary as the work progresses, in order to obtain satisfactory construction.

D. Stones or rock fragments larger than 2 inches in their greatest dimensions will not be permitted in the top 12 inches of the finished subgrade of all fills or embankments.

E. In cuts, all loose or protruding rocks on the back slopes shall be barred loose or otherwise removed to line or finished grade of slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings or as directed by the ENGINEER.

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SECTION 02207

AGGREGATE MATERIALS

PART 1 GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, equipment and materials required to complete all work associated with the installation of aggregate material beneath foundations, as backfill and as roadway subgrades and other related and incidental work as required to complete the work shown on the Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01090 - Reference Standards

B. Section 02221 – Trenching, Backfilling and Compaction

C. Section 02224 – Excavation and Backfill for Structures

D. Section 02230 – Granular Fill Material

E. Section 02276 - Erosion and Sedimentation Control

F. Section 02510 - Paving and Surfacing

G. Section 02604 – Utility Structures

H. Section 02610 – Site Drainage

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the Specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Florida Department of Transportation (FDOT), Standard Specifications for Road and Bridges Construction (latest edition).

2. ASTM C 127 Test for Specific Gravity and Absorption of Coarse Aggregate.

3. ASTM C 136 Test for Sieve Analysis of Fine and Coarse Aggregates.

4. ASTM C 535 Test for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Materials gradation and certification.

2. ASTM C127, ASTM C136, and ASTM C535 test results

PART 2 -- PRODUCTS

2.01 CRUSHED STONE, SCREENED GRAVEL and AGGREGATE BASE COURSE (ABC)

A. Crushed stone or screened gravel shall meet the requirements of Aggregate Standard Size No. 57 as defined by FDOT Standard Specifications.

B. ABC shall meet the requirements of ABC as defined by FDOT Standard Specifications.

2.02 SELECT SAND

A. Select sand shall meet the requirements of FDOT Standard Specifications for materials and gradation.

PART 3 -- EXECUTION

3.01 CRUSHED STONE, SCREENED GRAVEL AND AGGREGATE BASE COURSE (ABC)

A. Contractor shall install crushed stone, screened gravel and ABC in accordance with the FDOT Standard Specifications and as shown on the Drawings and indicated in the Contract Documents.

1. Unless otherwise stated herein or shown on the Drawings, all mat foundations (bottom slabs) for the proposed structures shall have a blanket of crushed stone or ABC 6-inches thick minimum placed directly beneath the proposed mat. The blanket shall extend a minimum of 12 inches beyond the extremities of the mat.

2. For subgrade preparation at structures and structural fill, the foundation material shall be ABC where specifically specified on Drawings, otherwise, crushed stone or screened gravel shall be used.

3. For ground under drains, pipe bedding, and drainage layers beneath structures the coarse aggregate shall meet the requirements of aggregate standard Size No. 57 as defined by FDOT Standard Specifications.

3.02 SELECT SAND

A. Contractor shall install select sand in accordance with the FDOT Standard Specifications and as shown on the Drawings and indicated in the Contract Documents.

- END OF SECTION -

SECTION 02221

TRENCHING, BACKFILLING AND COMPACTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all trenching for pipelines and appurtenances, including drainage, filling, backfilling, disposal of surplus material and restoration of trench surfaces and easements.

B. Excavation shall extend to the width and depth shown on the Drawings or as specified herein and shall provide suitable room for installing pipe, structures and appurtenances.

C. Furnish and place all sheeting, bracing and supports and shall remove from the excavation all materials which the ENGINEER may deem unsuitable for backfilling. The bottom of the excavation shall be firm, dry and in all respects, acceptable. If conditions warrant, deposit gravel for pipe bedding, or gravel refill for excavation below grade, directly on the bottom of the trench immediately after excavation has reached the proper depth and before the bottom of the trench has become softened or disturbed by any cause whatsoever. The length of open trench shall be related closely to the rate of pipe laying. All excavation shall be made in open trenches.

D. All excavation, trenching and related sheeting, bracing, etc., shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and to the Florida Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations" (Chapter 454 CMR 10.00 et. seq.) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

E. Wherever the requirement for 95 percent compaction is referred to herein it shall mean "at least 95 percent of maximum dry density as determined by ASTM D1557, Method D".

F. Prior to the start of work submit the proposed method of backfilling and compaction to the ENGINEER for review.

1.02 RELATED WORK

A. The required subsurface preparation for the tank is included in Section 02221 Trenching, Backfilling and Compaction.

B. Site Preparation is included in Section 406 in JEA’s Water & Wastewater Standards Manual, and Section 02100.

C. Dewatering is included in Section 02140.

D. Earthwork is included in Section 02200, and in Section 408 in JEA's Water & Wastewater Standards Manual.

E. Granular Fill Materials are included in Section 02230.

F. Paving and Surfacing is included in Section 02510, and in JEA's Water & Wastewater Standards Manual, Section 490.

G. Grassing is included in Section 441 in JEA's Water & Wastewater Standards Manual.

H. Grassing is included in Section 02936.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM D1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu ft (2,700 KN-m/cu m)).

2. Four (4) Geotechnical Exploration and Evaluation Reports prepared by Meskel & Associates Engineering, two (2) entitled "Nassau WRF Improvements Phase 1B", Nassau County, Florida, dated July 19, 2018 and October 1, 2019; one (1) entitled "JEA Radio Avenue Storage & Repump Station: Stormwater Pond and Access Road", dated April 2, 2019; and one (1) entitled "Radio Avenue Access Road and Future Expansion", dated May 1, 2020.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials for use as structural fill, common fill, select common fill and gravel shall conform to Section 02230.

PART 3 EXECUTION

3.01 GENERAL

A. All excavation, backfill and grading necessary to complete the work shall be made by the CONTRACTOR and the cost thereof shall be included in the contract price.

B. Material shall be furnished as required per Section 02230.

C. The CONTRACTOR shall take all the necessary precautions to maintain the work area in a safe and workable condition.

D. The CONTRACTOR shall protect his work at all times by flagging, marking, lighting and barricading. It shall also be the CONTRACTOR's responsibility to preserve and protect all above and underground structures, pipelines, conduits, cables, drains or utilities which are existing at the time he encounters them.

Failure of the Drawings to show the existence of these obstructions shall not relieve the CONTRACTOR from this responsibility. The cost of repair of any damage which occurs to these obstructions during or as a result of construction shall be borne by the CONTRACTOR without additional cost to the OWNER.

3.02 TRENCH PROTECTION

A. All excavation, trenching, and related sheeting, bracing, etc., shall conform to the requirements of the Florida Trench Safety Act (Part IV, Chapter 553 of the Florida Statutes) which incorporates by reference, the Occupational Safety and Health Administration's (OSHA) excavation safety standards, (29 CFR 1926.650 Subpart P).

B. Construct and maintain sheeting and bracing as required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, existing piping and/or foundation material from disturbance, undermining, or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed they shall be immediately filled and rammed.

C. For pipe trench sheeting, no sheeting is to be withdrawn if driven below mid-diameter of any pipe, and no wood sheeting shall be cut off at a level lower than 1 foot above the top of any pipe unless otherwise directed by the ENGINEER. If during the progress of the work the ENGINEER decides that additional wood sheeting should be left in place, he may direct the CONTRACTOR in writing. If steel sheeting is used for trench sheeting, removal shall be as specified above, unless written approval is given by the ENGINEER for an alternate method of removal. Sheeting left in place shall be shown on the CONTRACTOR's record drawings.

D. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, utilities, existing piping, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as may be directed.

E. The right of the ENGINEER to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the CONTRACTOR from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the CONTRACTOR to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

3.03 JOB CONDITIONS

A. The CONTRACTOR shall examine the site and review the available test borings or undertake his own soil borings prior to submitting his bid, taking into consideration all conditions that may affect his work. The OWNER and ENGINEER will not assume responsibility for variations of sub-soil quality or conditions at locations other than places shown and at the time the investigation

was made. Boring log data and soil samples are available for examination after signing a release at the office of the ENGINEER.

B. Existing Utilities: Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the ENGINEER and the OWNER of such piping or utility immediately for directions. Repair damaged utilities to satisfaction of utility OWNER.

C. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.

1. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

3.04 TRENCH EXCAVATION

A. Trench excavation shall include material of every description and of whatever substance encountered, except rock and boulders. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.

B. Strip and stockpile topsoil from grassed areas crossed by trenches. At the CONTRACTOR’s option, topsoil may be otherwise disposed of and replaced, when required, with approved topsoil of equal quality.

C. While excavating and backfilling is in progress, traffic shall be maintained, and all utilities and other property protected as provided in the Terms and Conditions and General Requirements.

D. Trenches shall be excavated to the depth indicated on the Drawings and in widths sufficient for laying the pipe, bracing and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry and in all respects acceptable to the ENGINEER. Trench width shall be practical minimum.

E. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. The trench may be excavated by machinery to, or just below the designated subgrade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Subgrade soils which become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced with compacted Structural Fill as required by the ENGINEER at the CONTRACTOR’s expense.

F. Where pipe is to be laid directly on the trench bottom, final excavation at the bottom of the trench shall be performed manually, providing a flat-bottom true to grade upon undisturbed material. Bell holes shall be made as required. Blocking shall not be used to raise pipes to grade.

G. Where pipe is to be laid on crushed stone bedding, the trench may be excavated by machinery to the normal depth of the pipe provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

3.05 DISPOSAL OF MATERIALS

A. Excavated material shall be stacked without excessive surcharge on the trench bank or obstructing free access to hydrants and gate valves. Inconvenience to traffic and abutters shall be avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.

B. It is expressly understood that no excavated material shall be removed from the site of the work or disposed of, except as directed by the ENGINEER. When removal of surplus materials has been approved by the ENGINEER, dispose of such surplus material in approved designated areas.

C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided. When required, it shall be re-handled and used in backfilling the trench.

D. All surplus and/or unsuitable excavated material shall be disposed of in the following manner:

1. Transport from OWNER's property and legally dispose of. Any permit required for the hauling and disposing of this material beyond OWNER's property shall be obtained by the contractor prior to commencing hauling operations.

E. Suitable excavated material may be used for fill if it meets the specifications for structural fill, select common fill, or common fill and is approved by the ENGINEER. Excavated material so approved may be neatly stockpiled at the site where designated by the ENGINEER provided there is an area available where it will not interfere with the operation of the facility nor inconvenience traffic or adjoining property owners.

3.06 SHEETING AND BRACING

A. The CONTRACTOR shall furnish, install and maintain sheeting and bracing required by Federal, State or local safety requirements to support the sides of the excavation and prevent loss of ground which could endanger personnel, damage or delay the work or endanger adjacent structures. If the ENGINEER is of the opinion that at any point sufficient or proper supports have not been provided, he/she may order additional supports placed at the expense of the CONTRACTOR. Compliance with such order shall not relieve the CONTRACTOR from his/her responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.

B. Where sheeting and bracing is required to support the sides of trenches, the CONTRACTOR shall engage a professional engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed

shall be in conformity with the design and certification of this shall be provided by the professional engineer. The CONTRACTOR shall submit P.E. Certification Form contained in Section 01300 to show compliance with this requirement.

C. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the screened gravel backfill.

1. When installing rigid pipe (R.C., V.C., A.C., etc), any portion of the box extending below mid diameter shall be raised above this point prior to moving the box ahead to install the next pipe. This is to prevent the separation of installed pipe joints due to movement of the box.

2. When installing flexible pipe (PVC, etc), trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened gravel shall be placed to fill any voids created and the screened gravel and backfill shall be re-compacted to provide uniform side support for the pipe.

D. Permission will be given to use steel sheeting in lieu of wood sheeting for the entire job wherever the use of sheeting is necessary. The cost for use of sheeting will be included in the bid items for pipe and shall include full compensation for driving, bracing and later removal of sheeting.

E. All sheeting and bracing shall be carefully removed in such manner as not to endanger the construction of other structures, utilities, or property, whether public or private. All voids left after withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as directed.

F. No payment will be given for sheeting, bracing, etc, during the progress of the work. No payment will be given for sheeting which has actually been left in the trench for the convenience of the CONTRACTOR.

G. Sheeting driven below mid-diameter of any pipe shall remain in place from the driven elevation to at least 1-ft above the top of the pipe.

3.07 DEWATERING AND DRAINAGE

A. Dewatering and drainage shall be performed as specified in Section 02140 and 02610.

3.08 TEST PITS

A. Excavation of test pits may be required for the purpose of exploring and locating buried debris, underground utilities or structures as an aid in establishing the precise location of new work.

B. Test pits shall be backfilled and compacted as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as specified.

3.09 EXCAVATION BELOW GRADE AND REFILL

A. Whatever the nature of unstable material encountered or the groundwater conditions, trench drainage shall be complete and effective.

B. If the CONTRACTOR excavates below grade through error or for the CONTRACTOR's own convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the ENGINEER to excavate below grade as set forth in the following paragraph, in which case the work of excavating below grade and furnishing and placing the refill shall be performed at his own expense.

C. If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the crushed stone or screened gravel notwithstanding effective drainage, the subgrade material shall be removed to the extent directed and the excavation refilled with a 6-in layer of coarse sand, or a mixture graded from coarse sand to the fine gravel, as approved by the ENGINEER, to form a filter layer preserving the voids in the gravel bed of the pipe. The composition and gradation of gravel shall be approved by the ENGINEER prior to placement. Screened gravel shall then be placed in 6-in layers thoroughly compacted up to the normal grade of the pipe.

D. Geotextile filter fabric may be substituted for filter layer if approved by the ENGINEER.

3.10 BACKFILLING

A. The pipe shall be placed on a bedding of at least 8 inches of compacted Structural Fill. Pipe bedding material shall be pre-shaped by means of a template prior to placing the pipe. Blocking shall not be used to raise the pipe to grade. Bell holes shall be provided at each joint to allow the joints to be assembled.

B. As soon as practicable after the pipe has been laid and jointed, backfilling shall begin and thereafter performed expeditiously. Compacted Structural Fill, as specified for the type of pipe installed, shall be placed up to 1-ft over the pipe.

C. An impervious dam or bulkhead cutoff of clay or other impervious material shall be constructed in the trench as directed, to interrupt the unnatural flow of groundwater after construction is completed. The dam shall be effectively keyed into the trench bottom and sidewalls. Provide at least one clay or other impervious material dam in the pipe bedding between each manhole where directed or every 300-ft, whichever is less.

D. Where the pipes are laid cross-country, the remainder of the trench shall be filled with Common Fill material in layers not to exceed 1-ft and mounded 6-in above the existing grade or as directed. Where a loam or gravel surface exists prior to

cross-country excavations, it shall be removed, conserved and replaced to the full original depth as part of the work under the pipe items. In some areas it may be necessary to remove excess material during the clean-up process, so that the ground may be restored to its original level and condition.

E. Where the pipes are laid in streets, the remainder of the trench up to a depth of 12-in below the bottom of the specified permanent paving shall be backfilled with Common Fill material in layers not to exceed 1-ft and thoroughly compacted.

F. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until Structural Fill has been placed and compacted to a level 1-ft over the pipe.

G. Backfill shall be brought up evenly on all sides. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping, to 95 percent compaction. If rolling is employed, it shall be by use of a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench.

H. If water restrictions are in force, obtain water elsewhere, or compact the backfill by other approved methods at no additional cost to this Contract.

I. Where other methods are not practicable, compaction shall be by use of hand or pneumatic ramming with tools weighing at least 20 lbs. The material being spread and compacted in layers not over 6 in thick. If necessary, sprinkling shall be employed in conjunction with rolling or ramming.

J. Backfill around structures shall be Structural Fill material. All backfill shall be compacted to the specified degree of compaction, especially under and over pipes connected to the structures.

K. Subject to the approval of the ENGINEER, fragments of ledge and boulders smaller than 6-in may be used in trench backfill providing that the quantity in the opinion of the ENGINEER is not excessive. Rock fragments shall not be placed until the pipe has at least 2-ft of earth cover. Small stones and rocks shall be placed in thin layers alternating with earth to ensure that all voids are completely filled. Fill shall not be dropped into the trench in a manner to endanger the pipe.

L. Bituminous paving shall not be placed in backfilling unless specifically permitted, in which case it shall be broken up as directed. Frozen material shall not be used under any circumstances.

M. All road surfaces shall be broomed and hose-cleaned immediately after backfilling. Dust control measures shall be employed at all times.

3.11 COMPACTION

A. The CONTRACTOR shall control soil compaction during construction to provide the percentage of maximum density specified. The CONTRACTOR shall provide the ENGINEER copies of all soil testing reports, prepared by a professional

Geotechnical Engineer licensed in the State of Florida, demonstrating compliance with these specifications.

B. When existing trench bottom has a density less than that specified, the CONTRACTOR shall moisture-condition to the optimum moisture content and recompact to the required depth and percentage of maximum density.

C. Percentage of Maximum Density Requirements

1. Structural fill or undisturbed soil from the bottom of the pipe trench to 1 foot above the pipe shall be compacted to achieve a minimum density of 95% of the maximum dry density as determined by ASTM D1557.

2. Common fill from 1 foot above the utility pipes to grade shall be densified to a minimum density of 95% of the maximum dry density as determined by ASTM D1557.

3. Structural fill under and around structures, and to the extent of excavation shall be densified to a minimum density of 95% of the maximum dry density as determined by ASTM D1557.

4. Structural fill or common fill under roads, paved surfaces and/or roadways embankments shall be densified to a minimum density of 98% of the maximum dry density as determined by ASTM D1557.

D. Compaction Tests

1. As a minimum, one compaction test location shall be required for each 150 linear feet of pipe and every 100 square feet of backfill around structures. The ENGINEER may determine that more compaction tests are required to certify the installation depending on field conditions. The locations of compaction tests within the trench shall be in conformance with the following schedule:

a. One test on compacted subgrade soils.

b. One test at the spring line of the pipe.

c. At least one test for each 12-inch layer of backfill within the pipe bedding zone.

d. One test at an elevation of one foot above the top of the pipe.

e. One test for each one foot of backfill placed from one foot above the top of the pipe to finished grade elevation.

2. If based on compaction testing reports and inspection, backfill, which has been placed, is below specified density, the CONTRACTOR shall, at his own expense, provide additional compaction and testing prior to commencing further construction.

3.12 GRADING

A. Grading shall be performed at such places as are indicated on the Drawings, to the lines, grades, and elevations shown or as approved by the ENGINEER and shall be made in such a manner that the requirements for formation of embankments can be followed. All unacceptable material encountered, of whatever nature within the limits indicated, shall be removed and disposed of as directed by the Engineer. During the process of excavation, the grade shall be maintained in such condition that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or condition of the work.

B. If at the time of excavation it is not possible to place any material in its proper section of the permanent structure, it shall be stockpiled in approved areas for later use. No extras will be considered for the stockpiling or double handling of excavated material.

C. The right is reserved to make adjustments or revisions in lines or grades if found necessary as the work progresses, due to discrepancies on the Drawings or in order to obtain satisfactory construction.

D. Stones or rock fragments larger than 2 inches in their greatest dimensions will not be permitted in the top 12 inches of the final grade line.

E. All fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings, or as approved by the ENGINEER.

F. In cuts, all loose or protruding rocks on the back slopes shall be barred loose or otherwise removed to line or finished grade of slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings or as approved by the ENGINEER.

G. No grading is to be done in areas where there are existing pipe lines that may be uncovered or damaged until such lines which must be maintained are relocated, or where lines are to be abandoned, all required valves are closed and drains plugged at manholes.

H. The CONTRACTOR shall replace all pavements cut or otherwise damaged during the progress of the work as specified elsewhere herein.

3.13 RESTORING TRENCH SURFACE

A. Where the trench occurs adjacent to paved streets, in shoulders, sidewalks, or in cross-country areas, thoroughly consolidate the backfill and shall maintain the surface as the work progresses. If settlement takes place, immediately deposit additional fill to restore the level of the ground.

B. In and adjacent to streets, the 12-in layer of trench backfill below the specified initial pavement shall consist of compacted bank-run gravel. Should the CONTRACTOR wish to use material excavated from the trench as gravel subbase for pavement replacement, the CONTRACTOR, at his/her own

expense, have samples of the material tested by an independent testing laboratory at intervals not to exceed 500-ft, in order to establish its compliance with the specifications. Only material which has been tested and approved by the ENGINEER shall be allowed to be incorporated into the work.

C. The surface of any driveway or any other area which is disturbed by the trench excavation and which is not a part of the paved road shall be restored to a condition at least equal to that existing before work began.

D. In sections where the pipeline passes through grassed areas, and at the CONTRACTOR's own expense, remove and replace the sod, or loam and seed the surface to the satisfaction of the ENGINEER.

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SECTION 02224

EXCAVATION AND BACKFILL FOR STRUCTURES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Furnish all labor, equipment and materials required to complete all work associated with excavation, including off-site borrow excavation, dewatering, backfill, foundation and backfill stone, stockpiling topsoil and any excess suitable material in designated areas, backfill and subgrades beneath foundations, excavation support, disposing from the site all unsuitable materials, providing erosion and sedimentation control grading, preparation of structure subgrade, and other related and incidental work as required to complete the work shown on the Drawings and specified herein.

B. All excavations shall be in conformity with the lines, grades, and cross sections shown on the Drawings or established by JEA.

C. It is the intent of this Specification that the CONTRACTOR conduct the construction activities in such a manner that erosion of disturbed areas and off-site sedimentation be absolutely minimized

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 - Submittals

B. Section 02100 - Clearing and Grubbing.

C. Section 02222 – Excavation and Backfill for Utilities

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the Specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced Specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

2. American Society for Testing and Materials (ASTM):

a. ASTM C 127 Test for Specific Gravity and Absorption of Coarse Aggregate.

b. ASTM C 136 Test for Sieve Analysis of Fine and Coarse Aggregates.

c. ASTM D 422 Particle Size Analysis of Soils.

d. ASTM D 423 Test for Liquid Limit of Soils.

e. ASTM D 424 Test for Plastic Limit and Plasticity Index of Soils.

f. ASTM C 535 Test for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

g. ASTM D 698 Standard Method of Test for the Moisture Density Relations of Soils Using a 5.5 lb. (2.5 kg) Rammer and a 12 inch (305 mm) Drop.

h. ASTM D1556 Test for Density of Soil in Place by the Sand Cone Method.

i. ASTM D1557 Test for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 10 lbs. (4.5 kg) Rammer and 18 inch (457 mm) Drop.

j. ASTM D2049 Test Method for Relative Density of Cohesionless Soils.

k. ASTM D2167 Test for Density of Soil in Place by the Rubber Balloon Method.

l. ASTM D2216 Test for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.

m. ASTM D2487 Test for Classification of Soils for Engineering Purposes.

n. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil Aggregate by Nuclear Methods (Shallow Depth).

1.04 SUBSURFACE CONDITIONS

A. Information on subsurface conditions is referenced under Division 1, General Requirements.

B. A Separate geotechnical report is included as an Appendix as a reference for information purposes. The report identifies properties below grade and also offer recommendations for foundation design, primarily for use of the ENGINEER. The recommendations shall not be construed as requirements of the Contract unless specifically referenced by the Contract Documents.

C. JEA and/or the ENGINEER will not assume responsibility for variations of sub-soil quality or conditions at locations other than places shown and at the time the geotechnical investigation was made. The CONTRACTOR shall examine the site and review the available geotechnical boring logs or undertake its own subsurface investigation prior to submitting his bid, taking into consideration all conditions that may affect his work.

D. The CONTRACTOR shall satisfy himself as to the character and amount of different soil materials, groundwater and the subsurface conditions to be encountered in the work to be performed. Information and data, when furnished, are for the CONTRACTOR's general information. However, it is expressly understood that any interpretation or conclusion drawn there from is totally the responsibility of the CONTRACTOR. JEA assume no liability for the accurateness of the data reported. No claim for extra compensation or for extension of time will be allowed on account of subsurface conditions inconsistent with CONTRACTOR's assumptions.

E. Attention is directed to the fact that there may be water pipes, storm drains and other utilities located in the area of proposed excavation. Locate existing underground utilities in areas of work. Test pits and hand excavation in critical areas will be required prior to initiating work. Perform all repairs to same in the event that excavation activities disrupt service.

F. All existing utilities including piping, electrical conduits, electrical duct banks and telephone cables that are shown on the Contract Documents to be relocated, shall be relocated prior to initiating earthwork. Excavation and backfill for relocation of existing utilities shall conform to the requirements of Section 02222 entitled "Excavation and Backfill for Utilities". The Contractor shall coordinate relocation of utilities with utility companies having jurisdiction in the area. Should unknown or incorrectly identified piping or other utilities be encountered during excavation, the Contractor shall consult the Owner and the Engineer immediately for directions.

G. The CONTRACTOR shall cooperate with JEA and utility companies in keeping respective services and facilities in operation.

1.05 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 - Submittals, the CONTRACTOR shall submit the following:

1. Name and location of all material suppliers.

2. Certificate of compliance with the standards specified above for each source of each material.

3. Plans and cross sections of open cut excavations showing side slopes and limits of the excavation at grade.

4. Construction drawings and structural calculations for any types of excavation support required. Drawings and calculations shall be signed and sealed by a currently registered Professional Engineer in the State of Florida.

5. Monitoring plan and pre-construction condition inspection and documentation of all adjacent structures, utilities, and roadways near proposed installation of excavation support systems.

6. Dewatering procedures: The CONTRACTOR shall submit his proposed methods of handling groundwater and the locations at which the water will be disposed of. Methods shall be acceptable to JEA before starting and excavating. CONTRACTOR

shall submit plans showing the methods and location of dewatering and discharge. The drawings shall include a sufficient number of detailed sections to clearly illustrate the Scope of Work. The Drawings showing all of the above information, including calculations, shall be prepared by a qualified Professional Engineer registered in the State of Florida, and shall bear its seal and signature. If required by regulatory agencies, a copy of the dewatering permit shall be submitted.

7. The CONTRACTOR shall notify JEA of the off site and on-site sources of structural fill and submit to JEA a representative sample weighing approximately 50 lbs. The sample shall be delivered to a designated location on site.

8. Prior to any earthwork, the CONTRACTOR shall submit a sieve analysis of the proposed structural fill to JEA for review and approval.

9. The CONTRACTOR shall not place any foundation reinforcement steel until excavations have been tested for compaction.

10. The CONTRACTOR shall apply for and obtain all necessary permits for dewatering as necessary. CONTRACTOR shall be responsible for all permit fees.

1.06 QUALITY CONTROL

A. All soils testing shall be performed by an independent testing laboratory as specified in Section 01400 entitled "Quality Control". The CONTRACTOR shall schedule his Work so as to permit a reasonable time for testing before placing succeeding lifts of backfill and shall keep the laboratory informed of his progress. In the event any test shows the work is not in conformance with these Contract Documents, the cost of any subsequent testing to show conformance shall also be borne by the CONTRACTOR. All test results shall be sent directly to JEA.

1.08 PRODUCT HANDLING

A. Soil and rock material shall be excavated, transported, placed, and stored in a manner so as to prevent contamination, segregation and excessive wetting. Materials which have become contaminated or segregated will not be permitted in the performance of the work and shall be removed from the site

1.08 GROUNDWATER

A. The CONTRACTOR shall be responsible for anticipating groundwater conditions and shall provide positive control measures as required. Such measures shall ensure construction in the dry, stability of excavations, groundwater pressure control, prevention of tanks, pipes, and other structures from being lifted by hydrostatic pressures, and avoiding the disturbance of subgrade bearing materials.

1.09 PROHIBITION OF BLASTING

A. The use of explosives for excavation Work is strictly prohibited on this project.

1.10 PROTECTION OF PROPERTY AND STRUCTURES

A. The CONTRACTOR shall, at his own expense, sustain in place and protect from direct or indirect injury, all pipes, poles, conduits, walls, buildings, and all other structures, utilities, and property in the vicinity of his work. Such sustaining shall be done by the CONTRACTOR. The CONTRACTOR shall take all risks attending the presence of proximity of pipes, poles, conduits, walls, buildings, and all other structures, utilities, and property in the vicinity of his work. CONTRACTOR shall be responsible for all damage, and assume all expenses, for direct or indirect injury and damage, caused by his work, to any such pipe, structures, etc., or to any person or property, by reason of injury to them, whether or not such structures, etc., are shown on the Drawings.

PART 2 -- PRODUCTS

2.01 STRUCTURAL FILL MATERIAL

A. Soils from the excavations meeting requirements stipulated herein with the exceptions of topsoil and organic material may be used as select fill for backfilling and as structural subgrade support. All fill material shall be provided by the CONTRACTOR from any excess suitable on-site material or from offsite sources, all subject to review by JEA prior to use. The Contractor must determine the volume of material required for the site.

B. Select fill used for backfill shall be noncohesive, nonplastic, granular mixture of local sand and limerock, shall be free from vegetation, organic material or muck, and shall contain not more than 8 percent material by weight which passes the No. 200 sieve. Broken concrete shall not be used in the fill. Fill material containing limerock shall have sufficient sand to fill the voids in the limerock, and no individual rocks or pieces or hard material that will not pass a 3-inch diameter ring shall be used in the fill. Maximum Plasticity Inces (PI) shall be 6. Backfill against walls shall not contain any rock larger than ½-inch.

C. Select fill used under structures (structural fill) shall be furnished from off-site or on-site sources as required. Structural fill material shall be clean sand or sand and rock free from vegetation, organic material, muck, or other deleterious matter. Not more than 10 percent by weight shall pass the No. 200 sieve and shall have a Unified Soil Classification System designation of GP, GW, GP-GM, GW-GM, SP, SW, SP-SM, or SW-SM. All rock shall pass through a 3 inch diameter ring. Broken Portland cement or asphaltic concrete will not be considered an acceptable fill material. Unsuitable Fill Material: Classified as A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, and A-8 in accordance with AASHTO Designation M 145. Peat and other highly organic soils are also unsuitable as structural fill.

D. Regardless of material used as select fill, materials shall be compacted at a moisture content satisfactory to the Engineer, which shall be approximately that required to produce the maximum density except that the moisture content shall not be more than 2% below nor more than 2% above the optimum moisture content for the particular material tested in accordance with the ASTM D1557.

E. Where excavated material does not meet requirements for select fill, CONTRACTOR shall furnish off-site borrow material meeting the specified requirements herein.

2.02 CLEAN SAND

A. Clean sand for use in backfilling shall be furnished from off-site or on-site sources as required. Material shall be clean sand free from vegetation, organic material, muck, or other deleterious material. Not more than 10 percent by weight shall pass the No. 200 sieve and shall have a classification of A-3 in accordance with AASHTO Designation M 145.

PART 3 -- EXECUTION

3.01 STRIPPING OF TOPSOIL

A. In all areas to be excavated, filled, paved, or graveled, the topsoil shall be stripped to its full depth and shall be deposited in storage piles on the site, at locations designated by JEA, for subsequent reuse. Remove all tree stumps, concentration of roots and other deleterious materials. Topsoil shall be kept separated from other excavated materials and shall be piled free of roots and other undesirable materials.

3.02 EXCAVATION

A. Highly organic soils (peat or muck), weak silty materials, asphalt and concrete shall be removed from all foundation areas. In addition, all sandy silt zones shall be completely removed from mat foundation areas. Unsuitable material within structure footprints shall be over-excavated and backfilled with structural fill.

B. As a minimum, excavations shall be carried 5-feet outside slab or footing limits or by one foot for each foot excavated below the bearing grade of the mat or footing, whichever is less, unless noted otherwise.

C. All material excavated, regardless of its nature or composition, shall be classified as UNCLASSIFIED EXCAVATION. Excavation shall include the removal of all soil, rock, weathered rock, rocks of all types, boulders, conduits, pipe, and all other obstacles encountered and shown to be removed within the limits of excavation shown on the Drawings or specified herein. No additional payment will be made for the removal of obstacles encountered within the excavation limits shown on the Drawings and specified herein.

D. Excavated unsuitable material shall be removed from the site and disposed of by the Contractor.

E. All suitable material removed in the excavation shall be used as far as practicable in the formation of embankments, subgrades, and shoulders, and at such other places as may be indicated on the Drawings or indicated by JEA. No excavation shall be wasted except as may be permitted by JEA. Refer to the drawings for specific location and placement of suitable excavated materials in the formation of embankments, backfill, and structural and roadway foundations. JEA WILL DESIGNATE MATERIALS THAT ARE UNSUITABLE. The CONTRACTOR shall furnish off-site disposal areas for the unsuitable material and shall dispose of unsuitable material at such areas. Where suitable materials containing excessive moisture are encountered above grade in cuts, the CONTRACTOR shall construct above

grade ditch drains prior to the excavation of the cut material when in the opinion of JEA such measures are necessary to provide proper construction.

F. All excavations shall be made in the dry and in such a manner and to such widths as will give ample room for properly constructing and inspecting the structures and/or piping they are to contain and for such excavation support, pumping and drainage as may be required. Excavation shall be made in accordance with the grades and details shown on the Drawings and as specified herein.

G. Excavation slopes shall be flat enough to avoid slides that will cause disturbance of the subgrade or damage of adjacent areas. Excavation requirements and slopes shall be as indicated in the Drawings or as specified herein. The CONTRACTOR shall intercept and collect surface runoff both at the top and bottom of cut slopes. The intersection of slopes with natural ground surfaces, including the beginning and ending of cut slopes, shall be uniformly rounded as shown on the Drawings or as may be indicated by JEA. Concurrent with the excavation of cuts the CONTRACTOR shall construct intercepting berm ditches or earth berms along and on top of the cut slopes at locations shown on the Drawings or designated by JEA. All slopes shall be finished to reasonably uniform surfaces acceptable for seeding and mulching operations. No rock or boulders shall be left in place which protrude more than 1 foot within the typical section cut slope lines, and all rock cuts shall be cleaned of loose and overhanging material. All protruding roots and other objectionable vegetation shall be removed from slopes. The CONTRACTOR shall be required to submit plans of open cut excavation for review by JEA before approval is given to proceed.

H. The bottom of all excavations for structures and pipes shall be examined by JEA for the presence of unsuitable material. If, in the opinion of JEA, additional excavation is required due to the in place soils being soft, yielding, pumping and wet, the CONTRACTOR shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, and/or crushed stone or screened gravel as indicated by JEA. No payment will be made for subgrade disturbance caused by inadequate dewatering or improper construction methods.

I. All cuts shall be brought to the grade and cross section shown on the Drawings, or established by JEA, prior to final inspection and acceptance by JEA.

J. Slides and overbreaks which occur due to negligence, carelessness or improper construction techniques on the part of the Contractor shall be removed and disposed of by the CONTRACTOR as indicated by JEA at no additional cost to JEA. If grading operations are suspended for any reason whatsoever, partially completed cut and fill slopes shall be brought to the required slope and the work of seeding and mulching or other required erosion and sedimentation control operations shall be performed.

K. Where the excavation exposes sludge, sludge contaminated soil or other odorous materials, the Contractor shall cover such material at the end of each workday with a minimum of 6 inches and a maximum of 24 inches of clean fill. The work shall be an odor abatement measure and the material shall be placed to the depth deemed satisfactory by JEA for this purpose.

L. The CONTRACTOR shall ensure that its excavation work does not adversely affect the bearing capacity of the structural subsurface. Also, the CONTRACTOR shall proceed with foundation work immediately after excavation work and as expeditiously as possible so as to

minimize any potential for subsurface disturbance due to environmental factors, adverse weather, etc. The CONTRACTOR shall also take all necessary precautions to protect its work from potential adverse impacts. Where excavated areas are disturbed by subsequent operations or adverse weather, scarify surface, reshape, fill as required and compact to required density.

3.03 UNAUTHORIZED EXCAVATION

A. Excavation Work carried outside of the Work limits required by the Contract Documents shall be at the CONTRACTOR's expense, and shall be backfilled by the CONTRACTOR at his own expense with suitable material, as directed by JEA. Where, in the judgment of JEA, such over excavation requires use of lean concrete or crushed stone, the CONTRACTOR, at his expense shall furnish and place such materials.

3.04 EXCAVATION SUPPORT

A. The CONTRACTOR shall furnish, place, and maintain such excavation support which may be required to support sides of excavation or to protect pipes and structures from possible damage and to provide safe working conditions. Excavation for deep structures shall be sufficient to provide a clearance between their outer surfaces and the face of the excavation, excavation support, or bracing, of not less than 3 feet. Materials encountered in the excavation which have a tendency to slough or flow into the excavation, undermine the bank, weaken the overlying strata, or are otherwise rendered unstable by the excavation operation shall be retained by an excavation support, stabilization, grouting or other acceptable methods. If JEA is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports put in at the expense of the CONTRACTOR. The CONTRACTOR shall be responsible for the adequacy of all supports used and for all damage resulting from failure of support system or from placing, maintaining and removing it.

B. Selection of and design of any proposed excavation support systems is exclusively the responsibility of the CONTRACTOR. Excavation support shall comply with all applicable OSHA requirements. CONTRACTOR shall submit drawings and calculations on proposed systems sealed by a Professional Engineer currently registered in the State of Florida.

C. The CONTRACTOR shall exercise caution in the installation and removal of supports to insure that excessive or unusual loadings are not transmitted to any new or existing structure. The CONTRACTOR shall promptly repair at his expense any and all damage that can be reasonably attributed to installation or removal of excavation support system.

D. CONTRACTOR shall monitor movement in the excavation support systems as well as movement at adjacent structures, utilities and roadways near excavation supports. CONTRACTOR shall submit a monitoring plan developed by the excavation support design engineer. All pre-construction condition assessment and documentation of adjacent structures on-site and off-site shall be performed by the CONTRACTOR. If any sign of distress such as cracking or movement occurs in any adjacent structure, utility or roadway during installation of supports, subsequent excavation, service period of supports, subsequent backfill and construction, or removal of supports, JEA shall be notified

immediately. CONTRACTOR shall be exclusively responsible for any damage to any roadway, structure, utility, pipes, etc. both on-site and off-site, as a result of his operations.

E. All excavation supports shall be removed upon completion of the work except as indicated herein. JEA may permit supports to be left in place at the request and expense of the CONTRACTOR. Any excavation supports left in place shall be cut off at least two (2) feet below the finished ground surface or as directed by JEA.

3.05 PROTECTION OF SUBGRADE

A. To minimize the disturbance of bearing materials and provide a firm foundation, the CONTRACTOR shall comply with the following requirements:

1. Use of heavy rubber tired construction equipment shall not be permitted on the final subgrade unless it can be demonstrated that drawdown of groundwater throughout the entire area of the structure is at least 3 feet below the bottom of the excavation (subgrade). Even then, the use of such equipment shall be prohibited should subgrade disturbance result from concentrated wheel loads.

2. Subgrade soils disturbed through the operations of the CONTRACTOR shall be excavated and replaced with compacted select fill or crushed stone at the CONTRACTOR's expense as indicated by the Engineer.

3.06 PROOFROLLING

A. Proof-rolling of in-place granular soils shall be performed on the subgrade of all structures and all areas that will support select fill. Surface area to be proof-rolled shall extend 5 feet out from the footing perimeter. After stripping of topsoil, excavation to subgrade and prior to placement of fills, the exposed subgrade shall be carefully inspected by probing and testing as needed. Any topsoil or other organic material still in place, frozen, wet, soft, or loose soil, and other undesirable materials shall be removed. Each section of subgrade shall be subjected to multiple, overlapping (minimum of 20 percent overlap) coverages of the compactor. Proof-rolling shall continue to check for pockets of soft material hidden beneath a thin crust of better soil and until no further vertical settlement of the surface is visually discernable. Any unsuitable materials thus exposed shall be removed and replaced with an approved compacted material. Groundwater shall be maintained at least 30 inches below the work area.

3.07 DEWATERING

A. The CONTRACTOR shall do all dewatering as required for the completion of the work. Procedures for dewatering proposed by the Contractor shall be submitted to the Engineer for review prior to any earthwork operations. Disposal of water to any surface water body will require silt screens. All water removed by dewatering operations shall be disposed of in accordance with the Florida Air and Water Pollution Control Act. The CONTRACTOR is responsible for obtaining any dewatering permits as required by regulatory agencies.

B. The dewatering system shall be of sufficient size and capacity as required to control groundwater or seepage to permit proper excavation operations, embankment construction

and reconstruction, subgrade preparation, and to allow concrete to be placed in a dry condition except where authorized tremie concrete construction work is shown or permitted.. The system shall include a sump system or other equipment, appurtenances and other related earthwork necessary for the required control of water, and shall include automatic starting devices and standby pumps that will ensure continuous dewatering in the event of an outage of one or more pumps. The CONTRACTOR shall draw down groundwater to at least 30 inches below the bottom of excavations (subgrade) at all times in order to maintain a dry and undisturbed condition. The groundwater level shall be controlled so as to permit the placing and curing of concrete and the maintenance of supporting foundations and adjacent work and structures. The CONTRACTOR is fully responsible for protecting structures from flotation until final acceptance of the work.

C. The CONTRACTOR shall control, by acceptable means, all water regardless of source. Water shall be controlled and its disposal provided for at each berm, structure, etc. The entire periphery of the excavation areas shall be ditched and diked to prevent water from entering the excavation. The CONTRACTOR shall be fully responsible for disposal of the water and shall provide all necessary means at no additional expense to JEA. The CONTRACTOR shall be solely responsible for proper design, installation, proper operation, maintenance, and any failure of any component of the system.

D. The CONTRACTOR shall be responsible for and shall repair without cost to JEA, any damage to work in place and the excavation, including damage to the bottom due to heave and including removal of material and pumping out of the excavated area. The CONTRACTOR shall be responsible for damages to any other area or structure caused by his failure to maintain and operate the dewatering system proposed and installed by the CONTRACTOR.

E. The CONTRACTOR shall take all the steps that he considers necessary to familiarize himself with the surface and subsurface site conditions, and shall obtain the data that is required to analyze the water and soil environment at the site and to assure that the materials used for the dewatering systems will not erode, deteriorate, or clog to the extent that the dewatering systems will not perform properly during the period of dewatering. Copies of logs of borings and laboratory test results are available to the CONTRACTOR. This data is furnished for information only, and it is expressly understood that JEA and Engineer will not be held responsible for any interpretations or conclusions drawn therefrom by the CONTRACTOR.

F. Prior to the execution of the work, the CONTRACTOR and JEA shall jointly survey the condition of adjoining structures. Photographs and records shall be made of any prior settlement or cracking of structures, pavements, and the like, that may become the subject of possible damage claims.

G. If a surface to receive foundation slabs cannot be maintained dry by the CONTRACTOR's dewatering efforts, the CONTRACTOR shall provide tremie seals at no additional cost to JEA. The placement of tremie seals shall not preclude dewatering operations specified herein. The limits of tremie seals shall be recommended by the CONTRACTOR and reviewed and accepted by JEA.

3.08 BACKFILLING

A. All structures shall be backfilled with the type of materials shown on the Drawings and specified herein. Select fill shall be deposited in successive, uniform, approximately horizontal layers not exceeding 12 inches in loose lifts for the full width. Compaction shall be in accordance with the requirements of Paragraph 3.09, COMPACTION.

B. Where excavation support is used, the CONTRACTOR shall take all reasonable measures to prevent loss of support beneath and adjacent to pipes and existing structures when supports are removed. If significant volumes of soil cannot be prevented from clinging to the extracted supports, the voids shall be continuously backfilled as rapidly as possible. The CONTRACTOR shall thereafter limit the depth below subgrade that supports will be installed in similar soil conditions or employ other appropriate means to prevent loss of support.

C. Backfill against concrete or masonry structure shall not be performed until the Work has been reviewed and backfilling permitted. Backfill against walls shall also be deferred until the structural slab for floors above the top fill line have been placed and attained design strength or earlier at the discretion of JEA. Partial backfilling against adequately braced wall may be considered by JEA on an individual situation basis. Where walls are to be waterproofed, all Work shall be completed and membrane materials dried or cured according to the manufacturer's instructions before backfilling.

3.09 COMPACTION

A. The CONTRACTOR shall compact embankments, backfill, crushed stone, aggregate base, and in place subgrade in accordance with the requirements of this Section. The densities specified herein refer to percentages of maximum density as determined by the noted test methods. Compaction of materials on the project shall be in accordance with the following schedule:

	Density % Mod. Proctor (D1557)	**Max. Lift Thickness as Compacted Inches**
Backfill Around Structures	98	8
Backfill Beneath Structures	98	8
Crushed Stone Beneath Structures	**	12
Select Sand	98	8
Crushed Stone Backfill	**	12
In place Subgrade Beneath Structures	95	Top 24-inches

*** The aggregate shall be compacted to a degree acceptable to the Engineer by use of a vibratory compactor and/or crawler tractor.*

B. Compaction shall be conducted as follows:

1. A vibratory compactor that imparts a dynamic force of not less than 44,000 pounds shall be used. Each section of subgrade shall be subjected to multiple, overlapping (minimum 20% overlap) coverages of the compactor as it operates at normal walking speed. Vibratory equipment shall not be used within 25 feet of any existing structure.
2. Within 25 feet of any existing structure, non-vibratory compaction equipment such as a drum roller with a maximum weight of 4 tons should be used. Within 5 feet of any existing structure, a walk behind vibratory sled or roller shall be used. A sufficient number of passes should be made within the construction area to compact the in-place soil as required in Article 3.09 A above.

C. Field density tests will be made by independent testing agency as described in Article 1.06. These tests shall be the basis for accepting or rejecting the compaction. In-place density tests will be performed in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 6938. The Engineer will be the sole judge as to which test method will be the most appropriate. Failure to achieve the specified densities shall require the CONTRACTOR to re compact the material or remove it as required. The CONTRACTOR shall, if necessary, increase his compactive effort by increasing the number of passes, using heavier or more suitable compaction equipment, or by reducing the thickness of the layers. The CONTRACTOR shall adjust the moisture contents of the soils to bring them within the optimum range by drying them or adding water as required.

D. The cost of all tests during construction will be borne by the CONTRACTOR. As a minimum, one in place density test shall be performed for each 1000 cubic yards of embankment placed, 500 cubic yards of backfill placed, 2500 square feet of foundation area, or one test performed each day for either. Additional testing deemed necessary by JEA will be performed under the testing allowance.

E. Final grades shall be within 0.1 foot of elevations shown. Where shown on the Drawings surfaces shall be sloped for drainage or other purposes.

F. Vibration monitoring shall be performed at nearby structures when compaction work is ongoing. A single monitoring point using vibration monitoring equipment capable of detecting velocities of 0.1 inch/second or less and survey measurements shall be used for vibration monitoring at each of the nearest structures. An elevation measurement on nearby structures shall be taken before compaction work starts, and then at least twice a day during the work with one reading taken at the conclusion of the day's operations. Elevation measurements shall be recorded to an accuracy of 0.001 foot. If at any time the CONTRACTOR detects settlement or heave of 0.005-feet or more, or vibration levels of 0.5 inch/second or more, the vibratory compaction shall be stopped immediately and JEA notified.

3.10 REMOVAL OF EXCESS AND UNSUITABLE MATERIALS

A. The CONTRACTOR shall remove and dispose of off-site all unsuitable materials. Within thirty (30) consecutive days after Notice to Proceed, the CONTRACTOR shall submit to JEA for review all required permits and a list of disposal sites for the unsuitable materials. If the disposal site is located on private property, the submittal shall also include written permission from the owner of record.

B. All unsuitable materials shall be disposed of in locations and under conditions that comply with federal, state and local laws and regulations.

C. The CONTRACTOR shall obtain an off-site disposal area prior to beginning demolition or excavation operations.

D. All excess and unsuitable materials shall be hauled in trucks of sufficient capacity and tight construction to prevent spillage. Trucks shall be covered to prevent the propagation of dust.

E. When all excess and unsuitable material disposal operations are completed, the CONTRACTOR shall leave the disposal sites in a condition acceptable to JEA and Owner(s) of the disposal site(s).

- - END OF SECTION - -

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SECTION 02230

GRANULAR FILL MATERIALS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required and obtain materials for filling and backfilling, grading and miscellaneous site work, for the uses shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Site Preparation is included in Section 406 in the JEA's Water & Wastewater Standards Manual, and Section 02100.

B. Dewatering is included in Section 02140.

C. Trenching, Backfilling and Compaction is included in Section 02221, and in JEA's Water & Wastewater Standards Manual, Section 408.

D. Sedimentation and Erosion Control is included in Section 02270.

E. Paving is included in Section 490 in the JEA's Water & Wastewater Standards Manual and Section 02510.

F. Grassing is included in Section 441 in the JEA's Water & Wastewater Standards Manual and Section 02936.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit, in accordance with Section 01300, complete product data for materials specified in this Section.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C33 - Standard Specification for Concrete Aggregates.

2. ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft (600kN-m/m)).

3. ASTM D 1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu ft (2,700kN-m/cu m)).

4. ASTM D 422 – Standard Test Method for Particle-Size Analysis of Soils.

5. ASTM D 2974 – Standard Test Method for Moisture, Ash and Organic Matter of Peat and Other Organic Soils (Test Method C).

B. Florida Department of Transportation (FDOT), Standard Specifications for Road and Bridge Construction (latest edition).

Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. Laboratory Testing

1. At least 7 days prior to the placement of any backfill or fill materials, the CONTRACTOR shall deliver a representative sample of the proposed materials weighing at least 50 lbs to the independent soils testing laboratory in accordance with Section 02221. The cost of all tests during construction will be borne by the CONTRACTOR.

2. The CONTRACTOR shall engage the independent soils testing laboratory to perform:

a. Grain size analyses of the samples to determine their suitability for use as backfill or fill material in conformance to the materials requirements specified herein.

b. The appropriate Proctor analyses to determine the maximum dry densities required for compaction testing as specified elsewhere in the Contract Documents.

c. Test results certified by a Professional Engineer or Geologist licensed in the state of Florida.

3. Test results and determinations of suitability shall be delivered to the resident project representative no later than 3 days prior to the placement of backfill or fill materials.

B. Notify Engineer when:

1. Over excavation area is ready for backfilling.

2. Structure or tank is ready for backfilling, and whenever backfilling operations are resumed after a period of inactivity.

3. Soft or loose subgrade materials are encountered wherever embankment or site fill is to be placed.

4. Fill materials appears to be deviating from the Specifications.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Gradation Tests:

1. As necessary to locate acceptable sources of imported material.

2. During production of imported material, test as follows:
   a. Granular Fill: One test per 750 tons.

   b. Sand: One test per 750 tons.

   c. Base Course Rock: One test per 1500 tons.

   d. Foundation Stabilization Rock: One test per 1500 tons.

2.02 MATERIALS

A. Backfill and Fill materials shall be suitable excavated materials, natural or processed mineral soils obtained from off-site sources, or graded crushed stone or gravel. Backfill and Fill materials shall be free of all organic material, trash, or other objectionable materials which may be compressible or which cannot be properly compacted. Backfill and Fill materials shall be non-plastic (ASTM D 4318) and shall contain no more than 3 percent by weight of fibrous organic materials (as determined by ASTM D 2974 Method C).

B. Common Fill shall consist of non-plastic, mineral soil substantially free from organic materials, loam, wood, trash and other objectionable materials which may be compressible or which cannot be properly compacted. Common fill shall not contain stones larger than 3 inches in largest diameter and shall have a maximum of 70 percent passing the No. 40 sieve and a maximum of 20 percent passing No. 200 sieve. Common fill shall not have an organic content exceeding 4 percent, as determined by ASTM D2974 (Method C). Common fill shall not contain granite blocks, broken concrete, masonry rubble or other similar materials. It shall have physical properties such that it can be readily spread, moisture conditioned, and compacted during filling. Soil excavated from the structure and pond areas and which meets the above requirements may be used to raise existing grade in areas other than under structures, pavements, and other facilities unless approved in writing by a Geotechnical Engineer licensed in the State of Florida.

C. Select Common Fill shall be as specified above for Common Fill except that the material shall contain no stones larger than 2 inches in any dimension.

D. Crushed stone shall be sound, durable stone, angular in shape, and free of any foreign material, structural defects and chemical decay. The material shall conform to the physical and gradation requirements provided by the Florida Department of Transportation (FDOT) for No. 57 Stone. Filter fabric in accordance with FDOT Index 199 between the subgrade soils and the gravel/stone shall be required. Crushed stone shall be compacted by mechanical means and vibratory action during construction.

E. Sand:

   1. Sand shall conform to ASTM C33 for fine aggregate.

F. Riprap shall be fragmented limestone, rubble, or other angular rock and shall conform to the requirements of Section 530 of the Florida Department of

Transportation (FDOT) Standard Specifications for Road and Bridge Construction.

G. Filter fabric shall conform to the requirements of FDOT Index 199, Type D-3.

PART 3 EXECUTION

3.01 INSTALLATION

A. The CONTRACTOR shall refer to other parts of the Specifications and Drawings for where these materials should be used.

B. Sand shall be utilized and placed in areas as shown, as specified, and as may be directed by the ENGINEER.

C. Common fill and/or select common fill shall be used and placed in areas as shown, as specified, and as may be directed by the ENGINEER.

END OF SECTION

SECTION 02270

EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required and perform all installation, maintenance, removal and area cleanup related to erosion and sedimentation control work as shown on the Drawings and as specified herein. The work shall include, but not necessarily be limited to; installation of temporary access ways and staging areas, silt fences, sediment removal and disposal, device maintenance, removal of temporary devices, temporary mulching and final cleanup.

B. All soil erosion and sediment control activities, provisions and measures shall comply with the “Manual for Erosion and Sediment Control in Florida”, latest edition, and NPDES General Permit. CONTRACTOR shall be responsible for designing, providing and maintain effective erosion and sedimentation control during construction. The control must ensure erosion and sedimentation will either be eliminated or maintained within acceptable limits as established by the OWNER.

C. The effectiveness of sedimentation and erosion control depends on effective initial installation and continual modification and maintenance during the course of work. The CONTRACTOR shall make a continual reasonable effort to achieve the objective of providing positive sedimentation and erosion control over all disturbed areas of the work site at all times. Should the ENGINEEER or the OWNER observe that areas are not continuously controlled, 10 percent of payments due for work in the areas not properly controlled shall be withheld until appropriate and complete sedimentation and erosion control actions are achieved.

1.02 RELATED WORK

A. Site Preparation is included in Section 406 in JEA’s Water & Wastewater Standards Manual, and Section 02100.

B. Earthwork is included in Section 408 in JEA’s Water & Wastewater Standards Manual, and Section 02200 Earthwork.

C. Grassing is included in Section 441 in JEA’s Water & Wastewater Standards Manual, and Section 02936 Grassing.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit, in accordance with General Conditions, within 10 days after award of Contract, technical product literature for all commercial products to be used for erosion and sedimentation control.

B. Approval does not relieve the CONTRACTOR of responsibility as to the effectiveness of the controls. The ENGINEER, or OWNER may require the CONTRACTOR to modify the control program to maintain its effectiveness at any time during the course of the work. The CONTRACTOR shall submit revised drawings as changes are made during the period the controls are in effect.

1.04 QUALITY ASSURANCE

A. The CONTRACTOR shall be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to offsite areas or into the stream system via surface runoff or underground drainage systems. Measures in addition to those shown on the Drawings necessary to prevent the movement of sediment off site shall be installed, maintained, removed, and cleaned up at the expense of the CONTRACTOR. No additional charges to the OWNER will be considered.

B. Sedimentation and erosion control measures shall conform to the requirements of all permits and Regulatory Agencies, and to requirements outlined in the State of Florida Erosion and Sediment Control Designer and Reviewer Manual, latest edition, Florida Department of Transportation Design Standards, latest edition, and Stormwater Pollution Prevention Plan.

C. Sedimentation and erosion control measures shall conform to the details shown on the Drawings.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed stone for sediment filtration devices, access ways and staging areas shall conform to Florida Department of Transportation Standard Specifications for Road and Bridge, latest edition.

B. Berm structural stone shall be rip-rap:

1. Rip-rap shall be sound, durable rock which is roughly rectangular shaped and of suitable quality to insure permanence in the condition in which it is to be used. Rounded stones, boulders, sandstone or similar soft stone will not be acceptable. Material shall be free from overburden, spoil, shale and organic material, meet the ENGINEER's approval and be well graded within the following limits:

Weight of Stone	Percent Finer by Weight
40 lb	100
12 lb	50
3 lb	0

C. Sediment Fence

1. Sediment fence shall be a prefabricated commercial product made of a woven, polypropylene, ultraviolet resistant material such as “Envirofence” by Mirafi Inc. or equal.

D. 1/4-in woven wire mesh for filter boxes shall be galvanized steel or hardware cloth.

E. Straw mulch shall be utilized on all newly graded areas to protect areas against washouts and erosion. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, or rye that is free from noxious weeds, mold or other objectionable material. The straw mulch shall contain at least 50 percent by weight of material to be 10-in or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment.

F. Latex acrylic copolymer or organic tackifier shall be a commercial product specifically manufactured for use as straw mulch tackifier.

G. An asphalt tackifier shall only be used when temperatures are too low to allow the use of a latex acrylic copolymer and only with prior written approval from the OWNER.

H. Temporary seeding shall be with annual ryegrass. Permanent grass and sod shall be in accordance with Section 441 in JEA’s Water & Wastewater Standards Manual and Section 02936.

PART 3 EXECUTION

3.01 INSTALLATION

A. Sediment Fence Installation

1. Sediment fences shall be positioned around the perimeter of the work area and as necessary to prevent off site movement of sediment produced by construction activities as directed by the ENGINEER.

2. The CONTRACTOR shall dig a trench approximately 6-in wide and 8-in deep along proposed fence lines.

3. The CONTRACTOR shall drive stakes, 10-ft on center (maximum) at back edge of trenches.

   a. Stakes shall be driven 18-in (minimum) into ground.

4. The CONTRACTOR shall hang filter fabric on posts carrying to bottom of trench with about 4-in of fabric laid across bottom of trench. Stretch fabric fairly taut along fence length and maintain secure both ways.

5. The CONTRACTOR shall backfill trench with suitable material as indicated in the geotechnical evaluation and exploration report.

6. The CONTRACTOR shall install pre-fabricated silt fence according to manufacturer's instructions.

B. Filter boxes shall be constructed as detailed on the Drawings, from 1/4-in woven wire mesh or hardware cloth and wood. The CONTRACTOR shall fill with crushed stone and place over all drop inlets and manholes to storm drain system as each inlet is completed. This should be done prior to setting casting, if there is a delay between installation of inlet structures or drain manholes and setting of castings. An alternate method is to ring each inlet with a sediment fence.

C. Staging areas and access ways shall be surfaced with a minimum depth of 6-in of crushed stone.

3.02 MAINTENANCE AND INSPECTIONS

A. Inspections

1. The CONTRACTOR shall make a visual inspection of all erosion and sedimentation control devices once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to offsite areas, the CONTRACTOR shall promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly.

B. Device Maintenance

1. Sediment Fences

a. The CONTRACTOR shall remove accumulated sediment once it builds up to 1/2 of the height of the fabric.

b. The CONTRACTOR shall replace damaged fabric, or patch with a 2-ft minimum overlap.

c. The CONTRACTOR shall make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.

2. Filter Boxes

a. The CONTRACTOR shall replace crushed stone when it becomes saturated with silt.

3. The CONTRACTOR shall add crushed stone to access ways and staging area as necessary to maintain a firm surface free of ruts and mudholes.

3.03 TEMPORARY MULCHING

A. The CONTRACTOR shall apply temporary mulch to areas where rough grading has been completed but final grading is not anticipated to begin within 30 days of the completion of rough grading.

B. Straw mulch shall be applied at rate of 100 lbs/1000 sq ft and tackified with latex acrylic copolymer at a rate and diluted in a ratio per manufacturer’s instructions.

3.04 PERFORMANCE

A. If temporary erosion and sedimentation control measures employed by the CONTRACTOR are insufficient, or fail to be effective in opinion of the ENGINEER or the OWNER, or fail to produce results which comply with the requirements of JEA, the CONTRACTOR shall immediately take whatever steps are necessary to correct the deficiency at no additional cost to the OWNER.

3.05 REMOVAL AND FINAL CLEANUP

A. Once the site has been fully stabilized against erosion, the CONTRACTOR shall remove sediment control devices and all accumulated silt. The CONTRACTOR shall dispose of silt and waste materials in proper manner. The CONTRACTOR shall re-grade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Drawings, and perform final topsoiling, preparation, and permanent grassing per Section 441 of JEA's Water & Wastewater Standards Manual and Section 02936.

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SECTION 02510

PAVING AND SURFACING

PART 1 -- GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, equipment and materials and perform all operations in connection with the construction of asphalt concrete pavement, asphalt concrete overlay, reinforced concrete pavement, gravel roads, concrete curb and gutter, repair and reconstruction of existing asphalt concrete pavement, repair of existing gravel roads, and pavement markings complete as specified herein and as detailed on the Drawings.

B. All new roads including the replacement of portions of the existing roads shall be to the limits, grades, thicknesses and types as shown on the Drawings. Patches for pipe crossings and areas damaged during the construction work shall be asphalt and/or gravel, depending upon the material encountered, unless otherwise indicated.

1.02 RELATED WORK

A. Site Preparation is included in Section 406 in the JEA's Water & Wastewater Standards Manual, and Section 02100.

B. Granular Materials is included in Section 02230.

C. Trenching, Backfilling and Compaction is included in Section 02221, and in JEA's Water & Wastewater Standards Manual, Section 408.

D. Sedimentation and Erosion Control is included in Section 02270.

E. Paving is included in Section 490 in the JEA's Water & Wastewater Standards Manual.

F. Sidewalk, Driveway, Curb and Gutter in Section 491 in the JEA's Water & Wastewater Standards Manual.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit, in accordance with Section 01300, complete product data for materials specified in this Section.

1.04 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. DOT Specifications: The phrase "DOT Specification" shall refer to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction. The DOT Specifications, are referred to herein and are hereby made a part of this Contract to the extent of such references, and shall be as binding upon the Contract as though reproduced herein in their entirety. The Sections of the DOT Specifications which are referenced herein are as follows:

DOT 160	Stabilizing
DOT 200	Rock Base
DOT 230	Limerock Stabilized Base
DOT 300	Prime and Tack Coats for Base Courses
DOT 320	Hot Bituminous Mixtures - Plant Methods and Equipment
DOT 330	Hot Bituminous Mixtures - General Construction Requirements
DOT 334	Superpave Asphalt Pavement
DOT 346	Portland Cement Concrete
DOT 350	Cement Concrete Pavement
DOT 337	Asphaltic Concrete Friction Courses
DOT 902	Fine Aggregate
DOT 911	Limerock Material for Base and Stabilized Base
DOT 916	Bituminous Materials

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Limerock Base

1. The limerock base shall consist of either one or two courses of Ocala Formation or Miami Oolite Formation limerock in accordance with Section 200 and 911 of the DOT Specifications.

B. Prime Coat

1. The material used for the prime coat shall be cut-back Asphalt Grade RC-70 conforming to Sections 300 and 916 of the DOT Specifications for prime to be used on Miami Oolite formation limerock.

C. Tack Coat

1. The material used for the tack coat shall be Emulsified Asphalt Grade RS-2 conforming to Sections 300 and 916 of the DOT Specifications. The complete site shall receive a final tack coat to provide a uniform finish for all new and existing paving at the plant site.

D. Asphaltic Concrete

1. The materials and construction of the asphaltic concrete patch and surface courses shall be Type SP-12.5 Asphalt Concrete conforming to Sections 330, 334, 337, and 916 of the DOT Specifications.

E. Rigid Portland Cement Concrete Pavement

1. All work, including materials associated with rigid concrete pavement shall be in accordance with Section 03300, Cast-In-Place Concrete. Class A concrete shall be used. Placement shall be in accordance with Section 03300, Cast-in-Place Concrete and conforming to Sections 346 and 350 of the DOT specifications.

2. Reinforcing, if specified shall be as shown on the Structural Drawings and as specified in Section 03200, Concrete Reinforcement.

F. Concrete Curb and Gutters

1. Concrete shall be Class B in accordance with the requirements of Section 03300, Cast-In-Place Concrete.

2. Joint reinforcing and wire welded fabric shall conform to Section 03200, Concrete Reinforcement.

3. Joint sealer shall be a one or two part polysulfide base self leveling sealant for horizontal surfaces that has been developed for foot and vehicular traffic. The sealant shall conform to the requirements of Section 07920, Sealants and Caulking.

4. Preformed joint filler shall be sponge rubber and conform to the requirements of AASHTO M-213.

PART 3 -- EXECUTION

3.01 SUBGRADE

A. Roadway subgrades shall be stabilized to the minimum depth shown on the Drawings to a Limerock Bearing Ratio (LBR) of not less than 40. Stabilizing shall be Type B as defined in Section 160 of the DOT Specifications. Stabilization may require the addition and thorough mixing in of crushed limerock, course limerock screenings, or any other stabilizing material acceptable to the

ENGINEER. The stabilizing material shall be applied in such quantity that, after mixing and blending, the subgrade will have a LBR of not less than 40. Stabilizing material shall be mixed or blended in the subgrade material by plowing, scarifying, disking, harrowing, blading, and mixing with rotary tillers until the mixed materials are of uniform bearing value throughout the width and depth of the layer being processed.

B. At least three density determinations shall be made on the final compaction operations on each course each day, and the density determinations shall be made at more frequent intervals if deemed necessary by the ENGINEER.

3.02 BASE COURSE

A. The limerock base shall be constructed in accordance with Section 200 of the DOT Specifications to the thickness and width indicated on the Drawings.

B. After spreading of the base material is completed, the entire surface shall be scarified and shaped so as to produce the exact grade and cross section after compaction. For double course base, this scarifying shall extend a depth sufficient to penetrate slightly the surface of the first course. The maximum depth of each lift shall be 8 inches.

C. When the material does not have the proper moisture content to insure the required density, wetting or drying shall be required. If the material is deficient in moisture, water will be added and uniformly mixed in by disking the base course to its full depth. If the material contains an excess of moisture, it shall be allowed to dry before being compacted. As soon as proper conditions of moisture are attained, the material shall be compacted to an average density not less than 98 percent maximum density as determined in more than one course. The density shall be obtained in each lift of the base.

D. During final compacting operations, if blading of any areas is necessary to obtain the true grade and cross section, the compacting operations for such areas shall be completed prior to making the density determination on the finished base.

E. Unless otherwise directed by the ENGINEER, the surface shall be "hard-planed" with a blade grader immediately prior to the application of the prime coat to remove the thin glaze or cemented surface and to allow free penetration of the prime material. The materials planed from the base shall be removed from the base area.

F. If cracks or checks appear in the base, either before or after priming, which in the opinion of the ENGINEER, would impair the structural efficiency of the base course, the CONTRACTOR shall remove such cracks or checks by rescarifying, reshaping, adding base material where necessary and recompacting, at no additional cost to JEA.

G. If at any time the subgrade material shall become mixed with the base course material, the CONTRACTOR shall, without additional compensation, dig out and remove the mixture, reshape and compact the subgrade, and replace the

materials removed with clean base material, which shall be shaped and compacted as specified above.

3.03 ASPHALT CONCRETE COURSES

A. The prime coat shall be applied at a rate of 0.15 gallons per square yard, and the Work shall be performed in accordance with Section 300 of the DOT Specifications.

B. The tack coat shall be applied at a rate between 0.02 and 0.10 gallons per square yard, and the Work shall be performed in accordance with Section 300 of the DOT Specifications.

C. The spreading, compacting and jointing the wearing surface shall be in accordance with Sections 330 and 331 of the DOT Specifications to the thickness indicated on the Drawings.

3.04 RIGID PORTLAND CEMENT CONCRETE PAVEMENT

A. The subgrade and base course beneath portland cement concrete pavement shall be prepared in accordance with the applicable Sections of these Specifications and referenced Standard Specifications, except that the CONTRACTOR shall use an approved automatically controlled fine grading machine to produce final subgrade and base surfaces meeting the lines, grades, and cross sections (thicknesses) shown on the Drawings or established by the ENGINEER.

B. The surface of the base shall be damp at the time the concrete is placed. The CONTRACTOR shall sprinkle the base when necessary to provide a damp surface. The CONTRACTOR shall satisfactorily correct all soft areas in the subgrade or base prior to placing concrete.

C. Hauling over the base course shall not be allowed except where specifically permitted by and in writing by the ENGINEER. The ENGINEER may allow equipment dumping concrete to operate on the base to the extent and under the conditions the ENGINEER deems necessary to facilitate placing and spreading the concrete.

D. Installation of the rigid concrete pavement shall be in accordance with the details shown on the Drawings and Division 3 - Concrete. The rigid concrete pavement shall cure a minimum of ten (10) calendar days and until the concrete has attained a minimum flexural strength of 550 psi as indicated by flexural strength testing. The CONTRACTOR shall coordinate and pay for all flexural strength testing with a minimum of four (4) 6-inch by 6-inch by 20-inch beams for every fifty (50) cubic yards of pavement concrete installed.

E. Contraction joints shall be spaced at intervals as shown on the Drawings. Transverse contraction joints shall be formed by an approved joint insert. Expansion joints shall be placed when the pavement abuts a structure using 1-inch expansion joint material (filler) and sealant as specified herein.

3.05 PAVEMENT REPAIR

A. All damage to pavement as a result of Work under this Contract shall be repaired in a manner satisfactory to the ENGINEER and at no additional cost to JEA. The repair shall include the preparation of the subgrade, the placing and compacting of the limerock base, the priming of the base and the placing and maintaining of the surface treatment, all as specified herein.

B. The width of all repairs shall extend at least 12 inches beyond the limit of the damage. The edge of the pavement to be left in place shall be cut to a true edge with a saw or other acceptable method so as to provide a clean edge to abut the repair. The line of the repair shall be reasonably uniform with no unnecessary irregularities.

3.07 CONCRETE CURB AND GUTTER

A. The expansion joint filler for concrete curb and gutters shall be cut to conform with the cross section of the curb. Expansion joints shall be spaced at intervals of not more than 25-feet. Formed control joints shall be installed at intervals not exceeding 10 feet. Depth of joint shall be 1/3 the thickness. Curved forms shall be used where radii are indicated; straight segments shall not be permitted. Upon removal of the forms, exposed curb faces shall be immediately rubbed down to a smooth and uniform surface. No plastering shall be permitted.

END OF SECTION

SECTION 02610

SITE DRAINAGE

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Work under this section includes the furnishing of all labor material and equipment required to provide proper drainage of the site.

1.02 GENERAL REQUIREMENTS:

A. Pipe sizes shown on the drawings are based on concrete pipe with a coefficient of roughness based on Florida Department of Transportation Standards.

B. All workmanship, materials, equipment and installation shall be in accordance with the applicable portions of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, and referred to hereinafter as Standard Specification.

1.03 RELATED WORK

A. Site Preparation is included in Section 406 in the JEA's Water & Wastewater Standards Manual and Section 02100.

B. Dewatering is included in Section 02140.

C. Trenching, Backfilling and Compaction is included in Section 02221, and in JEA's Water & Wastewater Standards Manual, Section 408.

D. Erosion and Sedimentation control are included in Section 02270.

1.04 SUBMITTALS

A. The CONTRACTOR shall submit, in accordance with Section 01300, complete product data for materials specified in this Section.

PART 2 - MATERIALS

2.01 CONCRETE PIPE

A. Pipe: Concrete pipe shall conform to Section 449 of the Standard Specifications. All pipe shall be Class III unless otherwise noted on the Drawings.

A. Sealing Joints: The joints of new pipe shall be sealed by use of round rubber gaskets meeting the requirements of Section 942 and as provided in

Paragraph 430-7 of the Standard Specifications. All joints to be wrapped with non-woven filter fabric.

2.02 DRAINAGE STRUCTURES

A. Structures, including mitered end sections, shall be used where shown on the drawings and constructed in accordance with the details shown and Standard Specification.

B. Concrete shall be in accordance with Section 346, of the Standard Specification.

2.02 POLYETHYLENE CORRUGATED PIPE

A. Drainage pipe may be high density polyethylene corrugated exterior/smooth interior pipe in sizes 12 inches through 36 inches and conforming with AASHTO M294, Type S. Material shall meet ASTM D 1248 Type III Category 4, Grade P33, Class C; or ASTM D 3350 Cell Classification 324420C. Minimum conveyance factor shall be a Manning "n" value of 0.010. Acceptable manufacturer shall be Hi-Q, as manufactured by Hancor, Inc., N-12 polyethylene pipe, as manufactured by Advanced Drainage Systems, Inc., or ENGINEER approved equal. *If RCP Class is called out higher than class III on the Drawings, CONTRACTOR must submit documentation of fill cover and load strength that is equal to or greater than RCP Class IV or V.*

B. Couplings and Fittings: Coupling bands shall cover at least one full corrugation on each section of pipe. When gasketed coupling bands are required, the gasket shall be made of closed-cell synthetic expanded rubber meeting the requirements of ASTM D 1056, Type 2. Gaskets shall be installed on the coupling band by the pipe manufacturer. All coupling bands shall beet or exceed the soil-tightness requirement of the AASHTO Standard Specification for Highway Bridges, Section 23, Paragraph 23.3.1.5.4(e). Pipe fittings shall conform to AASHTO M294.

2.04 MANHOLES

A. Precast Concrete Manholes: ASTM C 478, precast reinforced concrete, of depth indicated with provision for rubber gasket joints.

B. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having a separate base slab or base section with integral floor.

1. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
2. Top Section: Eccentric cone type, unless concentric cone or flat-slab-top type is indicated. Top of cone to match grade rings.
3. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness and match 24-inch diameter frame and cover.
4. Gaskets: ASTM C 443, rubber.
5. Steps: Cast into base, riser, and top sections sidewall at 12-to 16-

inch intervals.

6. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
7. Channel and Bench: Concrete.

C. Cast-in-Place Manholes: Reinforced concrete of dimensions and with appurtenances indicated.

1. Bottom, Walls, and Top: Reinforced concrete.
2. Channel and Bench: Concrete.
3. Steps: Cast into sidewall at 12- to 16-inch intervals.

D. Manhole Steps: Wide enough for an adult to place both feet on one step and designed to prevent lateral slippage off the step.

1. Material: Steel-reinforced plastic.

E. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, heavy-duty, ductile iron, 24-inch inside diameter by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover, indented top design, with lettering "STORM SEWER" cast into cover.

2.05 CATCH BASINS

A. Precast Concrete Catch Basins: ASTM C 478 or ASTM C 858, precast reinforced concrete, of depth indicated. Sections shall have provision for rubber gasket joints. Base section slab shall have minimum thickness of 6 inches.

1. Base Section: Base riser section and separate base slab, or base riser section with integral floor.
2. Riser Sections: Sections shall be of lengths to provide depth indicated.
3. Top Section: Type to match FDOT configuration detailed.
4. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness, as necessary.
5. Gaskets: ASTM C 443, rubber.
6. Steps: Cast into riser sidewall at 12- to 16-inch intervals.
7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
8. Channel and Bench: Concrete.

B. Cast-in-Place Catch Basins: Reinforced concrete of dimensions and with appurtenances indicated.

1. Bottom, Walls, and Top: Reinforced concrete.
2. Channel and Bench: Concrete.

C. Catch Basin Steps: Wide enough for an adult to place both feet on one step and designed to prevent lateral slippage off the step.

1. Material: Steel-reinforced plastic.

D. Catch Basin Frames and Grates: Per FDOT Standard Frame and Grates.

2.06 OUTFALLS

A. General: Construct of reinforced concrete pipe, mitered end section, toewalls, and rip rap, as indicated.

2.07 CONCRETE AND REINFORCEMENT

A. Concrete: Portland cement mix, 3,000 psi:

1. Cement: ASTM C 150, Type II
2. Fine Aggregate: ASTM C 33, sand
3. Coarse Aggregate: ASTM C 33, crushed gravel
4. Water: Potable

B. Reinforcement: Steel conforming to the following:

1. Fabric: ASTM A 185, welded wire fabric, plain
2. Reinforcement Bars: ASTM A 615, Grade 60, deformed

C. Forms:

1. Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces without distortion or defects. Material shall be of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal.

2. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Release agent to be within allowable volatile limits according to applicable local, state and federal codes.

2.01 MASONRY

A. Bricks for accessories shall be hard common clay brick. Mortar shall be one part Portland cement and three parts masonry sand to which shall be added lime putty in the amount of 50 percent of the volume of cement. Special commercial mortar mixes may be used if approved by the ENGINEER. All masonry materials shall conform to the latest applicable ASTM specifications. Set all masonry units in full beds of mortar, with full joints and strike all joints flush. Masonry reinforcements shall be galvanized Dur-O-Wal, or approved equal, and shall be installed at every other bed joint.

2.09 CURING MATERIALS

A. Conform to TT-C-800, with 30-percent minimum solids content.

B. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately

1. 9 oz. per sq. yard, complying with AASHTO M-182, Class 2.

C. Moisture-Retaining Cover: One of the following, complying with ASTM C-171.

1. Waterproof paper
2. Polyethylene film
3. White burlap-polyethylene sheet

D. Clear Solvent-Borne Liquid Membrane-Forming Curing Compound: This is a solvent-borne membrane-forming curing compound. Revise to Type II and verify manufacturer's products when a white pigmented curing compound is required. Do not use if waterborne low-VOC emissions compounds are required. ASTM C-309, Type I, Class A or B, wax free.

E. Clear Waterborne Membrane-Forming Curing Compound:

1. This is a waterborne membrane-forming curing compound. Use when low VOC emissions are required. ASTM C-309, Type I, Class B.
2. Provide material that has a maximum volatile organic compound (VOC) rating of 350 mg per liter.

F. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete surfaces for temporary protection from rapid moisture loss.

PART 3 - EXECUTION

3.01 PREPARATION OF FOUNDATION FOR BURIED STORMWATER SYSTEMS

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.02 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground stormwater system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert, unless approved otherwise by the ENGINEER. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed. The pipe shall be carefully examined for defects and the inside cleaned. After placing pipe in the ditch, the ends shall be wiped free from all dirt, sand and foreign material. All pipe and joints shall be made, handled, and installed in strict accordance with the manufacturer's recommendations and instructions. A copy of the installation manual shall be furnished to the ENGINEER prior to placing pipe on the job site.

1. Install concrete pipe in accordance with applicable provisions of American Concrete Pipe Association "Concrete Pipe Field Manual", unless otherwise indicated.
2. Place concrete pipe with elliptical reinforcing so that the reference lines indicating top of pipe are not more than 5 degrees from vertical plane through longitudinal axis of pipe.

C. Use manholes or catch basins for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated. The ENGINEER shall be notified at least 24 hours before the pouring of any concrete is to be started, and such pouring shall not be started until the reinforcement has been approved as placed.

D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install piping pitched down in direction of flow, at minimum slope per plans.

F. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

3.03 MANHOLES

A. General: Install manholes complete with accessories as indicated. Form continuous concrete or split pipe section channel and benches between inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 3 inches above finished grade, unless otherwise indicated.

B. Place precast concrete manhole sections as indicated, and install in accordance with ASTM C 891.

C. Construct cast-in-place manholes as indicated.

D. Provide rubber joint gasket complying with ASTM C 443 at joints of sections.
E. Apply bituminous mastic coating at joints of sections.

3.04 CATCH BASINS

A. Construct catch basins to sizes and shapes indicated.
B. Set frames and grates to elevations indicated.

3.05 OUTFALLS

A. Construct outfalls of reinforced concrete which will attain 28-day compressive strength of not less than 3000 psi.

3.06 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the requirements specified for new work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap, with not less than 6 inches of 3,000-psi, 28-day compressive-strength concrete.

C. Make branch connections from side into existing 15 to 18-inch piping by removing section of existing pipe and installing wye fitting into existing piping. Encase entire wye with not less than 6 inches of 3,000-psi, 28-day compressive-strength concrete.

D. Make branch connections from side into existing 24-inch or larger piping or to underground structures by cutting opening into existing unit sufficiently large to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

1. Provide concrete that will attain minimum 28-day compressive strength of 3,000 psi, unless otherwise indicated.
2. Use epoxy bonding compound as interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

3.07 CLOSING ABANDONED STORMWATER SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping that is indicated to remain in place. Provide sufficiently strong closures to withstand hydrostatic or earth pressure that may result after ends of abandoned utilities have been closed.

1. Close open ends of concrete pipe or structures with not less than 8-inch-thick brick masonry bulkheads.
2. Close open ends of other piping with plastic plugs, or other acceptable methods suitable for size and type of material being closed. Wood plugs are not acceptable.

B. Abandoned Structures: Remove structure and close open ends of the remaining piping or remove top of structure down to not less than 3 feet below final grade; fill structure with stone, rubble, gravel, or compacted dirt, to within 1 foot of top of structure remaining, and fill with concrete.

3.08 FIELD QUALITY CONTROL

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction. All sampling and testing shall be conducted by a testing laboratory under the direction of a Professional ENGINEER, licensed in the State of Florida, at the CONTRACTOR's expense. Submit test results directly to the ENGINEER. The following tests shall be taken:

1. 28-day compressive test of concrete, minimum of three test cylinders per 50 cubic yards of concrete poured.
2. Air content, minimum one test for each day's pour.
3. Slump test, minimum one test for each day's pour.
4. CONTRACTOR shall replace materials removed for testing purposes.
5. Should any work or materials fail to meet the requirements set forth in the plans and specifications, CONTRACTOR shall pay for retesting of same.

B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
3. Flush piping between manholes, to remove collected debris.

C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

D. Make inspections after pipe between manholes has been installed, cleaned and approximately 2 feet of backfill is in place, and again at completion of project. Each section of pipe between structures is to show from either end on examination, a full circle of light. Each appurtenance to the system shall be of the specified size and form, to neatly and substantially constructed, with the top set permanently to exact position and grade.

If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects and reinspect. All repairs shown necessary by the inspections are to be made, broken or cracked pipe replaced, all deposits removed and the pipe left true to line and grade as herein specified, or shown on the plans, entirely clean and free from

abnormalities and ready for use.

E. Limits of Infiltration and Methods of Testing: The allowable limit of groundwater infiltration for the entire system of new stormwater systems or any one trunk, or interceptor shall be in complete accordance with ASTM C425-71T and shall not exceed a limit of infiltration equal to 0.2 gal/inch diameter/hour/100 linear feet of pipe.

1. The test will be made by measuring the infiltrated flow of water over a measuring weir set up in the invert of the sewer, or by an alternate method approved by the ENGINEER, a known distance from a temporary bulkhead or other limiting point of infiltration. After the sewer have been pumped out, and normal conditions prevail, tests shall be started.
2. Tests shall be run continuously for a period of not less than three (3) hours, with weir readings taken at 20 minute intervals. The tests shall be made by the CONTRACTOR. The ENGINEER shall be notified 24 hours in advance. Where infiltration occurs in excess of the specified amount, the defective pipe or joints shall be located and repaired at the expense of the CONTRACTOR. If the defective portions cannot be located, the CONTRACTOR, at his own expense, shall remove and reconstruct as much of the original work as necessary to obtain a sewer within allowable infiltration limits upon such retesting as necessary.

F. Clean-up: Before final inspection and acceptance, the CONTRACTOR shall clean ditches, shape shoulders and restore all disturbed areas, including street crossings, grass plots, to as good as condition as existed before work started.

G. All trenches shall be leveled and loose material removed from pavement gutters, sidewalks, pipe lines, and inlet sediment traps, employing hand labor, if necessary.

END OF SECTION

SECTION 02936

GRASSING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The specification for this project is the Grassing – Section 441 of JEA's Water & Wastewater Standards Manual. This specification is a clarification of type grassing to utilize on the project.

1. Sodding is required 6-feet wide around the prestressed concrete tank (from the edge of the perimeter concrete curb extending 6-feet).

2. Sodding is required 3-feet wide around all structures including equipment pads and driveway.

3. Sodding is required for the access road swale, minimum width of 6-feet.

4. Sodding is required for the pond bank from the seasonal high ground water table to the top of pond per detail in Drawings.

5. Sod or hydroseeding shall be acceptable on the remainder of the disturbed areas of the site.

B. CONTRACTOR shall furnish all labor, materials, equipment and incidentals required and prepare lawn bed and seeding those areas shown on Drawings and as specified herein.

1. All areas within the construction limits shown on the Drawings.

1.02 SUBMITTALS

A. CONTRACTOR shall submit, in accordance Section 01300, identification labels and certification of sod type.

1.03 WARRANTY

A. Guarantee grassing for a period of 90 days after date of final completion by CONTRACTOR.

PART 2 PRODUCT

2.01 SOD AND SEEDING

A. Species to be used are included in JEA's Water & Wastewater Standards Manual, Section 441 – Grassing.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that soil preparation and related preceding work has been completed.

B. Do not start work until conditions are satisfactory.

3.02 INSTALLATION

A. Apply seeding and sodding per JEA's Water & Wastewater Standards Manual, Section 441 – Grassing.

B. Keep seeded and sodded areas continuously moist to a depth below the root zone for three weeks after placement. If there is no water available to the site, the CONTRACTOR shall provide the water.

3.03 MAINTENANCE

A. Soil should be kept continuously moist, but not too wet, until seed has germinated and become well established.

3.04 CLEANING

A. Immediately clean spills from paved and finished surface areas.

B. Remove debris and excess materials from project site.

END OF SECTION

`SECTION 03100

CONCRETE FORMWORK

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall design and furnish all materials for concrete formwork, bracing, and supports and shall design and construct all falsework, all in accordance with the provisions of the Contract Documents.

1.02 RESPONSIBILITY

A. The design and engineering of the formwork as well as safety considerations are the responsibility of the CONTRACTOR.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 - Submittals

B. Section 03200 - Concrete Reinforcement

C. Section 03300 - Cast-in-Place Concrete

D. Section 03315 - Grout

1.04 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all work specified herein shall conform to or exceed the requirements of the Building Code and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of this Section.

1. Codes and Standards

a. The Building Code, as referenced herein, is the Florida Building Code (FBC).

2. Government Standards

a. PS 1 U.S. Product Standard for Concrete Forms, Class I.

3. Commercial Standards

a. ACI 347 Recommended Practice for Concrete Formwork.

b. ACI 318R Building Code Requirements for Reinforced Concrete.

c. ACI 350 Code Requirements for Environmental Engineering Concrete Structures

1.05 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Manufacturer’s data on proposed form release agent.

2. Manufacturer’s data on proposed formwork system form ties.

1.06 QUALITY ASSURANCE

A. The variation from established grade or lines shall not exceed 1/4 inch in 10 feet and there shall be no offsets or visible bulges or waviness in the finished surface. All tolerances shall be within the "Suggested Tolerances" specified in ACI 347. The CONTRACTOR shall grind smooth all fins and projections between formwork panels as directed by the Engineer.

B. Curved forms shall be used for curved and circular structures that are cast-in-place. Straight panels will not be acceptable for forming curved structures.

C. Concrete formwork shall be in accordance with ACI 301, ACI 318, and ACI 347.

PART 2 -- PRODUCTS

2.01 FORM MATERIALS

A. Except as otherwise expressly accepted by the Engineer, all lumber brought on the job site for use as forms, shoring, or bracing shall be new material. All forms shall be smooth surface forms and shall be of the following materials:

Footing sides	-	Construction grade Southern Pine or plywood
Walls	-	Steel or plywood panel
Columns	-	Steel, plywood or fiber glass
Roof and floor Slabs	-	Plywood
All other work	-	Steel panels, plywood or tongue and groove lumber

B. Wood materials for concrete forms, formwork, and falsework shall conform to the following requirements:

1. Lumber shall be Southern Pine, construction grade or better, in conformance with U.S. Product Standard PS20.

2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Pine plywood manufactured especially for concrete formwork and shall conform to the requirements of PS I for Concrete Forms, Class I, and shall be edge sealed. Thickness shall be as required to

support concrete at the rate it is placed, but not less than 5/8-inch thick.

2.02 PREFABRICATED FORMS

A. Form materials shall be metal, wood, plywood, or other acceptable material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade indicated. Metal forms shall be an acceptable type that will accomplish such results. Wood forms for surfaces to be painted shall be Medium Density Overlaid plywood, MDO Ext. Grade.

2.03 FORMWORK ACCESSORIES

A. Exterior corners in concrete members shall be provided with 3/4-inch chamfers. Re-entrant corners in concrete members shall not have fillets unless otherwise shown.

B. Form ties shall be provided with a plastic cone or other suitable means for forming a conical hole to insure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 1-1/2 inches; and all such fasteners shall be such as to leave holes of regular shape for reaming.

C. Form ties for water-retaining structures shall have integral waterstops. Removable taper ties may be used when acceptable to the Engineer. At locations where acceptable, a preformed mechanical EPDM rubber plug shall be used to seal the hole left after the removal of the taper tie. Plugs shall be X-Plug by the Greanstreak Group, Inc., or approved equal. Friction fit plugs shall not be used.

D. Form release agent shall be a blend of natural and synthetic chemicals that employs a chemical reaction to provide quick, easy and clean release of concrete from forms. It shall not stain the concrete and shall leave the concrete with a paintable surface. Formulation of the form release agent shall be such that it would minimize formation of "Bug Holes" in cast-in-place concrete.

PART 3 -- EXECUTION

3.01 FORM DESIGN

A. Forms and falsework shall be designed for total dead load, plus all construction live load as outlined in ACI 347. Design and engineering of formwork and safety considerations during construction shall be the responsibility of the CONTRACTOR.

B. Forms shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members.

C. All forms shall be designed for predetermined placing rates per hour, considering expected air temperatures and setting rates.

3.02 CONSTRUCTION

A. The type, size, quality, and strength of all materials from which forms are made shall be subject to the approval of JEA. No falsework or forms shall be used which are not clean and suitable. Deformed, broken or defective falsework and forms shall be removed from the work.

B. Forms shall be smooth and free from surface irregularities. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Joints between the forms shall be sealed to eliminate any irregularities. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to a practical minimum.

C. Forms shall be true to line and grade, and shall be sufficiently rigid to prevent displacement and sagging between supports. Curved forms shall be used for curved and circular structures. Straight panels joined at angles will not be acceptable for forming curved structures. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly placed concrete. Facing material shall be supported with studs or other backing which shall prevent both visible deflection marks in the concrete and deflections beyond the tolerances specified.

D. Forms shall be mortar tight so as to prevent the loss of water, cement and fines during placing and vibrating of the concrete. Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during placement and vibration of concrete. Such gasket may be a 1 to 1-1/2 inch diameter polyethylene rod held in position to the underside of the wall form.

E. All vertical surfaces of concrete members shall be formed, and side forms shall be provided for all footings, slab edges and grade beams, except where placement of the concrete against the ground is called for on the Drawings. Not less than 1-inch of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed

F. All forms shall be constructed in such a manner that they can be removed without hammering or prying against the concrete. Wood forms shall be constructed for wall openings to facilitate loosening and to counteract swelling of the forms.

G. Adequate clean out holes shall be provided at the bottom of each lift of forms. Temporary openings shall be provided at the base of column forms and wall forms and at other points to facilitate cleaning and observation immediately before the concrete is deposited. The size, number and location of such clean outs shall be as acceptable to JEA.

H. Construction joints shall not be permitted at locations other than those shown or specified, except as may be acceptable to JEA. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. For flush surfaces at construction joints exposed to view, the contact surface of the form sheathing over the hardened concrete in the previous placement shall be lapped by not more than 1 inch. Forms shall be held against hardened concrete to prevent offset or loss of mortar at construction joints and to maintain a true surface.

I. The formwork shall be cambered to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads. Set forms and intermediate screed strips for slabs accurately to produce the designated elevations and contours of the finished surface. Ensure that edge forms and screed strips are sufficiently strong to support vibrating screeds or roller pipe screeds if the nature of the finish specified requires the use of such equipment. When formwork is cambered, set screeds to a like camber to maintain the proper concrete thickness.

J. Positive means of adjustment (wedges or jacks) for shores and struts shall be provided and all settlement shall be taken up during concrete placing operation. Shores and struts shall be securely braced against lateral deflections. Wedges shall be fastened firmly in place after final adjustment of forms prior to concrete placement. Formwork shall be anchored to shores or other supporting surfaces or members to prevent upward or lateral movement of any part of the formwork system during concrete placement. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

K. Runways shall be provided for moving equipment with struts or legs. Runways shall be supported directly on the formwork or structural member without resting on the reinforcing steel.

3.03 EXAMINATION

A. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The CONTRACTOR shall assume full responsibility for the adequate design of all forms, and any forms which are unsafe or inadequate in any respect shall promptly be removed from the Work and replaced at the CONTRACTOR's expense. A sufficient number of forms of each kind shall be provided to permit the required rate of progress to be maintained. The design and inspection of concrete forms and falsework, shall comply with applicable local, state and Federal regulations. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by CONTRACTOR's personnel and by the Engineer and shall be in sufficient number and properly installed. During concrete placement, the CONTRACTOR shall continually monitor plumb and string line form positions and immediately correct deficiencies.

B. Concrete forms shall conform to the shape, lines, and dimensions of members as called for on the Drawings, and shall be substantially, free from surface defects, and sufficiently tight to prevent leakage. Forms shall be properly braced or tied together to

maintain their position and shape under a load of freshly-placed concrete.

C. All forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Plywood, 5/8 inch and greater in thickness, may be fastened directly to studding if the studs are spaced close enough to prevent visible deflection marks in the concrete. The forms shall be tight so as to prevent the loss of water, cement and fines during placing and vibrating of the concrete.

   Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during placement and vibration of concrete. Such gasket may be a 1 to 1-1/2-inch diameter polyethylene rod held in position to the underside of the wall form. Adequate clean-out holes shall be provided at the bottom of each lift of forms. The size, number, and location of such clean-outs shall be as acceptable to the Engineer.

D. Concrete construction joints will not be permitted at locations other than those shown or specified, except as may be acceptable to the Engineer. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory affect whatsoever on the concrete. Pipe stubs and anchor bolts shall be set in the forms where required.

3.04 EARTH FORMS

A. All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is called for on the Drawings. Not less than 1 inch of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.

3.05 FOOTINGS, SLAB EDGES AND GRADE BEAMS

A. Provide wood side forms for all footings, slab edges and grade beams.

3.06 FORM ACCESSORIES

A. Suitable moldings shall be placed to bevel or round all exposed corners and edges of beams, columns, walls, slabs, and equipment pads. Chamfers shall be 3/4 inch unless otherwise noted.

B. Form ties shall be so constructed that the ends, or end fasteners, can be removed without causing appreciable spalling at the faces of the concrete. After ends, or end fasteners of form ties have been removed, the embedded portion of the ties shall

terminate not less than 2 inches from the formed face of the concrete that is exposed to water or enclosed surfaces above the water surface, and not less than 1 inch from the formed face of all other concrete. Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers so as to leave the surface of the holes clean and rough before being filled with mortar as specified in Section 03350 - Concrete Finishing. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete member. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. No snap ties shall be broken off until the concrete is at least three days old. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste.

3.07 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

3.08 INSERTS, EMBEDDED PARTS AND OPENINGS

A. Sleeves, pipe stubs, inserts, anchors, expansion joint material, waterstops, and other embedded items shall be positioned accurately and supported against displacement prior to concreting. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

B. Embedded Form Ties: Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers so as to leave the surface of the holes clean and rough before being filled with mortar as specified for in Section 03350 entitled "Concrete Finishes". Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1-inch back from the formed face or faces of the concrete.

3.09 FORM CLEANING

A. Forms may be reused only if in good condition and only if acceptable to the Engineer. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces which are permanently exposed to view. Unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the Engineer.

3.10 FORMWORK TOLERANCES

A. Formwork shall be constructed to insure that finished concrete surfaces will be in

accordance with the tolerances listed in ACI 347.

1. The following construction tolerances are hereby established and apply to finished walls and slab unless otherwise shown in the Drawings:

Item	Tolerance
Variation of the constructed linear outline from the established position in plan	In 10 feet: 1/4 inch; In 20 feet or more: 1/2 inch
Variation from the level or from the grades shown on the Drawings	In 10 feet: 1/4 inch; In 20 feet or more: 1/2 inch
Variation from the plum	In 10 feet: 1/4 inch; In 20 feet or more: 1/2 inch
Variation in the thickness of slabs and walls	Minus 1/4 inch; Plus 1/2 inch
Variation in the locations and sizes of slab and wall openings	Plus or minus 1/4 inch

B. The Contractor shall establish and maintain in an undisturbed condition and until final completion and acceptance of the project, sufficient control points and bench marks to be used for reference purposes to check tolerances. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by Contractor's personnel and by the Engineer and shall be in sufficient number and properly installed. During concrete placement, the Contractor shall continually monitor plumb and string line form positions and immediately correct deficiencies.

C. Regardless of the tolerances specified, no portion of any structure shall extend beyond the legal boundary of the building.

3.11 FORM REMOVAL

A. Forms shall not be disturbed until the concrete has attained sufficient strength. Shoring shall not be removed until the supported member has acquired sufficient strength to support its weight and the load upon it. Members subject to additional loads during construction shall be adequately shored to sustain all resulting stresses. Forms shall be removed in such manner as not to impair safety and serviceability of the structure. All concrete to be exposed by form removal shall have sufficient strength not to be damaged thereby.

B. Remove top forms on sloping surfaces of concrete as soon as removal operations will not allow the concrete to sag. Perform any needed repairs or treatments required on sloping surfaces at once, and follow immediately with the specified curing.

C. The CONTRACTOR shall be responsible for the removal of forms and shores. Forms or shores shall not be removed before test cylinders have reached the specified minimum 28 day compressive strength for the class of concrete specified in Section

03300 entitled "Cast-in-Place Concrete", nor sooner than listed below:

1. Grade beam side forms.....3 days
2. Wall forms.....3 days
3. Column forms.....3 days
4. Beam and girder side forms.....3 days
5. Beam bottoms and slab forms/shores.....14 days

D. When, in the opinion of the Engineer, conditions of the work or weather justify, forms may be required to remain in place for longer periods of time.

E. An accurate record shall be maintained by the Contractor of the dates of concrete placings and the exact location thereof and the dates of removal of forms. These records shall be available for inspection at all times at the site, and two copies shall be furnished the Engineer upon completion of the concrete work.

3.12 RESHORING

A. When reshoring is permitted or required the operations shall be planned in advance and subjected to approval by the Engineer.

B. Reshores shall be placed after stripping operations are complete but in no case later than the end of the working day on which stripping occurs.

C. Reshoring for the purpose of early form removal shall be performed so that at no time will large areas of new construction be required to support their own weight. While reshoring is under way, no construction or live loads shall be permitted on the new construction. Reshores shall be tightened to carry their required loads but they shall not be overtightened so that the new construction is overstressed. Reshores shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified.

3.13 MAINTENANCE OF FORMS

A. Forms shall be maintained at all times in good condition, particularly as to size, shape, strength, rigidity, tightness, and smoothness of surface. Forms, when in place, shall conform to the established alignment and grades. Before concrete is placed, the forms shall be thoroughly cleaned. The form surfaces shall be treated with a nonstaining mineral oil or other lubricant acceptable to JEA. Any excess lubricant shall be satisfactorily removed before placing the concrete. Where field oiling of forms is required, the CONTRACTOR shall perform the oiling at least two weeks in advance of their use. Care shall be exercised to keep oil off the surfaces of steel reinforcement and other metal items to be embedded in concrete.

- END OF SECTION -

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish, fabricate and place all concrete reinforcing steel, welded wire fabric, couplers, and concrete inserts for use in reinforced concrete and shall perform all appurtenant work, including all the wires, clips, supports, chairs, spacers, and other accessories and special work necessary to hold the reinforcing steel in place and protect it from injury and corrosion, all in accordance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 - Submittals

B. Section 03100 - Concrete Formwork

C. Section 03300 - Cast-in-Place Concrete

D. Section 03315 - Grout

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of these specifications, all Work specified herein shall conform to or exceed the requirements of the Building Code and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of this Section.

1. Codes and Standards

a. The Building Code, as referenced herein, is the Florida Building Code (FBC).

2. Commercial Standards

a. ACI 315 Details and Detailing of Concrete Reinforcement.

b. CRSI Concrete Reinforcing Steel Institute Manual of Standard Practice

c. ACI SP66 ACI Detailing Manual

d. ACI 305 Hot Weather Concreting

e. ACI 318 Building Code Requirements for Reinforced Concrete.

f. ACI 350 Code Requirements for Environmental Engineering Concrete Structures

g. WRI Manual of Standard Practice for Welded Wire Fabric.

h. ASTM A 1064 Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

i. ASTM A 615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

1.04 SUBMITTALS

A. The Contractor shall furnish shop bending diagrams, placing lists, and Drawings of all reinforcing steel prior to fabrication in accordance with the requirements of the Section 01300 entitled, "Submittals." The CONTRACTOR shall submit detailed placing and shop fabricating drawings, prepared in accordance with ACI 315 and ACI Detailing Manual - (SP66) for all reinforcing steel. These drawings shall be made to such a scale as to clearly show joint locations, openings, the arrangement, spacing and splicing of the bars. Where opening sizes are dependent on equipment selection the CONTRACTOR shall indicate all necessary dimensions to define steel lengths and placing details

B. Details of the concrete reinforcing steel and concrete inserts shall be submitted by the CONTRACTOR at the earliest possible date after receipt by the CONTRACTOR of the Notice to Proceed. Said details of reinforcing steel for fabrication and erection shall conform to ACI 315 and the requirements specified and shown. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. The shop Drawings shall include bar placement diagrams which clearly indicate the dimensions of each bar splice.

C. Where mechanical couplers are shown on the Drawings to be used to splice reinforcing steel, the CONTRACTOR shall submit manufacturer's literature which contains instructions and recommendations for installation for each type of coupler used; certified test reports which verify the load capacity of each type and size of coupler used; and shop Drawings which show the location of each coupler with details of how they are to be installed in the formwork.

D. Requests to relocate any bars that cause interferences or that cause placing tolerances to be violated.

E. Request to use splices not shown on the Drawings

F. Request to use mechanical couplers along with manufacturer’s literature on the mechanical couplers with instructions for installation, and certified test reports on the coupler’s capacity.

G. Request and procedure to field bend or straighten partially embedded reinforcing

H. Proposed supports for each type of reinforcing.

I. Certification that all installers of dowel adhesives are certified as Adhesive Anchor Installers in accordance with the ACI-CRSI Anchor Installer Certification Program.

J. International Code Council-Evaluation Services Evaluation Services Report (ICC-ES ESR) for dowel adhesives.

K. Adhesive dowel testing plan.

1.05 QUALITY ASSURANCE

A. Installer Qualifications for Drilled-In Rebar: Drilled-in rebar shall be installed by an Installer with at least three years of experience performing similar installations. Installer shall be certified as an Adhesive Anchor Installer in accordance with ACI-CRSI Adhesive Anchor Installation Certification Program.

B. Installer Training: Conduct a thorough training with the manufacturer or the manufacturer's representative for the Installer on the project. Training shall consist of a review of the complete installation process for drilled-in anchors, to include but not be limited to the following:

1. Hole drilling procedure.

2. Hole preparation and cleaning technique.

3. Adhesive injection technique and dispenser training/maintenance.

4. Rebar doweling preparation and installation.

5. Proof loading/torquing.

C. Provide a list of names of all installers who are trained by the Manufacturer's Field Representative on this jobsite prior to installation of products. Record must include the installer name, date of training, products included in the training and trainer name and contact information.

D. Provide a copy of the current ACI/CRSI "Adhesive Anchor Installer" certification cards for all installers who will be installing adhesive anchors in the horizontal to vertically overhead orientation.

E. If requested by JEA, the CONTRACTOR shall provide samples from each load of reinforcing steel delivered in a quantity adequate for testing. Costs of initial tests will be paid by JEA. Costs of additional tests due to material failing initial tests shall be paid by the CONTRACTOR.

F. Inspections of the adhesive dowel system may be made by JEA or other representatives of JEA in accordance with the requirements of the ESR published by

the manufacturer. Provide adequate time and access for inspection of products and anchor holes prior to injection, installation, and proof testing.

PART 2 -- PRODUCTS

2.01 REINFORCEMENT

A. All reinforcing steel for all reinforced concrete construction shall conform to the following requirements:

1. Bar reinforcement shall conform to the requirements of ASTM A 615 for Grade 60 Billet Steel Reinforcement, and shall be manufactured in the United States. All reinforcing steel shall have the manufacturer's mill marking rolled into the bar which shall indicate the producer, size, type and grade. All reinforcing bars shall be deformed bars. Smooth reinforcing bars shall not be used unless specifically called for on the Drawings.

2. Welded wire fabric reinforcement shall conform to the requirements of ASTM A 185 and the details shown on the Drawings; provided, that welded wire fabric with longitudinal wire of W9.5 size wire shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches; and provided further, that welded wire fabric with longitudinal wires larger than W9.5 size shall be furnished in flat sheets only. All welded wire fabric reinforcement shall be galvanized.

B. Field welding of reinforcing steel will not be allowed.

C. Use of coiled reinforcing steel will not be allowed.

2.02 ACCESSORY MATERIALS

A. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers and other devices to position reinforcing during concrete placement. Wire bar supports shall be plastic protected (CRSI Class 1).

B. Tie Wire: Galvanized 16 gauge annealed type.

C. Concrete blocks (dobies), used to support and position reinforcing steel, shall have the same or higher compressive strength as specified for the concrete in which it is located. Concrete blocks shall only be used bottom mat of reinforcing steel for slabs on grade.

2.03 MECHANICAL COUPLERS

A. Mechanical couplers shall develop a tensile strength which exceeds 100 percent of the ultimate tensile strength and 125 percent of the yield strength of the reinforcing bars being spliced. The reinforcing steel and coupler used shall be compatible for obtaining the required strength of the connection.

B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied.

C. Hot forged sleeve type couplers shall not be used. Acceptable mechanical couplers are Dayton Superior Dowel Bar Splicer System by Dayton Superior, Dayton, Ohio, or approved equal. Mechanical couplers shall only be used where shown on the Drawings or where specifically approved by the Engineer.

D. Where the threaded rebar to be inserted into the coupler reduces the diameter of the bar, the threaded rebar piece shall be provided by the coupler manufacturer.

2.04 DOWEL ADHESIVE SYSTEM

A. Where shown on the Drawings, reinforcing bars anchored into hardened concrete with a dowel adhesive system shall use a two-component adhesive mix which shall be injected with a static mixing nozzle following manufacturer's instructions.

B. All holes shall be drilled in accordance with the manufacturer's instructions except that core drilled holes shall not be permitted unless specifically allowed by JEA. Cored holes, if allowed by the manufacturer and approved by JEA, shall be roughened in accordance with manufacturer's requirements.

C. Thoroughly clean drill holes of all debris, drill dust, and water in accordance with manufacturer's instructions prior to installation of adhesive and reinforcing bar.

D. Degree of hole dampness shall be in strict accordance with manufacturer recommendations. Installation conditions shall be either dry or water-saturated. Water filled or submerged holes shall not be permitted unless specifically approved by JEA.

E. Injection of adhesive into the hole shall be performed in a manner to minimize the formation of air pockets in accordance with the manufacturer's instructions.

F. Embedment Depth:

1. The embedment depth of the bar shall be as show on the Drawings. Although all manufacturers listed below are permitted, the embedment depth shown on the Drawings is based on "SET-XP" by Simpson Strong-Tie Co. If the CONTRACTOR submits one of the other named dowel adhesives from the list below, JEA shall evaluate the required embedment and the CONTRACTOR shall provide the required embedment depth stipulated by JEA specific to the approved dowel adhesive.

2. Where the embedment depth is not shown on the Drawings, the embedment depth shall be determined to provide the minimum allowable bond strength equal to the tensile strength of the rebar according to the manufacturer's ICC-ES ESR.

3. The embedment depth shall be determined using the actual concrete compressive strength, a cracked concrete state, maximum long term temperature of 110 degrees F, and maximum short term temperature of 140 degrees F. In no case shall the embedment depth be less than the minimum, or more than the maximum, embedment depths stated in the manufacturer's ICC-ES ESR.

G. JEA's approval is required for use of this system in locations other than those shown on the Drawings.

H. The adhesive system shall be IBC compliant for use in both cracked and uncracked concrete, must comply with the latest revision of ICC-ES Acceptance Criteria AC308, and shall have a valid ICC-ES report. The adhesive system shall be "Epcon System C6+ Adhesive Anchoring System" as manufactured by ITW Redhead, " HIT-HY 200 Injection Adhesive Anchor System" as manufactured by Hilti, Inc. "SET-XP" as manufactured by Simpson Strong-Tie Co. or "Pure 110+ Epoxy Adhesive Anchor System" by DeWalt. Fast-set epoxy formulations shall not be acceptable.

I. All individuals installing dowel adhesive system shall be certified as an Adhesive Anchor Installer in accordance with the ACI-CRSI Anchor Installation Certification Program.

2.05 FABRICATION

A. Reinforcing steel shall be accurately formed to the dimensions and shapes shown on the Drawings, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as modified by the Drawings. Stirrups and tie bars shall be bent around a pin having a diameter not less than 1-1/2 inch for No. 3 bars, 2-inch for No. 4 bars, and 2-1/2 inch for No. 5 bars. Bends for other bars shall be made around a pin having a diameter not less than 6 times the minimum thickness, except for bars larger than 1 inch, in which case the bends shall be made around a pin of 8 bar diameters. Bars shall be bent cold.

B. The CONTRACTOR shall fabricate reinforcing bars for structures in accordance with bending diagrams, placing lists, and placing Drawings. Said Drawings, diagrams, and lists shall be prepared by the CONTRACTOR as specified under Section entitled "Submittals," herein.

C. Fabricating Tolerances: Bars used for concrete reinforcing shall meet the following requirements for fabricating tolerances:

1. Sheared length: + 1 inch

2. Depth of truss bars: + 0, - 1/2 inch

3. Stirrups and ties: + 1/2 inch

4. All other bends: + 1 inch

D. No fabrication shall commence until approval of Shop Drawings has been obtained. All reinforcing bars shall be shop fabricated unless approved to be bent in the field. Reinforcing bars shall not be straightened or rebent in a manner that will injure the material. Heating of bars will not be permitted.

E. Welded wire fabric with longitudinal wire of W9.5 size or smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches.

Welded wire fabric with longitudinal wires larger than W9.5 size shall be furnished in flat sheets only

2.06 MINIMUM REINFORCEMENT

A. Unless otherwise shown on the Drawings or in the absence of the steel being shown, the minimum cross sectional area of reinforcing steel in the direction of principal reinforcement shall be 0.0033 times the gross concrete area of all concrete members.

B. Unless otherwise shown on the Drawings or in the absence of the steel being shown, the minimum cross sectional area of temperature reinforcing steel (reinforcing steel perpendicular to the principal reinforcing steel) shall be as follows:

1. 0.0020 times the gross concrete area in slabs of non-water-bearing structures.

2. 0.0015 times the gross concrete area vertically in walls of non-water-bearing structures.

3. 0.0025 times the gross concrete area horizontally in walls of non-water-bearing structures.

4. 0.0050 times the gross concrete area in slabs of water-bearing structures

5. 0.0030 times the gross concrete area vertically in walls of water-bearing structures.

6. 0.0050 times the gross concrete area horizontally in walls of water-bearing structures.

7. Temperature steel shall not be spaced further apart than five times the slab or wall thickness, nor more than 18 inches.

PART 3 -- EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

A. All reinforcing shall be neatly bundled and tagged for placement when delivered to the job site. Bundles shall be properly identified for coordination with mill test reports.

B. Reinforcing steel shall be stored above ground on platforms or other supports and shall be protected from the weather at all times by suitable covering. It shall be stored in an orderly manner and plainly marked to facilitate identification.

C. Reinforcing steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.

D. The surfaces of all reinforcing steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is

delay in depositing concrete, reinforcing shall be reinspected and if necessary recleaned.

3.02 PLACEMENT

A. Reinforcing steel shall be accurately positioned as shown on the Drawings, and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcing steel shall be supported by concrete, plastic or plastic protected (CRSI Class 1) metal supports, spacers or metal hangers which are strong and rigid enough to prevent any displacement of the reinforcing steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support reinforcing steel shall be tied to the steel with wire ties which are embedded in the blocks. For concrete over formwork, the Contractor shall furnish concrete, metal, plastic, or other acceptable bar chairs and spacers.

B. The portions of all accessories in contact with the formwork shall be made of plastic or steel coated with a 1/8 inch minimum thickness of plastic which extends at least 1/2 inch from the concrete surface. Plastic shall be gray in color.

C. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.

D. Bars additional to those shown on the Drawings which may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at its own expense.

E. Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in Section 7.5 of ACI 318 except where in conflict with the requirements of the Building Code.

F. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be as acceptable to the Engineer. Reinforcing bars shall not be cut to place electrical plumbing or mechanical conduits, piping, ducts, etc. without the expressed written approval of the Engineer of Record.

G. Welded wire fabric shall be supported on slab bolsters spaced not less than 30 inches on centers, extending continuously across the entire width of the reinforcing mat, and supporting the reinforcing mat in the plane shown on the Drawings.

H. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3 feet on centers in any direction. The construction practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.

I. The clear distance between parallel bars (except in columns and between multiple layers of bars in beams) shall be not less than the nominal diameter of the bars nor less than 1-1/3 times the maximum size of the coarse aggregate, nor less than one inch.

J. Where reinforcement in beams or girders is placed in 2 or more layers, the clear distance between layers shall be not less than one inch.

K. In columns, the clear distance between longitudinal bars shall be not less than 1-1/2 times the bar diameter, nor less than 1-1/2 times the maximum size of the coarse aggregate, nor less than 1-1/2 inches.

L. The clear distance between bars shall also apply to the distance between a contact splice and adjacent splices or bars.

M. Reinforcing bar splices shall only be used at locations shown on the Drawings. When it is necessary to splice reinforcement at points other than where shown, the character of the splice shall be as acceptable to the Engineer.

N. The length of lap for reinforcing bars, unless otherwise shown on the Drawings shall be in accordance with ACI 318, Section 12.15.1 for a class B splice.

O. Laps of welded wire fabric shall be in accordance with the ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

P. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as shown on the Drawings. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. After the concrete is placed, couplers intended for future connections shall be plugged and sealed to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged with plastic plugs which have an O-ring seal.

Q. Reinforcing shall not be straightened or rebent in a manner which will injure the material. Bars with kinks or bends not shown on the Drawings shall not be used. All bars shall be bent cold, unless otherwise permitted by the Engineer. No bars partially embedded in concrete shall be field-bent except as shown on the Drawings or specifically permitted by the Engineer.

R. Dowel Adhesive System shall be installed in strict conformance with the manufacturer's recommendations and as required in Article 2.04 above. A representative of the manufacturer must be on site prior to adhesive dowel installation to provide instruction on proper installation procedures for all adhesive dowel installers. Testing of adhesive dowels shall be as indicated below. If the dowels have a hook at the end to be embedded in subsequent work, an approved mechanical coupler shall be provided at a convenient distance from the face of existing concrete to facilitate adhesive dowel testing while maintaining required hook embedment in subsequent work.

S. All adhesive dowel installations in the horizontal or overhead orientation shall be conducted by a certified Adhesive Anchor Installer as certified by ACI/CRSI per ACI 318-11 9.2.2. Current AAI Certificates must be submitted to the Engineer of Record for approval prior to commencement of any adhesive anchor installations.

T. Adhesive Dowel Testing

1. At all locations where adhesive dowels are shown on the Drawings, at least 5 percent of all adhesive dowels installed shall be tested to the value indicated on

the Drawings, with a minimum of one tested dowel per group. If no test value is indicated on the Drawings but the installed dowel is under direct tension, the Contractor shall notify the Engineer to verify the required test value.

2. Contractor shall submit a plan and schedule indicating locations of dowels to be tested, load test values and proposed dowel testing procedure (including a diagram of the testing equipment proposed for use) prior to conducting any testing. The testing equipment shall have a minimum of three support points and shall be of sufficient size to locate the edge of supports no closer than two times the anchor embedment depth from the center of the anchor.

3. Where Contract Documents indicate adhesive dowel design is the Contractor's responsibility, the Contractor shall submit a plan and schedule indicating locations of dowels to be tested and load test values, sealed by a Professional Engineer currently registered in the State of Florida. The Contractor shall also submit documentation indicating the Contractor's testing procedures have been reviewed and the proposed procedures are acceptable.

4. Adhesive Dowel shall have no visible indications of displacement or damage during or after the proof test. Concrete cracking in the vicinity of the dowel after loading shall be considered a failure. Dowels exhibiting damage shall be removed and replaced. If more than 5 percent of tested dowels fail, then 100 percent of dowels shall be proof tested.

5. Proof testing of adhesive dowels shall be performed by an independent testing laboratory hired directly by the Contractor. The Contractor shall be responsible for costs of all testing, including additional testing required due to previously failed tests.

3.03 SPLICING

A. Reinforcing bar splices shall only be used at locations shown on the Drawings. When it is necessary to splice reinforcing at points other than where shown, the splice shall be as acceptable to JEA.

B. The length of lap for reinforcing bars, unless otherwise shown on the Drawings shall be in accordance with ACI 318 for a class B splice.

C. Laps of welded wire fabric shall be in accordance with ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

D. Mechanical splices shall be used only where shown on the drawings or when approved by JEA.

E. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as shown on the Drawings. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. After the concrete is placed, couplers intended for future connections shall be plugged and sealed to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged with plastic plugs which have an O-ring seal.

3.04 INSPECTION

A. The CONTRACTOR shall advise JEA of his intentions to place concrete and shall allow him adequate time to inspect all reinforcing steel before concrete is placed.

B. The CONTRACTOR shall advise JEA of his intentions to place grout in masonry walls and shall allow him adequate time to inspect all reinforcing steel before grout is placed.

3.05 CUTTING OF EMBEDDED REBAR

A. The CONTRAACTOR shall not cut embedded rebar cast into structural concrete without prior approval.

3.06 CLEANING AND PROTECTION

A. Reinforcing steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.

B. The surfaces of all reinforcing steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcing shall be reinspected and, if necessary recleaned.

- END OF SECTION -

SECTION 03290

JOINTS IN CONCRETE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall construct all joints in concrete at the locations shown on the Drawings. Joints required in concrete structures are of various types and will be permitted only where shown on the Drawings, unless specifically accepted by JEA.

B. Construction joints, expansion joints, contraction joints and control joints shall be provided at the locations shown and formed in accordance with the details shown on the Drawings.

C. Waterstops shall be provided where shown on the Drawings, and in all waterbearing joints in hydraulic structures.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 - Concrete Formwork

B. Section 03200 - Concrete Reinforcement

C. Section 03300 - Cast-in-Place Concrete.

D. Section 03315 - Grout

E. Section 03350 - Concrete Finishes

F. Section 03370 -Concrete Curing

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all work specified herein shall conform to or exceed the applicable requirements of the following documents to the extent that the provisions therein are not in conflict with the requirements of this Section.

TT-S-00227E(3)	Sealing Compound, Elastomeric Type, Multi-component (For Caulking, Sealing, And Glazing Buildings And Other Structures).
CRD-C572	U.S. Army Corps of Engineers Specifications for Polyvinylchoride Waterstops
ASTM C 920	Specification for Elastomeric Joint Sealants.
ASTM D 624	Test Method for Rubber Property -- Tear Resistance.

ASTM D 638	Test Method for Tensile Properties of Plastics.
ASTM D 746	Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
ASTM D 747	Test Method for Apparent Bending Modules of Plastics by Means of a Cantilever Beam.
ASTM D 1752	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
ASTM D 2240	Test Method for Rubber Property -- Durometer Hardness.
ACI 301	Specifications for Structural Concrete for Buildings
ACI 318	Building Code Requirements for Structural Concrete
ACI 350	Code Requirements for Environmental Engineering Concrete Structures
ACI 224.3	Joints in Concrete Construction

1.04 TYPES OF JOINTS

A. Construction Joints: When fresh concrete is placed against a hardened concrete surface, the joint between the two pours is called construction joint. Unless noted otherwise, all joints in water bearing structures shall be provided with a waterstop of the shape specified herein or shown on the Drawings.

B. Contraction Joints: Contraction joints are similar to construction joints except that the fresh concrete shall not bond to the hardened surface of the first pour, which shall be coated with a bond breaker. The slab reinforcement shall be stopped 4-1/2 inches from the joint; which is provided with a sleeve-type dowel, to allow shrinkage of the concrete of the second pour. Waterstop and/or sealant groove shall also be provided when specified on the Drawings.

C. Expansion Joints: To allow the concrete to expand freely, a space is provided between the two pours, the joint shall be formed as detailed on the Drawings. This space is obtained by placing a preformed joint filler against the first pour, which acts as a form for the second pour. Unless noted otherwise, all expansion joints in water bearing members shall be provided with a 9-inch wide waterstop. Preformed joint filler shall be installed with the edge at the indicated distance below or back from finished concrete surface, and shall have a slightly tapered, dressed, and oiled wood strip secured to or placed at the edge thereof during concrete placement, which shall later be removed to form space for sealing material. The space so formed shall be filled with a joint sealant material as specified herein. The joint sealant shall be isolated from the filler using a bond breaker.

D. Control Joints: The function of the control joint is to provide a weaker plane in the concrete, where shrinkage cracks will probably occur. A groove, of the shape and

dimensions shown on the Drawing, is formed or saw-cut in the concrete. This groove shall be filled with a joint sealant.

1.05 SUBMITTALS

A. Waterstops: Prior to production of the material required under this contract, qualification samples shall be submitted. Such samples shall consist of extruded or molded sections of each size or shape to be used, and shall be accomplished so that the material and workmanship represents in all respects the material to be furnished under this contract. The balance of the material to be used under this contract shall not be produced until after JEA has reviewed the qualification samples. The samples shall be delivered to a location on site indicated by JEA.

B. Joint Sealant: Prior to ordering the sealant material, the CONTRACTOR shall submit to JEA for JEA's review, sufficient data to show general compliance with the requirements of the Contract Documents.

C. CONTRACTOR shall submit product data sheets of all materials proposed under this section.

D. Shipping Certification: The CONTRACTOR shall provide written certification from the manufacturer as an integral part of the shipping form, to show that all of the material shipped to this project meets or exceeds the physical property requirements of the Contract Documents. CONTRACTOR certificates are not acceptable.

E. The CONTRACTOR shall submit placement Shop Drawings showing the location and type of all joints for each structure.

F. The Contractor shall submit details of proposed joints in each structure.

G. For sawcut contraction joints submit documentation indicating the following:

a. Proposed method of sawcutting indicating early entry or conventional sawing.

b. Description of how work is to be performed including equipment to be utilized, and curing methods.

c. Description of alternate method in case of time constraint issues or failure of equipment.

1.06 QUALITY ASSURANCE

A. Waterstop

1. Review: It is required that all waterstop field joints shall be subject to review inspection, and no such work shall be scheduled or started without having made prior arrangements with the Engineer to provide for the required reviews. Not

less than 24 hours' notice shall be provided to the Engineer for scheduling such reviews.

2. All field joints in waterstops will be subject to rigid review for misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects which would reduce the potential resistance of the material to water pressure at any point. All defective joints shall be replaced with material which will pass said review, and all faulty material shall be removed from the site and disposed of by the CONTRACTOR at its own expense.

3. The following defects represent a partial list of defects which shall be grounds for rejection:

   a. Offsets at joints greater than 1/16 inch or 15 percent material thickness, at any point, whichever is less.

   b. Exterior crack at joint, due to incomplete bond, deeper than 1/16 inch or 15 percent of material thickness, at any point, whichever is less.

   c. Any combination of offset or exterior crack which will result in a net reduction in the cross section of the waterstop in excess of 1/16 inch or 15 percent of material thickness at any point, whichever is less.

   d. Misalignment of joint which result in misalignment of the waterstop in excess of 1/2 inch in 10 feet.

   e. Porosity in the welded joint as evidenced by visual inspection.

   f. Bubbles or inadequate bonding which can be detected with pen-knife test. (If, while prodding the entire joint with the point of a pen knife, the knife breaks through the outer portion of the weld into a bubble, the joint shall be considered defective.)

1.07 GUARANTEE

A. The CONTRACTOR shall provide a two-year written guarantee of the entire sealant installation against faulty and/or incompatible materials and workmanship, together with a statement that it agrees to repair or replace, to the satisfaction of JEA, at no additional cost to JEA, any such defective areas which become evident within said two-year guarantee period.

PART 2 -- PRODUCTS

2.01 PVC WATERSTOPS

A. General: Waterstops shall be extruded from an elastomeric polyvinylchloride compound containing the plasticizers, resins, stabilizers, and other materials necessary to meet the requirements of these Specifications. No reclaimed or scrap material shall be used. The CONTRACTOR shall obtain from the waterstop manufacturer and shall furnish to the Engineer for review, current test reports and a written certification of the

manufacturer that the material to be shipped to the job meets the physical requirements as outlined in the U.S. Army Corps of Engineers Specification CRD-C572 and listed in Paragraph C. below.

B. Multi-Rib Waterstops: All PVC waterstops shall be of Multi-rib construction of the following types:

1. Expansion Joints and Control Joints: Waterstops for expansion joints shall be ribbed with a center bulb. They shall be 9-inches wide with a minimum thickness at any point of 3/8 inches. Waterstops for expansion joints and control joints shall be Style 738 by Greenstreak or equal.

2. All other Construction Joints: Waterstops for all other construction joints shall be flat ribbed, 6 inches wide with a minimum thickness at any point of 3/8 inches. Waterstops for all construction joints shall be serrated style 732 by Greenstreak or equal.

3. Install Waterstops as shown as manufactured structures .

4. T-type Waterstops installed against existing concrete shall be Style 609 by Greenstreak, or equal. Compatible batten bars and anchor bolts shall be supplied by the same manufacturer .

5. Provide factory made waterstop fabrications for all changes of direction, intersections, and transitions leaving only straight butt joint splices for the field .

6. Provide hog rings or grommets spaced at 12 inches on center along length of waterstop.

7. Prefabricated joint fittings (90 degree bends and tees) shall be used at all intersections of the ribbed-type waterstop.

C. Waterstop Testing Requirements: When tested in accordance with the specified test standards, the waterstop material shall meet or exceed the following requirements:

	Value	**ASTM Std.**
Tensile Strength-min (psi)	1750	D 638, Type IV
Ultimate Elongation-min (percent)	350	D 638, Type IV
Low Temp. Brittleness-Max (degrees F)	-35	D 746
Stiffness in Flexure-min (psi)	400	D 747
Accelerated Extraction (CRD-C572)		
Tensile Strength-min (psi)	1500	D 638, Type IV
Ultimate Elongation-min (percent)	300	D 638, Type IV
Effect of Alkalies (CRD-C572)		

Ultimate Elongation-min (percent)	300	D 638, Type IV
Change in Weight (percent)	+0.25/-0.10	----
Change in Durometer, Shore A	+5	D 2240
Finish Waterstop		
Tensile Strength-min (psi)	1400	D 638, Type IV
Ultimate Elongation-min (percent)	280	D 638, Type IV

2.02 CHEMICAL RESISTANT WATERSTOPS

A. General: Waterstops shall be manufactured from thermoplastic elastomeric rubber material. The synthetic rubber shall be provide a high resistance to acids, bases, alcohols, oils, solvents or chemicals. No reclaimed material shall be used. The CONTRACTOR shall obtain from the waterstop manufacturer and furnish to the ENGINEER for review, current test reports and a written certification of the manufacturer that the material to be shipped to the job meets the physical requirements outlined herein. Waterstop connections shall be heat welded. All waterstop corners, intersections, and directional changes shall be miter cut, heat welded, factory fabricated. Only straight butt splices shall be allowed in the field.

B. Multi-Rib Waterstops: All chemical resistant waterstops shall be of multi-rib construction. Waterstops for expansion joints shall be 9”x3/16” ribbed with a center bulb. Waterstops for construction joints shall be 6”x3/16” ribbed with a center bulb. Chemical resistant waterstops shall be Westec Type TPE-R synthetic rubber, manufactured by Westec Barrier Technologies, St. Louis, MO, or equal.

C. Waterstop Physical Properties: When tested in accordance with the specified test standards, the waterstop material shall meet or exceed the following requirements:

Physical Property	Value	ASTM Std.
Tensile Strength	1800 psi	D-412
Ultimate Elongation	450%	D-412
100% Modulus	1000 psi	D-412
Shore A Hardness	85 units $\pm$ 5 units	D-2240
Brittle Point	-70^{o}F	D-746
Ozone Resistance	450 pphm passed	D-1171

D. Weathering Performance: When tested in accordance with the specified test standards, the waterstop material shall meet or exceed the following requirements:

Physical Property	Value	ASTM Std.
Tensile Strength (% Retention)	87%	D-412

Ultimate Elongation (% Retention)	84%	D-412
Shore A Hardness (units change)	7 units	D-2240

E. Chemical Resistance Properties: When tested in accordance with ASTM D-471 after 166 hours of full immersion at 73.4°F (23°C), the waterstop material shall meet or exceed the following requirements:

Fluid	Physical Property	Value
Sulfuric Acid 98%	Ultimate Elongation	77% Retention
	Ultimate Tensile	82% Retention
	100% Modulus	108% Retention
	Hardness Change Shore A	-1 Unit
	Weight Change	2.1%

Fluid	Physical Property	Value
Sodium Hydroxide 50%	Ultimate Elongation	101% Retention
	Ultimate Tensile	107% Retention
	100% Modulus	104% Retention
	Hardness Change Shore A	-4 Unit
	Weight Change	-0.1%

2.03 HYDROPHILIC WATERSTOPS (Expanding Rubber Waterstop)

A. Hydrophilic waterstops shall be designed to expand and seal under hydrostatic conditions. At construction joints, the waterstops shall be Adeka Ultraseal MC 2010 M for wall/slab thickness greater than 9 inches, and Adeka Ultraseal KBA-1510FF for wall/slab thickness less than 9 inches or equal. At expansion joints, the waterstops shall be Adeka Ultraseal KM-3030M or equal.

B. Plate fabrications used to plug flow channels for future expansion or otherwise to close wall openings shall be caulked using hydrophilic waterstops designed for the application. Caulking agents shall be Adeka Ultraseal P201 or equal.

2.04 JOINT SEALANT

A. Joint sealant shall comply with Section 07920 entitled “Sealants and Caulking”.

2.05 EXPANSION JOINT MATERIAL

A. Preformed expansion joint material shall be non-extruding, and shall be one of the following types:
   1. Type I – Sponge rubber, conforming to ASTM D1752, Type I

   2. Type II – Cork, conforming to ASTM D1752, Type II

   3. Type III – Self-expanding cork, conforming to ASTM D1752, Type III

   4. Type IV – Bituminous fiber, conforming to ASTM Designation D1752

2.06 BACKER ROD

A. Backer rod shall comply with Section 07920 entitled “Sealants and Caulking”.

2.07 BOND BREAKER

A. Bond breaker shall be Super Bond Breaker as manufactured by Burke Company, San Mateo, California; Hunt Process 225-TU as manufactured by Hunt Process Co., Santa Fe Springs, CA; Select Cure CRB as manufactured by Select Products Co., Upland, CA; or equal. It shall contain a fugitive dye so that areas of application will be readily distinguishable.

2.08 CONTRACTION JOINT INSERTS

A. Contraction joint inserts shall be Transverse-Control Joints by Greenstreak Plastic Products or equal.

PART 3 -- EXECUTION

3.01 GENERAL

A. Unless otherwise shown on the Drawings, waterstops of the type specified herein shall be embedded in the concrete across joints as shown. All waterstops shall be fully continuous for the extent of the joint. Splices necessary to provide such continuity shall be accomplished in conformance to printed instructions of manufacturer of the waterstops. The CONTRACTOR shall take suitable precautions and means to support and protect the waterstops during the progress of the Work and shall repair or replace at its own expense any waterstops damaged during the progress of the Work. All waterstops shall be stored so as to permit free circulation of air around the waterstop material.

B. When any waterstop is installed in the concrete on 1 side of a joint, while the other half or portion of the waterstop remains exposed to the atmosphere for more than 14 days, suitable precautions shall be taken to shade and protect the exposed waterstop from direct rays of the sun during the entire exposure and until the exposed portion of the waterstop is embedded in concrete.

3.02 CONSTRUCTION JOINTS

A. Construction joints shall be as shown on the Drawings. Otherwise, Contractor shall submit description of the joint and its location to Engineer for approval.

B. Unless noted otherwise on the Drawings, construction joints shall be located near the middle of the spans of slabs, beams, and girders unless a beam intersects a girder at this point. In this case, the joints in the girders shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, or girders and the top of footings or floor slabs unless noted otherwise on Drawings. Beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as slabs. Joints shall be perpendicular to the main reinforcement.

C. Maximum distance between horizontal joints in slabs and vertical joints in walls shall be 45'-0". For exposed walls with fluid or earth on the opposite side, the spacing between vertical and horizontal joints shall be a maximum of 25’-0”.

D. All corners shall be part of a continuous placement, and should a construction joint be required, the joint shall not be located closer than five feet from a corner.

E. All reinforcing steel and welded wire fabric shall be continued across construction joints. Keys and inclined dowels shall be provided as shown on the Drawings or as directed by the Engineer. Longitudinal keys shall be provided in all joints in walls and between walls and slabs or footings, except as specifically noted otherwise on the Drawings. Size of keys shall be as shown on the Drawings.

F. All joints in water bearing structures shall have a waterstop. All joints below grade in walls or slabs which enclose an accessible area shall have a waterstop.

3.03 EXPANSION JOINTS

A. Size and location of expansion joints shall be as shown on the Drawings.

B. All expansion joints in water-bearing structures shall have a center-bulb type waterstop. All expansion joints below grade in walls or slabs which enclose an accessible area shall have a center-bulb type waterstop.

3.04 CONTRACTION JOINTS

A. Location of contraction joints shall be as shown on the Drawings

B. Contraction joints shall be formed either by sawcutting or with contraction joint inserts as specified in paragraph 2.08, A. Sawcutting of joints will not be permitted unless specifically approved by the Engineer.

C. If approved by the Engineer, sawcutting of contraction joints in lieu of forming shall conform to the following requirements:

1. Joints shall be sawed as soon as the concrete can support foot traffic without leaving any impression, normally the same day as concrete is placed and in no case longer than 24 hours after concrete is placed.

2. Curing shall be performed using wet curing methods as indicated in Section 03370 – Concrete Curing. Curing mats, fabrics or sheeting materials shall remain in place to the extent possible while cutting of joint is being performed. Curing materials shall only be removed as required and shall be immediately reinstalled once cutting of the joint has been completed.

3. Depth of joint shall be as shown on the drawings or noted in these specifications. At locations where the joint cannot be installed to full depth due to curbs or other stopping points hand tools shall be used to complete joints.

4. Saw cut joints shall meet the requirements of ACI 224.3, Section 2.8, Jointing Practice.

3.05 SPLICES IN PVC WATERSTOPS

A. Splices in waterstops shall be performed by heat sealing the adjacent waterstop sections in accordance with the manufacturer's printed recommendations. It is essential that:

1. The material not be damaged by heat sealing.

2. The splices have a tensile strength of not less than 60 percent of the unspliced materials tensile strength.

3. The continuity of the waterstop ribs and of its tubular center axis be maintained.

B. Butt joints of the ends of 2 identical waterstop sections may be made while the material is in the forms.

C. All joints in waterstop involving more than 2 ends to be joined together, and all joints which involve an angle cut, alignment change, or the joining of 2 dissimilar waterstop sections shall be factory fabricated with not less than 24-inch long strips of material beyond the joint. Upon being inspected and accepted, such prefabricated waterstop joint assemblies shall be installed in the forms and the ends of the 24-inch strips shall be butt welded to the straight run portions of waterstop in place in the forms.

3.04 JOINT CONSTRUCTION

A. Setting PVC Waterstops: In order to eliminate faulty installation that may result in joint leakage, particular care shall be taken of the correct positioning of the waterstops during installation. Adequate provisions must be made to support the waterstops during the progress of the Work and to insure the proper imbedment in the concrete. The symmetrical halves of the waterstops shall be equally divided between the concrete pours at the joints. The center axis of the waterstops shall be coincident with the joint openings. Maximum density and imperviousness of the concrete shall be insured by thoroughly working it in the vicinity of all joints.

B. In placing PVC waterstops in the forms, means shall be provided to prevent them from being folded over by the concrete as it is placed. Unless otherwise shown, all waterstops shall be held in place with light wire ties on 12-inch centers which shall be

passed through the edge of the waterstop and tied to the curtain of reinforcing steel. Horizontal waterstops, with their flat face in a vertical plane, shall be held in place with continuous supports to which the top edge of the waterstop shall be tacked. In placing concrete around horizontal waterstops, with their flat face in a horizontal plane, concrete shall be worked under the waterstops by hand so as to avoid the formation of air and rock pockets.

C. Joint Location: Construction joints, and other types of joints, shall be provided where shown on the Drawings. When not shown on the Drawings, maximum distance between horizontal joints in slabs and vertical joints in walls shall be 45-feet, and maximum distance between vertical and horizontal joints for earth or water retaining walls shall be 25-feet, unless noted otherwise. The location of all joints, of any type, shall be submitted for review by the Engineer.

D. Joint Preparation: Special care shall be used in preparing concrete surfaces at joints where bonding between two sections of concrete is required. Unless otherwise shown on the Drawings, such bonding will be required at all horizontal joints in walls. Surfaces shall be prepared in accordance with the requirements of Section 03300 entitled "Cast-in-Place Concrete."

E. Adequate means shall be provided for anchoring the waterstop in concrete. Waterstops shall be positioned so that they are equally embedded in the concrete on each side of the joint.

F. Sealant application shall be in accordance with the manufacturer's printed instructions. The surfaces of the groove for the sealant shall not be coated. Concrete next to waterstops shall be placed in accordance with the requirements of Section entitled, "Cast-in-Place Concrete."

G. The primer and sealant shall be placed strictly in accordance with the printed recommendations of the manufacturer, taking special care to properly mix the sealant prior to application. All sealant shall cure at least 7 days before the structure is filled with water.

H. All sealant shall be installed by a competent waterproofing specialty CONTRACTOR who has a successful record of performance in similar installations. Before work is commenced, the crew doing the Work shall be instructed as to the proper method of application by a representative of the sealant manufacturer.

I. Thorough, uniform mixing of 2-part, catalyst-cured materials is essential; special care shall be taken to properly mix the sealer before its application. Before any sealer is placed, the CONTRACTOR shall arrange to have the crew doing the Work carefully instructed as to the proper method of mixing and application by a representative of the sealant manufacturer.

J. Any joint sealant which, after the manufacturer's recommended curing time for the job conditions of the Work hereunder, fails to fully and properly cure shall be completely removed; the groove shall be thoroughly sandblasted to remove all traces of the uncured or partially cured sealant and primer, and shall be re-sealed with the specified

joint sealant. All costs of such removal, joint treatment, re-sealing, and appurtenant work shall be at the expense of the CONTRACTOR.

3.07 INSTALLATION OF EXPANSION JOINT MATERIAL AND SEALANTS

A. Type I, II, or III shall be used in all expansion joints in structures and concrete pavements unless specifically shown otherwise on the Drawings. Type IV shall be used in sidewalk and curbing and other locations specifically shown on the Drawings.

B. All expansion joints exposed in the finish work, exterior and interior, shall be sealed with the specified joint sealant. Expansion joint material and sealants shall be installed in accordance with manufacturer's recommended procedures and as shown on the Drawings.

C. Expansion joint material that will be exposed after removal of forms shall be cut and trimmed to ensure a neat appearance and shall completely fill the joint except for the space required for the sealant. The material shall be held securely in place and no concrete shall be allowed to enter the joint or the space for the sealant and destroy the proper functions of the joint.

D. A bond breaker shall be used between expansion joint material and sealant. The joint shall be thoroughly clean and free from dirt and debris before the primer and the sealant are applied. Where the finished joint will be visible, masking of the adjoining surfaces shall be carried out to avoid their discoloration. The sealant shall be neatly tooled into place and its finished surfaces shall present a clean and even appearance.

E. Type 1 joint sealant shall be used in all expansion and contraction joints in concrete, except where Type 7 or Type 8 is required as stated below, and wherever else specified or shown on the Drawings. It shall be furnished in pour grade or gun grade depending on installation requirements. Primers shall be used as required by the manufacturer. The sealant shall be furnished in colors as directed by the Engineer.

F. Type 8 joint sealant shall be used in all concrete pavements and floors subject to heavy traffic and wherever else specified or shown on the Drawings.

G. Type 7 joint sealant shall be used for all joints in chlorine contact tanks and wherever specified or shown on the Drawings.

- END OF SECTION -

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish all materials for concrete in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished concrete, all in accordance with the requirements of the Contract Documents.

B. The requirements in this section shall apply to the following types of concrete:

1. Class A1 Concrete: Normal weight structural concrete to be used in all structures qualifying as environmental concrete structures that are designed in accordance with ACI 350 including pump stations, tanks, basins, process structures, and any structures containing fluids or process chemicals or other materials used in treatment process.

2. Class A2 Concrete: Normal weight structural concrete in all structures other than structures qualifying as environmental concrete structures as described above, and for all sidewalks and pavement.

3. Class A3 Concrete: Normal weight structural concrete to be used for interior slabs where a Type ”D” Steel Troweled Finish or Type “G” Hardened Finish is required. Class A3 concrete shall not contain entrained air.

4. Class A4 Concrete: Normal weight structural concrete to be used where specifically called for on Contract Drawings or areas where specifically requested by Contractor and approved by Engineer. Class A4 concrete is identical to Class A2 concrete except that coarse aggregate specified in Article 2.05 below shall be Size #89 (pea-rock) in accordance with ASTM C33.

5. Class B Concrete: Normal weight structural concrete used for duct bank encasements, catch basins, fence and guard post embedment, concrete fill, and other areas where specifically noted on Contract Drawings

6. Flowable Fill: Lean concrete proportioned without the use of coarse aggregate primarily for use as pipe backfill. Flowable fill shall be utilized only at locations indicated on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 - Submittals

B. Section 01400 - Quality Control

C. Section 03100 - Concrete Formwork

D. Section 03200 - Concrete Reinforcement

E. Section 03290 – Joints in Concrete

F. Section 03350 – Concrete Finishes

G. Section 03370 – Concrete Curing

H. Section 03400 - Precast Concrete, General

I. Section 03315 - Grout

J. Section 05500 - Metal Fabrications

K. Section 07190 - Vapor Barrier

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all work specified herein shall conform to or exceed the requirements of the Florida Building Code (FBC) and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of this Section.

B. Codes and Standards

1. The Building Code, as referenced herein, shall be the Florida Building Code.

C. Federal Specifications

1. UU-B-790A (Int.Amd. 1) Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellant and Fire Resistant).

D. Commercial Standards

1.	ACI 214	Recommended Practice for Evaluation of Strength Test Results of Concrete.
2.	ACI 301	Specifications for Structural Concrete for Buildings.
3.	ACI 304	Guide for Measuring, Mixing, Trasnporting, and Placing Concrete
4.	ACI 305	Hot Weather Concreting.
5.	ACI 306	Cold Weather Concreting.
6.	ACI 309	Recommended Practice for Consolidation of Concrete
7.	ACI 315	Details and Detailing of Concrete Reinforcement.

8.	ACI 318	Building Code Requirements for Reinforced Concrete.
9.	ACI 347	Recommended Practice for Concrete Formwork.
10.	ACI 350	Environmental Engineering Concrete Structures.
11.	ASTM C 31	Methods of Making and Curing Concrete Test Specimens in the Field.
12.	ASTM C 33	Specification for Concrete Aggregates.
13.	ASTM C 39	Test Method for Compressive Strength of Cylindrical Concrete Specimens.
14.	ASTM C42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
15.	ASTM C 88	Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate.
16.	ASTM C 94	Specification for Ready-Mixed Concrete.
17.	ASTM C 114	Method for Chemical Analysis of Hydraulic Cement.
18.	ASTM C 136	Method for Sieve Analysis of Fine and Coarse Aggregate.
19.	ASTM C 138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
20.	ASTM C 143	Test Method for Slump of Portland Cement Concrete.
21.	ASTM C 150	Specification for Portland Cement.
22.	ASTM C 156	Test Method for Water Retention by concrete Curing Materials.
23.	ASTM C 157	Test Method for length Change of Hardened Cement Mortar and Concrete.
24.	ASTM C 172	Standard Practice for Sampling Freshly Mixed Concrete
25.	ASTM C 192	Method of Making and Curing concrete Test Specimens in the Laboratory.
26.	ASTM C 227	Standard Test Method for Potential Alkali Reactivity of Cement Aggregate Combinations (Mortar-Bar Method).
27.	ASTM C 231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
28.	ASTM C 260	Specification for Air-Entraining Admixtures for Concrete.
29.	ASTM C 289	Standard Test Method for Potential Reactivity of Aggregates (Chemical Method).

30.	ASTM C 295	Standard Guide for Petrographic Examination of Aggregates for Concrete
31.	ASTM C 457	Standard Test Method for Microscopical Determination of the Air-Void System in Hardened Concrete
32.	ASTM C 494	Specification for Chemical Admixtures For Concrete.
33.	ASTM C 586	Standard Test Method for Potential Alkali Reactivity of Carbonate Rocks for Concrete Aggregates (Rock Cylinder Method).
34.	ASTM C 595	Standard Specification for Blended Hydraulic Cements
35.	ASTM C 618	Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
36.	ASTM C 989	Standard Specification for Slag Cement for Use in Concrete and Mortars.
37.	ASTM C 1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
38.	ASTM C 1260	Test Method for Potential Alkali Reactivity of Aggregates (Mortar Bar Method).
39.	ASTM C 1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
40.	ASTM C 1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
41.	ASTM C 1778	Reducing the Risk of Deleterious Alkali – Aggregate Reaction in Concrete.
42.	ASTM D 1751	Specification for preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
43.	ASTM D 6103	Standard Test Method for Flow Consistency of Controlled Low Strength Material
44.	ASTM E11	Specification for Wire-Cloth Sieves for Testing Purposes.
45.	ASTM E 119	Method for Fire Tests of Building Construction and Materials.

E. Any procedure, materials or operation specified by reference to the American Society for Testing and Materials (ASTM), the American Concrete Institute (ACI), Building Code or other references shall comply with the requirements of the current and most recent specifications or standards. In conflicts between listed standards and this specification,

the more stringent requirements shall govern.

F. The Contractor is expected to obtain the most recent issue of all standards, recommendations, codes or specifications referred to within this specification.

1.04 SUBMITTALS

A. The design mixes to be used shall be prepared by qualified persons and submitted for review. The design of the mix is the responsibility of the Contractor subject to the limitations of the specifications. Review processing of this submission will be required only as evidence the mix has been designed by qualified persons and that the minimum requirements of the specifications have been met. Such review will in no way alter the responsibility of the Contractor to furnish concrete meeting the requirements of the specifications. If in the progress of the work the sources of materials change in characteristics or the Contractor requests a new source in writing, the Contractor shall, at his expense submit new test data and information for the establishment of a new design mix. Submit mix designs for all classes of concrete to be used under this Contract. Mix design submittals shall include the following:

1. Sources of all materials and certifications of compliance with specifications for all sources of each material.

2. Certified current (less than one year old) chemical analysis of Portland Cement or Blended Cement to be used.

3. Certified current (less than one year old) chemical analysis of fly ash to be used.

4. Aggregate test results showing compliance with required standards, i.e. sieve analysis, aggregate soundness tests, etc.

5. Manufacturer's data on all admixtures stating compliance with required standards and are compatible with one another. Written conformance to the above mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to Mix design review by the Engineer.

6. Concrete mix design for each class of concrete specified herein. The design mixes to be used shall be prepared by qualified persons. The design of the mix is the responsibility of the Contractor subject to the limitations of the specifications. Review processing of this submission will be required only as evidence the mix has been designed by qualified persons and that the minimum requirements of the specifications have been met. Such review will in no way alter the responsibility of the Contractor to furnish concrete meeting the requirements of the specifications. If in the progress of the work the sources of materials change in characteristics or the Contractor requests a new source in writing, the Contractor shall, at his expense submit new test data and information for the establishment of a new design mix

7. Field experience records and/or trial mix data for the proposed concrete mixes.

B. Where ready-mix concrete is used, the Contractor shall provide delivery tickets at the time of delivery of each load of concrete. In addition to the information required by

ASTM C94, each ticket shall show the mix number, cement content, water/cementitious ratio, and amount of water allowed to be added to truck without exceeding required water/cementitious ratio.

C. A schedule of all concrete placement with volume of concrete planned to be placed each day.

D. A layout of all structures with all planned construction joint locations.

1.05 QUALITY ASSURANCE

A. Plant equipment and facilities shall meet all requirements of the Check List for Certification of Ready Mixed Concrete Production facilities of the National Ready Mixed Concrete Association and ASTM C 94.

B. Tests for compressive strength and slump of concrete will be performed as specified herein. Test for determining slump will be in accordance with the requirements of ASTM C 143.

C. The cost of initial trial mixes and initial laboratory tests to design the mixes including compression tests, sieve analysis, and tests on trial mixes shall be included in the Contract Price.

D. The cost of all tests during construction will be borne by the CONTRACTOR, including the cost of any additional tests and investigation on work performed which does not meet the Specifications. All test results shall be sent directly to the Engineer. The CONTRACTOR shall be responsible for coordination of all tests with the testing laboratory.

E. Concrete for testing shall be supplied by the CONTRACTOR at no cost to JEA, and the CONTRACTOR shall provide assistance to the Engineer in obtaining samples. The CONTRACTOR shall dispose of and clean up all excess material.

F. Construction Tolerances

1. The CONTRACTOR shall set and maintain concrete forms and perform finishing operations so as to ensure that the completed work is within the tolerances specified herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the specified permissible variation from lines, grades, or dimensions shown. Where tolerances are not stated in the Specifications, permissible deviations will be in accordance with ACI 347 and Section 03100 entitled "Concrete Formwork".

1.06 QUALITY CONTROL

A. Compressive Strength

1. Compression test specimens shall be taken during construction from the first placement of each class of concrete specified herein and at intervals thereafter as selected by the Engineer to insure continued compliance with these Specifications. At least one set of test specimens shall be made for each

placement. Additionally, test specimens shall be made for each fifty (50) cubic yards of concrete placed, or for each 5000 square feet of surface area for slabs or walls, whichever is greater.

2. Samples of freshly mixed concrete shall be obtained in accordance with ASTM C 172, and compression test specimens for concrete shall be made in accordance with ASTM C 31. Specimens shall consist of at least five 6-inch diameter by 12-inch high cylinders, or eight 4-inch diameter by 8-inch high cylinders. Each cylinder shall be identified by a tag attached to the side of the cylinder.

3. The Contractor shall provide approved curing boxes for storage of cylinders on site. The insulated curing box shall be of sufficient size and strength to contain all the specimens made in any four consecutive working days and to protect the specimens from falling over, being jarred or otherwise disturbed during the period of initial curing. The box shall be erected, furnished and maintained by the Contractor. Such box shall be equipped to provide the moisture and to regulate the temperature necessary to maintain the proper curing conditions required by ASTM C31. Such box shall be located in an area free from vibration such as pile driving and traffic of all kinds. No concrete requiring inspection shall be delivered to the site until such storage curing box has been provided. Specimens shall remain undisturbed in the curing box until ready for delivery to the testing laboratory but not less than sixteen hours

4. Compression test shall be performed in accordance with ASTM C 39. For 6x12 cylinders, two test cylinders will be tested at 7 days and 2 at 28 days. For 4x8 cylinders, three test cylinders will be tested at 7 days and three at 28 days. The remaining cylinders will be held to verify test results, if needed.

B. Consistency

1. Consistency of the concrete will be checked by the Engineer by standard slump cone tests. The Contractor shall make any necessary adjustments in the mix as the Engineer may direct and shall upon written order suspend all placing operations in the event the consistency does not meet the intent of the specifications. No payment shall be made for delays, material or labor costs due to such eventualities.

2. Slump tests shall be made in accordance with ASTM C 143. Slump tests shall be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.

C. Air Content

1. Samples of freshly mixed concrete will be tested for entrained air content by the Engineer in accordance with ASTM C 231.

2. Air content tests will be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.

D. Evaluation and Acceptance of Concrete

1. Evaluation and acceptance of the compressive strength of concrete shall be

according to the requirements of ACI 215 and ACI 318, Chapter 5 "Concrete Quality Mixing and Placing", and as specified herein.

2. If any concrete fails to meet these requirements, immediate corrective action shall be taken to increase the compressive strength for all subsequent batches of the type of concrete affected.

3. All concrete which fails to meet the ACI requirements and these specifications, is subject to removal and replacement at the cost of the Contractor. Additional testing may also be required to verify compressive strength of concrete. Additional testing shall involve extraction and testing of concrete cores in accordance with ASTM C 42. Engineer shall determine locations where concrete cores shall be taken. Nondestructive test methods shall not be used to verify strength of in-place concrete.

1.07 PRE-CONCRETE CONFERENCE

A. At least 35 days prior to start of the Concrete construction schedule, the Contractor shall conduct a meeting to review the proposed mix designs and to discuss the required methods and procedures to achieve the required concrete construction. The Contractor shall send a pre-concrete conference agenda to all attendees 20 days prior to the scheduled date of the conference.

B. As a minimum the agenda shall include:

1. Concrete Materials and Mix Designs

2. Inspection Responsibilities

3. Concrete Sampling and Testing Specification Requirements

4. Cylinder Storage and Transportation

5. Acceptance/Rejection Responsibility and Authority for Fresh Concrete

6. Concrete finishing

7. Concrete Curing

8. Test Report Distribution

9. Miscellaneous Items

C. The Contractor shall require responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to the following:

1. Contractor’s superintendent

2. For the concrete design mix – Laboratory retained for trial batching and tests

3. For field quality control – Concrete subcontractor, Concrete producer, Admixture Manufacturer(s), Concrete pumping contractor

D. Minutes of the meeting shall be recorded, typed and printed by the Contractor and distributed by him to all parties concerned within five days of the meeting. One copy of the minutes shall also be transmitted to the Engineer.

E. The minutes shall include a statement by the admixture manufacturer(s) indicating that the proposed mix design and placing techniques can produce the concrete quality required by these Specifications.

F. The Engineer will be present at the conference. The Contractor shall notify the Engineer at least 20 days prior to the scheduled date of the conference.

PART 2 --PRODUCTS

2.01 HYDRAULIC CEMENT

A. Portland Cement

1. Portland Cement shall be Type II conforming to ASTM C 150.

2. The total alkalies in the cement (calculated as the percentage of NA2O plus 0.658 times the percentage of K20) shall not exceed 0.60%.

3. The proposed Portland Cement shall not contain more the 8% tricalcium aluminate and more than 12% tetracalcium aluminoferrite.

B. Blended Cement

1. Blended cements shall be Type IP (Portland Fly Ash Cement) or Type IS (Portland Slag Cement) conforming to ASTM C 595.

2. Type IP cement shall be an interground blend of Portland Cement and fly ash in which the fly ash constituent is between 15% and 25% of the weight of the total blend.

3. Type IS cement shall be an interground blend of Portland Cement and slag cement in which the slag constituent is between 35% and 50% of the weight of the total blend.

4. Fly ash and slag cement used in the production of blended cements shall meet the requirements of Articles 2.02 and 2.03, respectively.

5. The total alkalies in the cement (calculated as the percentage of NA2O plus 0.658 times the percentage of K20) shall not exceed 0.60%.

C. Different types of cement shall not be mixed nor shall they be used alternately except when authorized in writing by the Engineer. Different brands of cement or the same brand from different mills may be used alternately. A resubmittal will be required if different cements are proposed during the Project.

D. Cement shall be stored in a suitable weather-tight building so as to prevent deterioration or contamination. Cement which has become caked, partially hydrated, or otherwise damaged will be rejected.

2.02 FLY ASH

A. Fly ash shall meet the requirements of ASTM C 618 for Class F, except that the loss on ignition shall not exceed 4%. Fly ash shall also meet the optional physical requirements for uniformity as shown in Table 3 of ASTM C 618.

B. For fly ash to be used in the production of type IP cement, the Pozzolan Activity Index shall be greater than 75% as specified in Table 3 of ASTM C 595.

C. When fly ash is used, the fly ash constituent shall be maximum 15% of the total weight of the combined Portland cement and fly ash.

D. For Type A1 concrete as required for use in environmental concrete structures, i.e. process structures or fluid containing structures, inclusion of fly ash or slag cement in the concrete mix, is mandatory.

E. Additional fly ash shall not be included in concrete mixed with Type IS or IP cement.

2.03 SLAG CEMENT

A. Slag cement shall meet the requirements of ASTM C 989 including tests for effectiveness of slag in preventing excessive expansion due to alkali-aggregate reactivity as described in Appendix X-3 of ASTM C 989.

B. When slag cement is used, the slag cement constituent shall be between 35% and 40% of the total weight of the combined Portland Cement and slag.

C. For Type A1 concrete as required for use in environmental concrete structures, i.e. process structures or fluid containing structures, inclusion of fly ash or slag cement in the concrete mix, is mandatory.

D. Additional slag cement shall not be included in concrete mixed with type IS or IP cement.

2.04 WATER

A. Water used for mixing concrete shall be clear, potable and free from deleterious substances such as objectionable quantities of silty organic matter, alkali, salts and other impurities.

B. Water shall not contain more than 100 PPM chloride.

C. Water shall not contain more than 500 PPM dissolved solids.

D. Water shall have a pH in the range of 4.5 to 8.5.

E. Water shall meet requirements of ASTM C 1602.

2.05 AGGREGATES

A. Aggregates shall be obtained from pits acceptable to the Engineer, shall be non-reactive, and shall conform to the FBC and ASTM C 33. Maximum size of coarse aggregate shall be as specified in Article 2.08, Paragraph B of this Section. Lightweight sand for fine aggregate will not be permitted.

1. Coarse aggregates shall consist of clean, hard, durable gravel, crushed gravel, crushed rock or a combination thereof. The coarse aggregates shall be prepared and handled in two or more size groups for combined aggregates with a maximum size not greater than 1 inch. When the aggregates are proportioned for each batch of concrete the two size groups shall be combined.

2. Fine aggregates shall be manufactured sand that is hard and durable.

3. Combined aggregates shall be well graded from coarse to fine sizes, and shall be uniformly graded between screen sizes to produce a concrete that has optimum workability and consolidation characteristics. Where a trial batch is required for a mix design, the final combined aggregate gradations will be established during the trial batch process.

4. When tested in accordance with "Potential Reactivity of Aggregates (Chemical Method)" (ASTM C 289), the ratio of silica released to reduction in alkalinity shall not exceed 1.0.

e. When tested in accordance with "Organic Impurities in Sands for Concrete" (ASTM C 40), the fine aggregate shall produce a color in the supernatant liquid no darker than the reference standard color solution.

f. When tested in accordance with "Resistance to Abrasion of Small size Coarse Aggregate by Use of the Los Angeles Machine" (ASTM C 131), the coarse aggregate shall show a loss not exceeding 42 percent after 500 revolutions, or 10.5 percent after 100 revolutions.

g. When tested in accordance with "Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate" (ASTM C 88), the loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using sodium sulfate.

2.06 ADMIXTURES

A. Air-entraining agent meeting the requirements of ASTM C 260, shall be used. Sufficient air-entraining agent shall be used to provide a total air content of 3 to 5 percent. Air-entraining agent shall be Sika AER by Sika Corp., MB-VR by Master Builders, Darex AEA by Grace, AEA-92S by Euclid Chemical Company, or equal.

B. Admixtures shall be required at the Engineer's discretion or, if not required, may be added at the CONTRACTOR's option to control the set, effect water reduction, and increase workability. In either case, the addition of an admixture shall be at the CONTRACTOR's expense. The use of an admixture shall be subject to acceptance by the Engineer. Concrete containing an admixture shall be first placed at a location

determined by the Engineer. If the use of an admixture is producing an inferior end result, the CONTRACTOR shall discontinue use of the admixture. Admixtures specified herein shall conform to the requirements of ASTM C 494. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used. Admixtures shall contain no free chloride ions, be non-toxic after 30 days, and shall be compatible with and made by the same manufacturer as the air entraining admixture.

1. Water reducing admixture shall conform to ASTM C 494, Type A and shall contain no more than 0.05% chloride ions. Acceptable products are “Eucon Series” by the Euclid Chemical Company, “Pozzolith Series” by BASF, and “Plastocrete Series” by Sika Corporation.

2. High range water reducer shall be sulfonated polymer conforming to ASTM C 494, Type F or G. The use of high range water reducer is mandatory for Class A3 concrete. The high range water reducer shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day’s operation of the job site system. Concrete shall be mixed at mixing speed for a minimum of 100 mixer revolutions after the addition of the high range water reducer. Acceptable products are “Eucon 37” or Plastol 5000 by the Euclid Chemical Company, “Rheobuild 1000 or Glenium Series” by BASF, and “Daracem 100 or Advaflow Series” by W.R. Grace.

3. A non-chloride, non-corrosive accelerating admixture shall be used when air temperature at time of placement is expected to be consistently below 40 degrees Fahrenheit as specifically approved by the Engineer. The admixture shall conform to ASTM C 494, Type C or E, and shall not contain more chloride ions than are present in municipal drinking water.

   The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least a year’s duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures. Acceptable products are “Accelguard 80/90 or NCA” by the Euclid Chemical Company and “Daraset” by W.R. Grace.

4. A water reducing retarding admixture shall be used when air temperature at time of placement is expected to be consistently above 90 degrees Fahrenheit as specifically approved by the Engineer. The admixture shall conform to ASTM, Type D and shall not contain more than 0.05% chloride ions. Acceptable products are “Eucon NR or Eucon Retarder 100” by the Euclid Chemical Company, “Pozzolith 200N” by BASF, and “Plastiment” by Sika Corporation.

5. The CONTRACTOR shall submit certification from each admixture manufacturer that all admixtures utilized in the design mix are compatible with one another and properly proportioned.

6. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05 percent chloride ions are not permitted.

7. Certification: Written conformance to the above mentioned requirements and the chloride ion content of the admixture will be required from the admixture

manufacturer prior to Mix design review by the Engineer.

2.07 ACCESSORIES

A. Epoxy adhesives shall be the following products for the applications specified to be used in strict accordance with manufacturer's recommendations.

1. For bonding freshly-mixed, plastic concrete to hardened concrete, Sikadur 32 Hi-Mod, LPL Epoxy Adhesive, as manufactured by Sika Chemical Corporation; Concresive 1001-LPL, as manufactured by Adhesive Engineering Company; or equal.

2. For bonding hardened concrete or masonry to steel, Colma-Dur Gel, Sikadur Hi-Mod Gel, or equal.

2.08 CONCRETE MIX

A. Concrete shall be composed of cement, admixtures, aggregates and water. These materials shall be of the qualities specified. The exact proportions in which these materials are to be used for different parts of the work will be determined by the CONTRACTOR. In general, the mix shall be designed to produce a concrete capable of being deposited so as to obtain maximum density and minimum shrinkage and, where deposited in forms, to have good consolidation properties and maximum smoothness of surface. Mix designs with more than 41 percent of sand of the total weight of fine and coarse aggregate shall not be used for Class A Concrete. The aggregate gradations shall be formulated to provide fresh concrete that will not promote rock pockets around reinforcing steel or embedded items. The proportions shall be changed whenever necessary or desirable to meet the required results at no additional cost to JEA. All changes shall be subject to review by JEA.

B. The proportions of cement, aggregates, admixtures and water used in the concrete shall be based on tests of grading and moisture content of materials, slump of concrete mixture, strength of concrete and the following factors:

1. Class A1 Concrete: Normal weight structural concrete to be used in all structures qualifying as environmental concrete structures that are designed in accordance with ACI 350 including pump stations, tanks, basins, process structures, and any structures containing fluid or process chemicals or other materials used in treatment process

Minimum cementitious materials content, per cubic yard	611 lbs.
Water-cementitious materials ratio, by weight	Maximum 0.42 Minimum 0.39
Coarse Aggregate	#57 per ASTM C33

Compressive strength at 28 days – F'c	4,500 psi
Air Content	3% ± 1%

2. Class A2 Concrete: Normal weight structural concrete in all structures other than structures qualifying as environmental concrete structures as described above, and for all sidewalks and pavement.

Minimum cementitious materials content, per cubic yard	611 lbs.
Water-cementitious materials ratio, by weight	Maximum 0.45 Minimum 0.39
Coarse Aggregate	#57 per ASTM C33
Compressive strength at 28 days – F'c	4,000 psi
Air Content	3% ± 1%

3. Class A3 Concrete: Normal weight structural concrete to be used for interior slabs where a Type "D" Steel Troweled Finish or Type "G" Hardened Finish is required. Class A3 concrete shall not contain entrained air.

Minimum cementitious materials content, per cubic yard	611 lbs.
Water-cementitious materials ratio, by weight	Maximum 0.45 Minimum 0.39
Compressive strength at 28 days - F'c	4,000 psi
Coarse Aggregate	#57 per ASTM C33
Air Content	3% Max (non-air entrained)

4. Class A4 Concrete: Normal weight structural concrete to be used where specifically called for on Contract Drawings or areas where specifically requested by Contractor and approved by Engineer. Class A4 concrete is identical to Class A2 concrete except that coarse aggregate specified in Article 2.05 below shall be Size #89 (pea-rock) in accordance with ASTM C33.

Minimum cementitious materials content, per cubic yard	517 lbs.
Water-cementitious materials ratio, by weight	Maximum 0.45 Minimum 0.39

Compressive strength at 28 days - F'c	4,000 psi
Coarse Aggregate	Pearock
Air Content	3% ± 1%

5. Class B Concrete: Normal weight structural concrete used for duct bank encasements, catch basins, fence and guard post embedment, concrete fill, and other areas where specifically noted on Contract Drawings

Minimum cement content, per cubic yard	500 lbs.
Water-cementitious materials ratio, by weight	Maximum 0.50 Minimum 0.39
Compressive strength lbs. per sq. inch at 28 days - F'c	3,000

6. Flowable Fill (In lieu of pipe bedding, select backfill)

Minimum cementitious materials content, per cubic yard	100 lbs.
Water-cementitious materials ratio, by weight	Maximum 5.0
Flowability, minimum	8 inches
Compressive strength at 28 days - F'c	50-150 psi
Coarse aggregate	none
Fine aggregate	limestone screenings

7. Slump range:

   a. 4 inches nominal unless high range water reducing admixture is used

   b. 8 inches max if high range water reducing admixture is used

C. All Class A1concrete, unless noted otherwise on the Drawings, shall be air entrained concrete. A water reducing admixture may be added to the mix at the Contractor's option.

D. All Class A1 concrete used in walls shall contain a high range water reducer.

E. The mix proportions used shall be changed subject to the limitation specified herein, whenever such change is necessary or desirable to secure the required strength, density, workability, and surface finish and the Contractor shall be entitled to no additional compensation because of such changes.

2.05 CONSISTENCY

A. The quantity of water entering into a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete which can be worked properly into place without segregation, and which can be compacted by the vibratory methods herein specified to give the desired density, impermeability and smoothness of surface. The quantity of water shall be changed as necessary, with variations in the nature or moisture content of the aggregates, to maintain uniform production of a desired consistency. The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143.

2.06 READY-MIXED CONCRETE

A. Ready-mixed concrete shall be used meeting the requirements as to materials, batching, mixing, transporting, and placing as specified herein and in accordance with ASTM C 94.

B. Ready-mixed concrete shall be delivered to the site of the work, and discharge shall be completed within one and one-half hour after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever is first. Upon delivery from the truck concrete temperature shall not exceed 90 degrees Fahrenheit.

C. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type. The counters shall be actuated at the time of starting mixers at mixing speeds.

D. Each batch of concrete shall be mixed in a truck mixer for not less than 70 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolution of mixing.

PART 3 -- EXECUTION

3.01 PROPORTIONING AND MIXING

A. Proportioning of the concrete mix shall be based on the results of field experience or laboratory trial mixes in conformance with Section 5.3, “Proportioning on the Basis of Field Experience and/of Trial Mixtures” of ACI 318. When trial mixes are used they shall conform to the requirements of Chapter 3 "Proportioning" of ACI 301; provided, that the maximum slump for any concrete shall not exceed the limits specified in this Section of the Specifications.

B. When field experience records are inadequate to confirm the quality of a proposed concrete mix in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318, or when required by the Engineer, an independent testing laboratory designated by the CONTRACTOR and acceptable to the Engineer shall test a trial batch of each of the preliminary concrete mixes submitted by the CONTRACTOR. The trial batches shall be prepared using the aggregates, cement and admixtures proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain enough samples to satisfy requirements stated below. Tests on individual materials stated in PART 2 -- PRODUCTS should already be performed before any trial mix is done. The cost of laboratory trial batch tests for each specified concrete mix will be borne by the CONTRACTOR and the CONTRACTOR shall furnish and deliver the materials to the testing laboratory at no cost to JEA.

C. An independent testing laboratory shall observe the preparation of the trial batch, and they shall prepare a minimum of fifteen (15) standard test cylinders in accordance with ASTM C 31 in addition to conducting slump (ASTM C 143), air content (C 231) and unit weight (C 138) tests. Compressive strength test on the cylinders shall subsequently be performed by the same laboratory in accordance with ASTM C 39 as follows: Test 3 cylinders at age 7 days; test 3 cylinders at age 21 days; test 3 cylinders at age 28 days and test 3 cylinders at 56 days. The cylinders shall be carefully identified as "Trial Mix, Contract No._____, Product_____." If the average 28-day compressive strength of the trial mix is less than that specified, or if any single cylinder falls below the required strength by more than 500 psi, the mix shall be corrected, another trial batch prepared, test cylinders taken, and new tests performed as before. Any such additional trial batch testing required shall be performed at no additional cost to JEA. Adjustments to the mix shall be considered refinements to the mix design and shall not be the basis for extra compensation to the CONTRACTOR.

D. Mixing of concrete shall conform to the requirements of Chapter 7 of ACI 301 Specifications.

E. Retempering of concrete or mortar which has partially hardened will not be permitted.

3.02 PREPARATION

A. Earth surfaces shall be thoroughly wetted by sprinkling, prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. A vapor barrier specified in Section 07190 entitled "Vapor Barrier" shall be placed. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

B. No concrete shall be placed until the reinforcement steel and formwork have been erected in a manner acceptable to the Engineer. The CONTRACTOR shall notify the Engineer not less than two working days prior to Concrete Placement, allowing one day for review and any corrective measures which are required.

C. Joints in Concrete

1. Concrete surfaces upon or against which concrete is to be placed shall be given a roughened surface for good bond and a bonding agent shall be placed. Contractor shall use an epoxy bonding agent for bonding fresh concrete to existing concrete where shown on the drawings.

2. On horizontal joints where concrete is to be placed on hardened concrete, flowing concrete containing a high range water reducing admixture or cement grout shall be placed with a slump not less than 8 inches for the initial placement at the base of the wall. Concrete or cement grout shall meet all strength and service requirements specified herein for applicable class of concrete. This concrete shall be worked well into the irregularities of the hard surface.

D. Placing Interruptions

1. When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means, that will secure proper union with subsequent work; provided that construction joints shall be made only where acceptable to the Engineer. Cold joints will be sufficient cause for rejection of the work.

E. Embedded Items

1. No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcing steel, and preparation of surfaces involved in the placing have been completed and accepted by the Engineer at least four hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.

2. All inserts or other embedded items shall conform to the requirements herein.

F. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms where shown on the Drawings or by shop drawings and shall be acceptable to the Engineer before any concrete is placed. Accuracy of placement is the responsibility of the CONTRACTOR.

G. All anchor bolts called for on the drawings shall be cast-in-place in the concrete. Drilled, impact, adhesive or other types of anchors shall not be substituted for anchor bolts unless otherwise shown on the Drawings. Anchor bolts shall conform to the requirements set forth in Section 05050 entitled "Metal Fastening".

H. Casting New Concrete Against Old

1. Where concrete is to be cast against old concrete (any concrete which is greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by sand-blasting (exposing aggregate) prior to the application of an epoxy bonding agent.

I. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the work. No concrete shall be deposited

underwater, except where shown on the Drawings to be placed by the tremie method, nor shall the CONTRACTOR allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, will be subject to the review of the Engineer.

J. Corrosion Protection

1. Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2 inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

2. Openings for pipes, inserts for pipe hangers and brackets, and the setting of anchors shall, where practicable, be provided for during the placing of concrete.

3. Anchor bolts shall be accurately set, and shall be maintained in position by templates while being embedded in concrete.

4. The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.03 PLACING CONCRETE

A. Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this Section.

B. Non-Conforming Work or Materials

1. Concrete which upon or before placing is found not to conform to the requirements specified herein shall be rejected and immediately removed from the Work. Concrete which is not placed in accordance with these Specifications, or which is of inferior quality, shall be removed and replaced by and at the expense of the CONTRACTOR.

C. Unauthorized Placement

1. No concrete shall be placed except in the presence of duly authorized representative
of the Engineer. The CONTRACTOR shall notify the Engineer at least 24 hours in advance of placement of any concrete.

D. Placement in Wall Forms

1. Concrete shall not be dropped through reinforcement steel or into any deep form, whether reinforcement is present or not, causing separation of the coarse aggregate from the mortar on account of repeatedly hitting rods or the sides of the form as it falls, nor shall concrete be placed in any form in such a manner as

to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, some means such as the use of hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case shall the free fall of concrete exceed 4 feet below the ends of ducts, chutes, or buggies.

2. Concrete shall be uniformly distributed during the process of depositing and in no case after depositing shall any portion be displaced in the forms more than 6 feet in horizontal direction. Concrete in forms shall be deposited in uniform horizontal layers not deeper than 2 feet; and care shall be taken to avoid inclined layers or inclined construction joints except where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in forms shall not exceed 5 feet of vertical rise per hour.

E. Casting New Concrete Against Old

1. An epoxy adhesive bonding agent shall be applied to set surfaces of construction joints according to the manufacturer's written recommendations.

F. Conveyor Belts and Chutes

1. All ends of chutes, hopper gates, and all other points of concrete discharge throughout the CONTRACTOR's conveying, hoisting and placing system shall be so designed and arranged that concrete passing from them will not fall separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type acceptable to the Engineer. Chutes longer than 50 feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the specified consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered. Sufficient illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.

G. Placement in Slabs

1. Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the pour. As the work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.

H. Temperature of Concrete

1. The temperature of concrete when it is being placed shall be not more than 90 degrees F. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the specified minimum temperature. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees Fahrenheit, the CONTRACTOR shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90

degrees F. The CONTRACTOR shall be entitled to no additional compensation on account of the foregoing requirements. During summer months concrete pours shall be scheduled in the morning or early part of the day when temperatures are cooler.

I. Pumping Equipment

1. Pumping equipment and procedures if used shall conform to the recommendations contained in the report of ACI Committee 304 on Placing Concrete by Pumping Methods, ACI 304.2R. The specified slump shall be measured at the point of discharge. The loss of slump in pumping shall not exceed 1-1/2 inches.

J. The order of placing concrete in all parts of the work shall be acceptable to the Engineer. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown on the Drawings. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall have cured at least 7 days before the contiguous unit or units are placed, except that the corner sections of vertical walls shall not be placed until the 2 adjacent wall panels have cured at least 14 days.

K. The surface of the concrete shall be level whenever a run of concrete is stopped. To insure a level, straight joint on the exposed surface of walls, a wood strip at least 3/4-inch thick shall be tacked to the forms on these surfaces. The concrete shall be carried about 1/2-inch above the underside of the strip. About one hour after the concrete is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel and all laitance shall be removed.

L. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement. Vibrators shall be high speed power vibrators (8000 to 10,000 rpm) of an immersion type in sufficient number and with (at least one) standby units as required.

M. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration, over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.

N. Concrete in walls shall be internally vibrated and at the same time, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the results herein specified within 15 minutes after

concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

3.04 CONCRETE FINISHING

A. Concrete finishes are specified in Section 03350 entitled "Concrete Finishes".

3.05 CURING AND PROTECTION

A. Curing is specified in Section 03370 entitled "Concrete Curing".

3.06 CONCRETE IN COLD WEATHER

A. Cold weather concreting procedures shall be in accordance with the requirements of ACI 306.

3.07 CONCRETE IN HOT WEATHER

A. Hot weather concreting procedures shall conform to the requirement of ACI 305, except that concrete temperature shall not exceed 90 degrees Fahrenheit when it is being placed.

B. When air temperatures exceed 85°F., or when extremely dry conditions exist even at lower temperatures, particularly if accompanied by high winds, the Contractor and his concrete supplier shall exercise special and precautionary measures in preparing, delivering, placing, finishing, curing and protecting the concrete mix. The Contractor shall consult with the Engineer regarding such measures prior to each day's placing operation and the Engineer reserves the right to modify the proposed measures consistent with the requirements of this Section of the Specifications. All necessary materials and equipment shall be on hand an in position prior to each placing operation.

C. Preparatory work at the job site shall include thorough wetting of all forms, reinforcing steel and, in the case of slab pours on ground or subgrade, spraying the ground surface on the preceding evening and again just prior to placing. No standing puddles of water shall be permitted in those areas which are to receive the concrete.

D. The temperature of the concrete mix when placed shall not exceed 90°F.

E. Temperature of mixing water and aggregates shall be carefully controlled and monitored at the supplier's plant, with haul distance to the job site being taken into account. Stockpiled aggregates shall, if necessary, be shaded from the sun and sprinkled intermittently with water. If ice is used in the mixing water for cooling purposes, it must be entirely melted prior to addition of the water to the dry mix.

F. Delivery schedules shall be carefully planned in advance so that concrete is placed as soon as practical after it is properly mixed.

G. The Contractor shall arrange for an ample work force to be on hand to accomplish transporting, vibrating, finishing, and covering of the fresh concrete as rapidly as possible.

3.08 PLACING CONCRETE UNDERWATER (TREMIE CONCRETE)

A. Placing concrete underwater will be permitted only when shown on the Drawings. Concrete deposited under water shall be carefully placed in a compacted mass in final position by means of a tremie, a closed bottom dump bucket or other approved method. Care must be exercised to maintain still water at the point of deposit. Concrete shall not be placed in running water. The consistency of the concrete shall be regulated to prevent segregation of materials. The method of depositing concrete shall be regulated such that the concrete enters the mass of the previously place concrete from within, displacing water with a minimum disturbance to the surface of the concrete.

B. Tremie shall consist of a tube having a diameter of not less than 10 inches and constructed in sections having flanged couplings fitted with gaskets. The tremie shall be supported to permit free movement of the discharge and over the entire top surface of the work and shall permit rapid lowering when necessary to choke off or retard the flow. The discharge end shall be entirely sealed at all times and the tremie tube kept full to the bottom of the hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised, but not out of the concrete at the bottom, until the batch discharges to the bottom of the hopper. The flow shall then be stopped by lowering the tremie. The flow shall be continuous until the placement has been completed.

3.09 PLACING CONCRETE UNDER PRESSURE (PUMPING)

A. Where concrete is conveyed and placed by mechanically applied pressure, the equipment shall have the capacity for the operation. The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. To obtain the least line resistance, the layout of the pipeline system shall contain a minimum number of bends with no change in pipe size. If two sizes of pipe must be used, the smaller diameter should be used at the pump end and the larger at the discharge end. When pumping is completed, the concrete remaining in the pipelines, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.

B. No aluminum parts shall be in contact with the concrete during the entire placing of concrete under pressure at any time.

C. Prior to placing concrete under pressure, the CONTRACTOR shall submit the concrete mix design together with test results from a recognized testing laboratory proving the proposed mix meets all requirements. In addition, at the CONTRACTOR’s option, an actual pumping test under field conditions may be performed prior to use of the accepted mix. This test requires a duplication of anticipated site conditions from beginning to end. The batching and truck mixing shall be the same as will be used; the same pump and operator shall be present and the pipe and pipe layouts will reflect the maximum height and distance contemplated.

D. If the pumped concrete does not produce satisfactory end results, the CONTRACTOR shall discontinue the Pumping operation and proceed with the placing of concrete using conventional methods.

E. The pumping equipment must have two cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the CONTRACTOR may have a standby pump on the site during pumping.

F. The minimum diameter of the hose (conduits) shall be four inches.

G. Pumping equipment and hoses (conduits) that are not functioning properly shall be replaced.

3.10 ORDER OF PLACING CONCRETE

A. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown on the Drawings and maximum lengths as indicated on Drawings. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall be have cured at least seven days before the contiguous unit or units are placed, except that the corner sections of vertical walls shall not be placed until the two adjacent wall panels have cured at least 14 days.

B. The surface of the concrete shall be level whenever a run of concrete is stopped.

3.11 CARE AND REPAIR OF CONCRETE

A. The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the Contractor's expense.

B. As soon as forms are removed, all exposed surfaces shall be carefully examined and Contractor shall immediately notify the Engineer. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until reviewed by the Engineer. In no case will extensive patching of honeycombed concrete be permitted.

C. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall have them repaired as directed. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced. All repairs and replacements herein specified shall be promptly executed by the Contractor at its own expense.

D. Holes left by tie-rod cones shall be repaired in an acceptable manner with dry-packed cement grout or premixed patching material as accepted by the Engineer.

E. Areas of concrete in which cracking, spalling, or other signs of deterioration develop

prior to final acceptance shall be removed and replaced, or repaired as directed. This stipulation includes concrete that has experienced cracking due to drying or thermal shrinkage of the concrete. Structural cracks shall be repaired using an approved epoxy injection system. Non-structural cracks shall be repaired using an approved hydrophilic resin pressure injected grout system, unless other means of repair are deemed necessary and approved. All repair work shall be performed at no additional cost to the Owner.

F. Concrete which fails to meet the strength requirements as outlined in Article 2.04, paragraph B, will be analyzed as to its adequacy based upon loading conditions, resultant stresses and exposure conditions for the particular area of concrete in question. If the concrete in question is found unacceptable based upon this analysis, that portion of the structure shall be strengthened or replaced by the Contractor at no additional cost to the Owner. The method of strengthening or extent of replacement shall be as directed by the Engineer.

3.12 CONCRETE SEALER

A. Contractor shall apply a sealer to the top surface of all finished concrete floor slabs and equipment pads which are to remain unpainted and not intended to be immersed unless stated otherwise. Sealer shall be as specified in Specification Section 03350 entitled “Concrete Finishes”.

- END OF SECTION -

SECTION 03315

GROUT

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish all materials for grout in accordance with the provisions of this Section and shall form, mix place, cure, repair, finish, and do all other Work as required to produce finished grout, all in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 - Submittals

B. Section 03300 - Cast-in-Place Concrete

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Specifications, codes, and standards shall be as specified in Section 03300 entitled "Cast-in-Place Concrete," and as referred to herein.

B. Additional Commercial Standards

CRD-C 621 Corps of Engineers Specification for Nonshrink Grout

1.04 SUBMITTALS

A. The CONTRACTOR shall submit certified test results verifying the compressive strength, shrinkage, and expansion requirements specified herein; and manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of grout used in the work.

PART 2 -- PRODUCTS

2.01 PREPACKAGED NON-SHRINK CEMENTITIOUS GROUT

A. Nonshrink grout shall be a prepackaged, inorganic, non-gas liberating, nonmetallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of nonshrink grout specified herein shall be that recommended by the manufacturer for the particular application.

B. Nonshrink grouts shall have a minimum 28 day compressive strength of 5000 psi (ASTM C109, restrained), shall have no shrinkage (0.0 percent) and a maximum 4.0

percent expansion in the plastic state when tested in accordance with ASTM C 827, and shall have no shrinkage (0.0 percent) and a maximum of 0.2 percent expansion in the hardened state when tested in accordance with CRD C 621.

C. Cement based grout shall be Five Star Grout as manufactured by Five Star Products, Inc., Fairfield, Connecticut, or equal.

D. Cementitious non-shrink grout shall be used at locations where there are no dynamic loads, the grout will not come in contact with wastewater or wastewater gases, and where non-shrink grout is identified on the Drawings. Applications include, but are not limited to, structural steel column base plates, gate frames and guides, and precast concrete to cast-in-place concrete joints.

2.02 PREPACKAGED NON-SHRINK EPOXY GROUT

A. Epoxy-based non-shrink grout shall be a three component, 100 percent solids, solvent-free system designed for machinery grouting. Applications include, but are not limited to, anchoring, pump and motor bases, and any other equipment imparting dynamic loads to the support system.

B. When non-shrink grout is identified on the Drawings in submerged (water or wastewater) or under wastewater gas environment, epoxy-based non-shrink grouts shall be used.

C. The epoxy grout shall be delivered to site as prepackaged, three-component systems composing of the resin, hardener, and specially blended aggregates. The components shall be stored as recommended by the manufacturer until use.

D. Non-shrink epoxy grout shall be Five Star DP Epoxy Grout by Five Star Products, Inc., Fairfield, Connecticut, or equal.

2.03 CEMENT GROUT

A. Cement grout shall be composed of Portland cement and sand in the proportion specified in the Contract Documents and the minimum amount of water necessary to obtain the desired consistency. If no proportion is indicated, cement grout shall consist of one part Portland cement to three parts sand. Water amount shall be as required to achieve desired consistency without compromising strength requirements. White Portland cement shall be mixed with Portland cement as required to match color of adjacent concrete.

B. The minimum compressive strength at 28 days shall be 4000 psi.

C. For beds thicker than 1-1/2 inch and/or where free passage of grout will not be obstructed by coarse aggregate, 1-1/2 parts of coarse aggregate having a top size of 3/8 inch should be added. This stipulation does not apply for grout being swept in by a mechanism. These applications shall use a plain cement grout without coarse aggregate regardless of bed thickness.

D. Sand shall conform to the requirements of ASTM C144.

2.04 DOWEL/ANCHOR BOLT ADHESIVE SYSTEM

A. When rebar or anchor bolts are specified to be drilled in and grouted on the Drawings, an adhesive system specified in Section 03200 entitled "Concrete Reinforcement" shall be used for dowels and an adhesive system specified in Section 05050 entitled "Metal Fastening" shall be used for anchor bolts.

2.05 CURING MATERIALS

A. Curing materials shall be as recommended by the manufacturer.

2.06 CONSISTENCY

A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow. Where "dry pack" is called for in the Contract Documents, it shall mean a grout of the above described consistency; the type of grout to be used shall be as specified herein for the particular application.

2.05 MEASUREMENT OF INGREDIENTS

A. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

B. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.

PART 3 -- EXECUTION

3.01 GENERAL

A. All curing, and protection of cement grout shall be as specified in Section 03370 entitled "Concrete Curing" (Methods 1 and 2); or as recommended by manufacturer. The finish of the grout surface shall match that of the adjacent concrete.

B. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

C. The Contractor, through the manufacturer of a non-shrink grout and epoxy grout, shall provide on-site technical assistance upon request, at no additional cost to the Owner.

3.02 CONSOLIDATION

A. Grout shall be placed in such a manner, for the consistency necessary for each application, so as to assure that the space to be grouted is completely filled.

3.03 GROUT INSTALLATION

A. Grout shall be placed quickly and continuously, shall completely fill the space to be grouted and be thoroughly compacted and free of air pockets. The grout may be poured in place, pressure grouted by gravity, or pumped. The use of pneumatic pressure or dry-packed grouting requires approval of the Engineer. For grouting beneath base plates, grout shall be poured from one side only and thence flow across to the open side to avoid air-entrapment.

- END OF SECTION

SECTION 03350

CONCRETE FINISHES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish all materials, labor, and equipment required to provide finishes of all concrete surfaces specified herein and shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 - Concrete Formwork

B. Section 03300 - Cast-in-Place Concrete

C. Section 03400 - Precast Concrete, General

D. Section 03315 - Grout

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ACI 301 -Specifications for Structural Concrete for Buildings

2. ACI 318 - Building Code Requirements for Reinforced Concrete

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300 entitled "Submittals".

1. Manufacturer's literature on all products specified herein.

PART 2 -- PRODUCTS

2.01 CONCRETE FLOOR SEALER

A. Floor sealer shall be Diamond Clear VOX or Super Diamond VOX by the Euclid Chemical Company, MasterKure CC 300 SB by BASF Master Builder Solutions.

2.02 CONCRETE LIQUID DENSIFIER AND SEALANT

A. Concrete liquid densifier and sealant shall be a high performance, deeply penetrating concrete densifier and sealant. Product shall be odorless, colorless, VOC-compliant,

non-yellowing siliconate based solution designed to harden, dustproof and protect concrete floors subjected to heavy vehicular traffic and to resist black rubber tire marks on concrete surfaces. The product must contain a minimum solids content of 20% of which 50% is siliconate. Acceptable products are Diamond Hard by the Euclid Chemical Company, Seal Hard by L&M Construction Chemicals and MasterKure HD 210 by BASF Master Builder Solutions.

2.03 NON-METALLIC FLOOR HARDENER

A. The specified non-metallic mineral aggregate hardener shall be formulated, processed, and packaged under stringent quality control at the manufacturer's owned and controlled factory. The hardener shall be a factory-blended mixture of specifically processed graded mineral aggregate, selected Portland cement, and necessary plasticizing agents. Acceptable products shall be "Surflex" by the Euclid Chemical Company, "Harcol" by Sonneborn, "Maximent" by BASF, and "Mastercon" by BASF.

2.04 NON-OXIDIZING HEAVY DUTY METALLIC FLOOR HARDENER

A. Non-oxidizing heavy duty metallic floor hardener shall be formulated, processed, and packaged under stringent quality control at the manufacturer's owned and controlled factory. The hardener shall be a mixture of specifically processed non-rusting aggregate, selected Portland cement, and necessary plasticizing agents. Product shall be "Diamond-Plate" by the Euclid Chemical Company, or Masterplate by BASF Construction Chemicals.

2.05 NON-SLIP FLOORING ADDITIVE

A. Non-slip flooring additives for slip resistant floors shall be non-metallic. Non-slip flooring additives shall be Frictex NS by BASF Construction Chemicals, A-H Alox by Anti-Hydro, or Euco Grip by the Euclid Chemical Company.

PART 3 -- EXECUTION

3.01 FINISHES ON FORMED CONCRETE SURFACES

A. After removal of forms, the finishes described below shall be applied in accordance with Article 3.05 of this Section entitled "Concrete Finish Schedule". Unless the finish schedule specifies otherwise, all surfaces shall receive at least a Type I finish. The Engineer shall be the sole judge of acceptability of all concrete finish work.

1. Type I - Rough: All fins, burrs, offsets, marks and all other projections left by the forms shall be removed. Projections, depressions, etc. below finished grade required to be removed will only be those greater than ¼-inch. All holes left by removal of ends of ties, and all other holes, depressions, bugholes, air/blow holes or voids shall be filled solid with cement grout after first being thoroughly wetted and then struck off flush. The only holes below grade to be filled will be tie holes and any other holes larger than ¼-inch in any dimension. Honeycombs shall be chipped back to solid concrete and repaired as directed by the Engineer. All holes shall be filled with tools, such as sponge floats and

trowels, that will permit packing the hole solidly with cement grout. Cement grout shall consist of one part cement to three parts sand, epoxy bonding agent (for tie holes only) and the amount of mixing water shall be as little as consistent with the requirements of handling and placing. Color of cement grout shall match the adjacent wall surface.

2. Type II - Grout Cleaned: Where this finish is required, it shall be applied after completion of Type I finish. After the concrete has been predampened, a slurry consisting of one part cement (including an appropriate quantity of white cement in order to produce a color matching the surrounding concrete) and 1-1/2 parts sand passing the No. 16 sieve, by damp loose volume, shall be spread over the surface with clean burlap pads or sponge rubber floats. Any surplus shall be removed by scraping and then rubbing with clean burlap. The finish shall be kept damp for at least 36 hours after application.

3. Type III - Smooth Rubbed: Where this finish is required, it shall be applied after the completion of the Type II finish. No rubbing shall be done before the concrete is thoroughly hardened and the mortar used for patching is firmly set. A smooth, uniform surface shall be obtained by wetting the surface and rubbing it with a carborundum stone to eliminate irregularities. Unless the nature of the irregularities require it, the general surface of the concrete shall not be cut into. Corners and edges shall be slightly rounded by the use of the carborundum stone. Brush finishing or painting with grout or neat cement will not be permitted. A 100 square foot example shall be established at the beginning of the project to establish acceptability.

3.02 SLAB AND FLOOR FINISHES

A. The finishes described below shall be applied to floors, slabs, flow channels and top of walls in accordance with Article 3.05 of this Section entitled "Concrete Finish Schedule". The Engineer shall be the sole judge of acceptability of all such finish work.

1. Type "A" - Screeded: This finish shall be obtained by placing screeds at frequent intervals and striking off to the surface elevation required. When a Type "F" finish is subsequently to be applied, the surface of the screeded concrete shall be roughened with a stiff brush or rake prior to final set.

2. Type "B" - Wood or Magnesium Floated: This finish shall be obtained after completion of a Type "A" finish by working a previously screeded surface with a wood or magnesium float until the desired texture is reached. Floating shall begin when the water sheen has disappeared and when the concrete has sufficiently hardened so that a person's foot leaves only a slight imprint. If wet spots occur, water shall be removed with a squeegee. Care shall be taken to prevent the formation of laitance and excess water on the finished surface. All edges shall be edged with an 1/8-inch tool as directed by the Engineer. The finished surface shall be true, even, and free from blemishes and other irregularities.

3. Type "C" - Cork Floated: This finish shall be similar to Type "B" but slightly

smoother than that obtained with a wood float. It shall be obtained by power or band floating with cork floats.

4. Type "D" - Steel Troweled: This finish shall be obtained after completion of a Type "B" finish. When the concrete has hardened sufficiently to prevent excess fine material from working to the surface, the surface shall be compacted and smoothed with not less than two thorough and complete steel troweling operations. In areas which are to receive a floor covering such as tile, resilient flooring, or carpeting, only one troweling operation is required. The finish shall be brought to a smooth, dense surface, free from defects and blemishes.

5. Type "E" - Broom or Belt: This finish shall provide the surface with a transverse scored texture by drawing a broom or burlap belt across the surface immediately after completion of a Type "B" finish.

6. Type "F" - Swept in Grout Topping: This finish shall be applied after a completion of a Type "A" finish. The concrete surface shall be properly cleaned, washed, and coated with a mixture of water and Portland Cement. Cement grout in accordance with Section 03315 shall then be plowed and swept into neat conformance with the blades or arms of the apparatus by turning or rotating the previously positioned mechanical equipment. Special attention shall be paid to true grades, shapes and tolerances as specified by the manufacturer of the equipment. Before beginning this finish, the Contractor shall notify the Engineer and the equipment manufacturer of the details of the operation and obtain approval and recommendations of the equipment manufacturer.

7. Type "G" - Hardened Finish: This finish shall be applied after completion of a Type “B” or Type “C” finish and prior to application of a Type “D” finish. Hardeners shall be applied in strict accordance with the manufacturer’s requirements. Hardeners shall be applied using a mechanical spreader. The hardener shall be applied in two shakes with the first shake comprising of 2/3 of the total amount. Type “D” finish shall be applied following completion of application of hardener.

    a. Non-metallic floor hardener shall be applied where specifically required on the Contract Drawings at the rate of 1.0 pounds/ft^2.

    b. Non-oxidizing heavy duty metallic floor hardener shall be applied at the loading docks and where specifically required on the Contract Drawings or specified herein at the rate of 1.5 pounds/ft^2.

8. Type "H" - Non-Slip Finish: This finish shall be provided by applying a non-slip flooring additive concurrently with the application of a Type “D” finish and/or installation of floor sealants. Application procedure shall be in accordance with manufacturer’s instructions. Finish shall be applied where specifically required on the Contract Drawings or specified herein.

9. Type "J" - Raked Finish: This finish shall be provided by raking the surface as soon as the condition of the concrete permits by making depressions of +/-1/4 inch.

3.03 SEALING OF CONCRETE FLOOR

A. Concrete sealers shall be applied where specifically required on the Contract Drawings or specified herein.

B. Sealers shall be applied after installation of all equipment, piping, etc. and after completion of any other related construction activities. Application of sealers shall be in strict accordance with manufacturer's requirements.

C. Sealers shall be applied to all floor slabs not painted and not intended to be immersed.

D. Floor slabs subjected to vehicular traffic shall be sealed with the concrete liquid densifier and sealer.

E. All other floor slabs to receive sealer shall be sealed with concrete floor sealer.

3.04 FINISHES ON EQUIPMENT PADS

A. Formed surfaces of equipment pads shall receive a Type I finish.

B. Top surfaces of equipment pads, except those surfaces subsequently required to receive non-shrink grout and support equipment bases, shall receive a Type "D" finish, unless otherwise noted. Surfaces which will later receive non-shrink grout shall, before the concrete takes its final set, be made rough by removing the sand and cement that accumulates on the top to the extent that the aggregate will be exposed with irregular indentations in the surface up to 1/2 inch deep.

3.05 CONCRETE FINISH SCHEDULE

Item	Type of Finish
Inner face of walls of tanks, flow channels, wet wells, perimeter walls, and miscellaneous concrete structures:	
From 3 feet below water surface to bottom of wall	I*
From top of wall to 3 feet below water surface	II*
Exterior concrete walls below grade	I
Exterior exposed concrete walls and columns (including top of wall) to one foot below grade. All other exposed concrete surfaces not specified elsewhere	II
All interior exposed concrete vertical surfaces in buildings	III
Interior exposed ceiling, including beams	III

Item	Type of Finish
Floors of process equipment tanks or basins, and slabs to receive roofing material or waterproof membranes	B
All interior finish floors of buildings and structures and walking surfaces which will be continuously or intermittently wet	C
All interior finish floors of buildings and structures which are not continuously or intermittently wet	D
Floors to receive tile, resilient flooring, or carpeting	D
Concrete in flow channels	D
Exterior concrete sidewalks, steps, ramps and landings	E
Floors of process equipment tanks indicated on Drawings to receive grout topping	F
Garage and storage area floors	G
Precast concrete form panels, hollow core planks, double tees	J

** Finish shall be acceptable to the coating applicator and manufacturer. See Section 09900 entitled "Painting".*

- END OF SECTION -

SECTION 03360

SHOTCRETE

PART 1 -- GENERAL

1.01 THE REQUIREMENTS

A. The CONTRACTOR shall furnish all labor, material, and equipment necessary to place the shotcrete as shown on the Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03300 – Cast-In-Place Concrete

B. Section 13206 – Prestressed Concrete Tanks

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all work hereunder shall conform to the applicable requirements of the reference portions of the following documents, to the extent that the requirements therein are not in conflict with the provisions of this Section.

1. ACI 506 — Recommended Practice for Shotcreting

2. ACI 506.2 — Specification for Materials, Proportioning, and Application of Shotcrete

3. ACI CP-60 — ACI Shotcrete Nozzleman Certification

1.04 SUBMITTALS

A. The CONTRACTOR shall submit the following in accordance with the requirements of Section 01300, Submittals:

1. Proposed mix proportions and test data on the mix. The test data may be from prior experience, if available, or from preconstruction testing in accordance with paragraph 1.05 below.

2. Certification that the source and quality of materials used in the proposed mix meets the requirements stated herein.

3. Copies of ACI Shotcrete Nozzleman Certificates.

1.05 QUALITY ASSURANCE

A. Preconstruction testing in accordance with ACI 506.2 shall be performed by the CONTRACTOR at CONTRACTOR's expense when the proposed mix including all materials has not previously been used and tested in similar previous work. Results of preconstruction testing shall be submitted with the proposed mix design submittal. In lieu of preconstruction testing, test data from previous jobs on the same mix design may be submitted for acceptance by JEA.

B. Construction testing shall be performed on test panels in accordance with ACI 506.2. CONTRACTOR shall make and field cure the test panels in accordance with ACI 506.2 at his expense. The test panels will be tested by a testing agency employed by the Owner. Should the strengths of shotcrete shown by the test specimens fall below acceptable values as stated in ACI 506.2, JEA shall have the right to require changes in the shotcrete mix for the remainder of the work. Furthermore, JEA shall have the right to require additional curing on those portions of the structure represented by the failing test specimens and to order additional strength tests be performed on cores cut from the structure. The additional curing, coring, and testing shall be at the expense of the CONTRACTOR. In the event that such additional curing does not give the strength required, as evidenced by core tests, JEA shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The CONTRACTOR shall have no claim for reimbursement for the required corrective measures.

PART 2 -- PRODUCTS

2.01 SHOTCRETE

A. Shotcrete shall be composed of cement, pozzolan (fly ash or ground granulated blast furnace slag) aggregate, water, and an air-entraining admixture, all in conformance with ACI 506.2. Additional admixtures conforming to ACI 506.2 may be submitted for JEA's approval.

B. All components of shotcrete including cement, aggregates, pozzolan, and admixtures shall meet requirements specified in Section 03300 – Cast-In-Place Concrete.

C. Shotcrete shall have a minimum design compressive strength, f'c, of 4,000 psi at 28 days, unless noted otherwise in the Contract Documents.

PART 3 -- EXECUTION

3.01 BATCHING AND MIXING

A. Mix proportions shall be controlled by weight batching in conformance with ACI 506.2.

3.02 SURFACE PREPARATION

A. Preparation of surfaces to receive shotcrete shall be performed in accordance with ACI 506.2.

3.03 PLACING SHOTCRETE

A. Shotcrete nozzlemen shall be certified in accordance with ACI CP-60.

B. Placement of shotcrete shall conform to ACI 506.2 and to the following requirements:

1. No shotcrete shall be placed when the air temperature is below 40 degrees Fahrenheit or when other weather conditions are unfavorable.

2. At the end of each day's work, or similar stoppage period, the shotcrete shall be cut off as square as possible. Before resuming shooting, these exposed portions shall be thoroughly cleaned and wetted by means of air and water blast.

3.04 FINISHING

A. Shotcrete shall have a sliced, troweled and rubbed finish unless noted otherwise on the Drawings.

3.05 CURING

A. Shotcrete shall be cured in accordance with ACI 506.2. Natural curing shall not be allowed.

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SECTION 03370

CONCRETE CURING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall protect all freshly deposited concrete from premature drying and excessively hot or cold temperatures, and maintain with minimal moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete in accordance with requirements specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 - Concrete Framework

B. Section 03290 – Joints in Concrete

C. Section 03300 - Cast-in-Place Concrete

D. Section 03315 - Grout

E. Section 03350 - Concrete Finishes

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the Section entitled "Submittals", the CONTRACTOR shall submit the following:

1. Proposed procedures for protection of concrete under wet weather placement conditions.

2. Proposed normal procedures for protection and curing of concrete.

3. Proposed special procedures for protection and curing of concrete under hot and cold weather conditions.

4. Proposed method of measuring concrete surface temperature changes.

5. Manufacturer's literature and material certification for proposed curing compounds.

1.04 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of other requirements of these specifications all work hereunder shall conform to the applicable requirements of the referenced portions of the following documents, to the extent that the requirements therein are not in conflict with the provisions of this Section.

1. ACI 301 Specifications for Structural Concrete for buildings
2. ACI 304 Guide for Measuring, Mixing, Transporting, and Placing Concrete, ACI 304
3. ACI 305 Hot Weather Concreting
4. ACI 306 Cold Weather Concreting
5. ACI 308 Standard Practice for Curing Concrete
6. ASTM C171 Specifications for Sheet Materials for Curing Concrete
7. ASTM C309 Specification for Liquid Membrane - Forming Compounds for Curing Concrete
8. ASTM C1315 Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

1.05 QUALITY ASSURANCE

A. Curing compound shall not be used on any surface where concrete, coatings, or other material will be bonded unless the manufacturer certifies that the curing compound will not prevent bond or indicates measures to be taken to completely remove the curing compound from areas to receive bonded applications, and specifically approved by JEA.

B. Care shall be taken to ensure that curing compounds are compatible with all finish concrete castings.

C. Curing compounds shall not be used on surfaces exposed to water in potable water storage tanks and treatment plants unless curing compound is certified in accordance with ANSI/NSF Standard 61.

PART 2 -- PRODUCTS

2.01 CURING COMPOUNDS

A. Clear curing and sealing compound shall be a clear styrene acrylate type complying with ASTM C 1315, Type 1, Class A with a minimum solids content of 30%. Moisture loss shall not be greater than 0.40 kg/m2 when applied at 300 sq.ft./gal. Manufacturer's certification is required. Acceptable products are Super Diamond Clear VOX by the Euclid Chemical Company, MasteKure CC 300 SB by BASF Master Builder Solutions, and Cure & Seal 30 Plus by Symons Corporation.

B. Where specifically approved by Engineer, on slabs to receive subsequent applied finishes, compound shall conform to ASTM C 309. Acceptable products are "Kurez DR VOX" or "Kurez W VOX" by the Euclid Chemical Company. Install in strict accordance with manufacturer's requirements.

2.02 EVAPORATION REDUCER

A. Evaporation reducer shall be BASF, “MasterKure ER 50”, or Euclid Chemical “Euco-Bar”.

PART 3 -- EXECUTION

3.01 PROTECTION AND CURING

A. All freshly placed concrete work shall be protected from the elements, flowing water and from defacement of any nature during construction operations.

B. As soon as the concrete has been placed and horizontal top surfaces have received their required finish, provision shall be made for maintaining the concrete in a moist condition for at least a 7-day period thereafter except for high early strength concrete, for which the period shall be at least the first three days after placement. Horizontal surfaces shall be kept covered, and intermittent, localized drying will not be permitted.

C. Walls that will be exposed on one side with either fluid or earth backfill on the opposite side shall be continuously wet cured for a minimum of five days. Use of a curing compound will not be acceptable for applications of this type.

D. After placing and finishing, use one or more of the following methods to preserve moisture in concrete:

1. Ponding or continuous fogging or sprinkling.

2. Application of mats or fabric kept continuously wet.

3. Continuous application of steam (under 150 degrees Fahrenheit).

4. Application of sheet materials conforming to ASTM C171.

5. If approved by the Engineer, application of a curing compound in accordance with Article 3.05. Apply the compound in accordance with the manufacturer's recommendation on after water sheen has disappeared from the concrete surface and after finishing operations. The rate of application shall not exceed 200 square feet per gallon. For rough surfaces, apply in two directions at right angles to each other.

D. Keep absorbent forms wet until they are removed. After form removal, cure concrete by one of the methods in paragraph D.

E. Any of the curing procedures used in Paragraph 3.01-D may be replaced by one of the other curing procedures listed in Paragraph 3.01-D after the concrete is one-day old. However, the concrete surface shall not be permitted to become dry at any time.

3.02 CURING CONCRETE UNDER COLD WEATHER CONDITIONS

A. Suitable means shall be provided for a minimum of 72 hours after placing concrete to maintain it at or above the minimum as placed temperatures specified in Article 3.02

herein.. During the 72-hour period, the concrete surface shall not be exposed to air more than 20°F above the minimum as placed temperatures.

B. Stripping time for forms and supports shall be increased as necessary to allow for retardation in concrete strength caused by colder temperatures. This retardation is magnified when using concrete made with blended cements or containing fly ash or ground granulated blast furnace slag. Therefore, curing times and stripping times shall be further increased as necessary when using these types of concrete.

C. The methods of protecting the concrete shall be approved by the Engineer and shall be such as will prevent local drying. Equipment and materials approved for this purpose shall be on the site in sufficient quantity before the work begins. The Contractor shall assist the Engineer by providing holes in the forms and the concrete in which thermometers can be placed to determine the adequacy of heating and protection. All such thermometers shall be furnished by the Contractor in quantity and type which the Engineer directs.

D. Curing procedures during cold weather conditions shall conform to the requirements of ACI 306.

3.03 CURING CONCRETE UNDER HOT WEATHER CONDITIONS

A. When air temperatures exceed 85°F, the CONTRACTOR shall take extra care in placing and finishing techniques to avoid formation of cold joints and plastic shrinkage cracking. If ordered by the Engineer, temporary sun shades and/or windbreakers shall be erected to guard against such developments, including generous use of wet burlap coverings and fog sprays to prevent drying out of the exposed concrete surfaces.

B. Immediately after screeding, horizontal surfaces shall receive an application of evaporation reducer. Apply in accordance with manufacturer's instructions. Final finish work shall begin as soon as the mix has stiffened sufficiently to support the workmen.

C. Curing and protection of the concrete shall begin immediately after completion of the finishing operation. Continuous moist-curing consisting of method 1 or 2 listed in paragraph 3.01D is mandatory for at least the first 24 hours. Method 2 may be used only if the finished surface is not marred or blemished during contact with the coverings.

D. At the end of the initial 24-hour period, curing and protection of the concrete shall continue for at least four (4) additional days using one of the methods listed in paragraph 3.01D.

E. Curing procedures during hot weather conditions shall conform to the requirements of ACI 305.

3.04 USE OF CURING COMPOUND

A. Curing compound shall be used only where specifically approved by the Engineer. Curing compound shall not be used on surfaces to receive subsequent coatings. Curing compound shall never be used for curing exposed walls with fluid or earth

backfill on the opposite side. A continuous wet cure for a minimum of five days is required for these applications. Curing compound shall not be used on surfaces exposed to water in potable water storage tanks and treatment plants unless curing compound is certified in accordance with ANSI/NSF Standard 61.

B. When permitted, the curing compound shall maintain the concrete in a moist condition for the required time period, and the subsequent appearance of the concrete surface shall not be affected.

C. The compound shall be applied in accordance with the manufacturer's recommendations after water sheen has disappeared from the concrete surface and after finishing operations. The rate of application shall not exceed 300 square feet per gallon. For rough surfaces, apply in two directions at right angles to each other.

3.05. EARLY TERMINATION OF CURING

A. Moisture retention measures may be terminated earlier than the specified times only when at least one of the following conditions is met:

1. The strength of the concrete reaches 85 percent of the specified 28-day compressive strength in laboratory-cured cylinders representative of the concrete in place, and the temperature of the in-place concrete has been constantly maintained at 50 degrees Fahrenheit or higher.

2. The strength of concrete reaches the specified 28-day compressive strength as determined by accepted nondestructive methods or laboratory-cured cylinder test results.

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SECTION 03400

PRECAST CONCRETE, GENERAL

PART 1 -- GENERAL

1.01 REQUIREMENTS

A. The CONTRACTOR shall construct all precast concrete items as required in the Contract Documents, including all appurtenances necessary to make a complete installation.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03200 – Concrete Reinforcement

B. Section 03300 - Cast-in-Place Concrete

C. Section 03350 – Concrete Finishes

D. Section 03370 – Concrete Curing

E. Section 03315 - Grout

F. Section 05500 - Metal Fabrications

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all work specified herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the end of the Bid.

1. Florida Building Code

2. ACI 318-Building Code Requirements for Reinforced Concrete

3. PCI Standard MNL-116 - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products

4. PCI Design Handbook

1.04 SUBMITTALS

A. The CONTRACTOR shall submit the following for review in accordance with Section 01300 entitled "Submittals".

1. Shop drawings for all precast concrete items showing all dimensions, locations, and type of lifting inserts, and details of reinforcement and joints.

2. A list of the design criteria used by the manufacturer for all manufactured, precast items.

3. Design calculations, showing at least the design loads and stresses on the item, shall be submitted. Calculations shall be signed and sealed by a Professional Engineer registered in the State of Florida.

4. Certified reports for all lifting inserts, indicating allowable design loads.

5. Information on lifting and erection procedures.

1.05 QUALITY ASSURANCE

A. All manufactured precast concrete units shall be produced by an experienced manufacturer regularly engaged in the production of such items. All manufactured precast concrete and site-cast units shall be free of defects, checks, and cracks. Care shall be taken in the mixing of materials, casting, curing and shipping to avoid any of the above. The Engineer may elect to examine the units at the casting yard or upon arrival of the same at the site. The Engineer shall have the option of rejecting any or all of the precast work if it does not meet with the requirements specified herein or on the Drawings. All rejected work shall be replaced at no additional cost to JEA.

B. Manufacturer qualifications:

The precast concrete manufacturing plant shall be certified by the Prestressed Concrete Institute, Plant Certification Program, prior to the start of production. Certification is only required for plants providing prestressed structural members such as hollow core planks, double T members, etc.

In lieu of such certification, the manufacturer shall, at his expense, meet the following requirements:

1. Retain independent testing or consulting firm approved by the architect/engineer and/or JEA.

2. The basis of inspection shall be the Prestressed Concrete Institute Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products, MNL-116.

3. This firm shall inspect the precast plant at two-week intervals during production and issue a report, certified by a registered engineer verifying that materials, methods, products and quality control meet all the requirements of the specifications, drawings, and MNL-116. If the report indicates to the contrary, the engineer, at the precaster's expense, will inspect and may reject any or all products produced during the period of non-compliance with the above requirements.

C. Plant production and engineering must be under direct supervision and control of an Engineer who possesses a minimum of five (5) years experience in precast concrete work.

PART 2 -- PRODUCTS

2.01 CONCRETE

A. Concrete materials including portland cement, aggregates, water, and admixtures shall conform to Section 03300 entitled "Cast-in-Place Concrete".

B. For prestressed concrete items, minimum compressive strength of concrete at 28 days shall be 5,000 psi unless otherwise specified. Minimum compressive strength of concrete at transfer of prestressing force shall be 3,500 psi.

C. For non-prestressed concrete items, minimum compressive strength of concrete at 28 days shall be 4,000 psi unless otherwise specified.

2.02 GROUT

A. Grout for joints between panels shall be a non-shrink, non-metallic grout in conformance with Section 03315 entitled "Grout".

B. Minimum compressive strength of grout at 7 days shall be 3,000 psi.

2.03 REINFORCING STEEL

A. Reinforcing steel used for precast concrete construction shall conform to Section 03200 entitled "Concrete Reinforcement'.

2.04 PRESTRESSING STRANDS

A. Prestressing strands shall be 7-wire, stress-relieved, high-strength strands Grade 250K or 270K.

2.05 STEEL INSERTS

A. Steel inserts shall be in accordance with Section 05500 entitled "Metal Fabrications".

B. All steel inserts protruding from or occurring at the surface of precast units shall be galvanized in accordance with Section 05035 entitled "Galvanizing".

2.06 WELDING

A. Welding shall conform to Section 05500 entitled "Metal Fabrications".

2.07 BEARING PADS

A. Plastic bearing pads shall be multi-monomer plastic strips which are non-leaching and support construction loads with no visible overall expansion, manufactured specifically for the purpose of bearing precast concrete.

PART 3 -- EXECUTION

3.01 FABRICATION AND CASTING

A. All precast members shall be fabricated and cast to the shapes, dimensions and lengths shown on the Drawings and in compliance with PCI MNL-116. Precast members shall be straight, true and free from dimensional distortions, except for camber and tolerances permitted later in this clause. All integral appurtenances, reinforcing, openings, etc., shall be accurately located and secured in position with the form work system. Form materials shall be steel and the systems free form leakage during the casting operation.

B. All cover of reinforcing shall be the same as detailed on the Drawings.

C. Because of the critical nature of the bond development length in prestressed concrete panel construction, if the transfer of stress is by burning of the fully tensioned strands at the ends of the member, each strand shall first be burned at the ends of the bed and then at each end of each member before proceeding to the next strand in the burning pattern.

D. The CONTRACTOR shall coordinate the communication of all necessary information concerning openings, sleeves, or inserts to the manufacturer of the precast members.

E. Concrete shall be finished in accordance with Section 03350 entitled "Concrete Finishes". All recesses due to cut tendons shall be grouted.

F. Curing of precast members shall be in accordance with Section 03370 entitled "Concrete Curing".

G. The manufacturer shall provide lifting inserts.

3.02 HANDLING, TRANSPORTING AND STORING

A. Precast members shall not be transported away from the casting yard until the concrete has reached the minimum required 28 day compressive strength and a period of at least five (5) days has elapsed since casting, unless otherwise permitted by the Engineer.

B. No precast member shall be transported from the plant to the job site prior to approval of that member by the plant inspector. This approval will be stamped on the member by the plant inspector.

C. During handling, transporting, and storing, precast concrete members shall be lifted and supported only at the lifting or supporting points as indicated on the shop drawings.

D. All precast members shall be stored on solid, unyielding, storage blocks in a manner to prevent torsion, objectionable bending, and contact with the ground.

E. Precast concrete members shall not be used as storage areas for other materials or equipment.

F. Precast members damaged while being handled or transported will be rejected or shall be repaired in a manner approved by the Engineer.

3.03 ERECTION

A. Erection shall be carried out by the manufacturer or under his supervision using labor, equipment, tools and materials required for proper execution of the work.

B. CONTRACTOR shall prepare all bearing surfaces to a true and level line prior to erection. All supports of the precast members shall be accurately located and of required size and bearing materials.

C. Installation of the precast members shall be made by leveling the top surface of the assembled units keeping the units tight and at right angles to the bearing surface.

D. Connections which require welding shall be properly made in accordance with Section 05050 entitled "Metal Fastening".

E. Grouting between adjacent precast members and along the edges of the assembled precast members shall be accomplished as indicated on the drawings, care being taken to solidly pack such spaces and to prevent leakage or droppings of grout through the assembled precast members. Any grout which seeps through the precast members shall be removed before it hardens.

F. In no case shall concentrated construction loads, or construction loads exceeding the design loads, be placed on the precast members. In no case shall loads be placed on the precast members prior to the welding operations associated with erection, and prior to placing of topping (if required).

G. No CONTRACTOR, Subcontractor or any of his employees shall arbitrarily cut, drill, punch or otherwise tamper with the precast members.

H. Precast members damaged while being erected will be rejected or shall be repaired in a manner approved by the Engineer.

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SECTION 03415

PRECAST PRESTRESSED CONCRETE HOLLOW CORE PLANKS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish all materials, labor, equipment, tools, etc., required for the design, fabrication, delivery and erection of precast, prestressed concrete hollow core planks in accordance with the Drawings and as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03300 – Cast In Place Concrete

B. Section 03400 – Precast Concrete, General

1.03 REFERENCED SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all Work specified herein shall conform to or exceed the requirements of the Building Code and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of this Section.

B. Commercial Standards:

ACI 318	Building Code Requirements for Reinforced Concrete.
ACI 423	Recommendations for Concrete Members Prestressed with Unbonded Tendons
ASTM A 416 for	Specification for Steel Strand, Uncoated Seven-Wire Stress Relieved Prestressed Concrete.
ASTM A 615	Specification for Deformed Billet Steel Bars for Concrete Reinforcement.
ASTM C 33	Specification for Concrete Aggregates.
ASTM C 39	Test method for Compressive Strength of Cylindrical Concrete Specimens.

1.04 MANUFACTURERS

A. The planks shall be hollow-core precast-prestressed concrete planks with concrete topping as shown on drawings, manufactured by the following, or equal:

1. Coreslab Structures - Orlando, Florida

B. The manufacturer shall be responsible for the design and fabrication of the planks.

1.05 SUBMITTALS

A. Submittals shall comply with Section 03400, Precast Concrete-General.

B. In addition to the requirements of Section 03400, submittals shall include:

1. Calculations shall indicate compliance with the Drawings and specified standards and shall include camber calculations.

2. Shop drawings shall cover each type of precast, prestressed concrete unit to be used, and shall show the exact profile of each unit, steel reinforcement, and other pertinent details, including the standard manufacturer's loading chart data for a specific span, as well as resisting moment, crowns, shore loads, and the manufacturer's specifications.

3. After review and acceptance by JEA, the CONTRACTOR shall submit two copies of the submittal to the Building Department for their review and approval.

1.06 QUALITY ASSURANCE

A. Quality assurance shall comply with Section 03400, Precast Concrete – General.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Materials shall comply with Section 03400, Precast Concrete – General, except as stated below.

B. Minimum compressive strength of concrete at transfer of prestressing force shall be 3,000 psi.

PART 3 -- EXECUTION

3.01 DESIGN CRITERIA

A. All units shall be designed in accordance with the applicable provisions of ACI 318 and PCI Design Handbook, prestressed to sustain the superimposed dead, live, and wind loads indicated herein and on the Drawings. Design and subsequent fabrication shall provide for a camber in each unit to eliminate total dead load deflection.

B. Superimposed Roof Loads

1. Dead Loads - Uniform load shall be that resulting from weight of member and weights of insulation material, built-up roofing, ballast, and concrete topping, as shown on the Drawings. Concentrated load at crane rail hanger-supports (when applicable) shall be that resulting from contributing weight of crane rail and its support-assembly.

2. Live Loads - Uniform live load shall be 20 psf unless noted otherwise on the

Drawings. Concentrated hoist loads shall consist of the rated capacity plus 33% impact loading and shall occur where crane rails are shown on the Drawings.

3. Wind Loads – Wind loads shall be per the Florida Building Code with an ultimate design wind speed of 138 MPH, Exposure Category C.

4. Other applicable loads per the Florida Building Code as indicated on the Drawings.

5. Units shall be capable of supporting the total superimposed loads indicated on the Drawings and specified herein. Provisions shall be made for any additional loads imposed on units by openings, or by supporting the work of other trades. In addition, the units shall be adequately reinforced to resist all handling stresses.

3.02 FABRICATION AND CASTING

A. All hollow core planks shall comply with Section 03400, Precast Concrete.

B. Hollow core plank dimensions shall comply with PCI Design Handbook and as indicated on the Drawings.

C. Curing of hollow core planks shall be equivalent to three days moist curing at 70°F.

D. Unless otherwise noted on the Drawings, permitted dimensional tolerances are as follows:

1.	Length	±1/2"
2.	Width	±1/4" Max.
3.	Depth	±1/4" Max.
4.	Differential Camber Between Adjacent Units	1/4" Max.
5.	Horizontal Alignment	±1/8" per 10' ±1/2" Max.
6.	Location of openings, blockouts, anchors, plates and inserts	±1/2" Max.
7.	Square Ends	±1/8" per 12" of Height

3.03 HANDLING, TRANSPORTING, AND STORING

A. Handling, transporting, and storing shall comply with Section 03400, Precast Concrete.

3.04 ERECTION

A. Erection shall comply with Section 03400, Precast Concrete.

B. All hollow core planks shall bear on bearing pads at each end.

1. All hollow core planks shall bear on plastic or neoprene bearing pads at each end in accordance with Section 03400, Precast Concrete.

C. The top of all hollow core planks which receive concrete topping shall be cleaned of all contaminants and thoroughly wetted just prior to placing the topping.

- END OF SECTION -

SECTION 03480

PRECAST CONCRETE MANHOLES, HANDHOLES AND VAULTS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall construct all precast concrete items as required in the Contract Documents, including all appurtenances necessary to make a complete installation.

1.02 QUALITY CONTROL

A. Without limiting the generality of other requirements of these specifications, all work specified herein shall conform to or exceed the requirements of the Florida Building Code (FBC) and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of this section:

1. ASTM C478 Specification for Precast Reinforced Concrete Manhole Sections.

2. ACI 318 Building Code Requirements for Reinforced Concrete.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit shop drawings for all precast concrete items. Submitted drawings shall show all dimensions, location and type of lifting inserts, and details of reinforcement and joints in accordance with Section 01300 entitled "Submittals".

B. For all precast items which are manufactured, the CONTRACTOR shall also submit a list of the design criteria used by the manufacturer.

C. For all precast items which are manufactured, and which have a clear dimension, in any direction, greater than or equal to 4 feet – 0 inches, the CONTRACTOR shall submit design calculations showing, at least, the design loads and stresses on the item. Calculations shall be signed and sealed by a Professional Engineer registered in the State of Florida.

D. The CONTRACTOR shall submit certified reports for all lifting inserts, showing allowable design loads on the inserts.

PART 2 -- PRODUCTS

2.01 MANUFACTURED ITEMS

A. Precast Concrete Manhole Sections

1. Precast concrete sections, twenty-four inches and larger in diameter, which are used as manhole sections, shall conform to ASTM C478 except as modified herein. Reinforcement, if shown, shall be as shown on the Drawings. Sections shall have rebate joints. Tapered top sections shall be supplied where they are shown on the drawings, or where they are otherwise indicated to be necessary. The design and manufacture of the sections shall be based on H-20 traffic loading. Reinforcement shall conform to the requirements of the Section 03200 entitled "Concrete Reinforcement". Minimum wall thickness shall be six inches. Cement shall be ASTM C150, Type II. The date and name of manufacturer shall be marked inside each precast section.

2. The interior of all sanitary manhole and lift station precast sections shall be provided with a polypropylene liner. The polypropylene liner shall be Sure Grip as manufactured by Agru America, Inc.

B. Miscellaneous Precast Vaults

1. Miscellaneous precast vaults shall include, but are not limited to, electric manholes, pull boxes and meter boxes. Vault dimensions shall be as required by the Contract Drawings. Concrete properties shall conform to the requirements of Section 03300 entitled "Cast-in-Place Concrete". Frames and lids of covers shall be provided by the vault manufacturer. Covers shall have lifting handles.

2. When leveling bolts are used to set the vault top sections, the CONTRACTOR shall ensure that the load on the vault will be transferred through the mortar to the vault, and will not be carried by the leveling bolts.

3. Where vaults are in areas which may be subjected to vehicular traffic, they shall be designed for H-20 traffic loading. In other areas, they shall be designed for a vertical live load of 300 psf. Lateral loads on all vault walls shall be as follows:

   a. Operating 75 x h (lbs.) triangular equivalent fluid pressure plus surcharge of 240 PSF in areas designed for vehicular traffic.

   b. Where h = depth of fill

   c. Piping, electrical, and other details shall be as required by the Contract Documents.

2.02 SITE-CAST ITEMS

A. Where removable concrete slabs are required by the drawings, they shall conform to the requirements set forth in Section 03300 entitled "Cast-in-Place Concrete." All thicknesses, reinforcing, and edge clearances shall be as shown on the drawings.

2.03 PRE-FORMED JOINT SEALANT

A. The joint sealing compound shall preformed, cold-applied, ready to use plastic joint sealing compound, "Ram-Neck" by K.T. Snyder Company; or equal.

2.04 MORTAR

A. Mortar used between the sections of precast concrete manholes and vaults shall be as recommended by the section manufacturer, subject to the requirements of Division 4.

2.05 NON-SHRINK GROUT

A. Non-shrink grout shall be as specified in Section 03315 entitled "Grout".

PART 3 -- EXECUTION

3.01 MANUFACTURED ITEMS

A. Precast Concrete Manhole Sections

1. Precast concrete manhole sections shall be set so as to be vertical, with sections in true alignment. The joint of the previously set section shall be covered with mortar and preformed joint sealant before the next section is placed. Before the mortar is set, joints shall be pointed, and exterior joints shall be thoroughly tooled so as to be slightly concave with a hard polished surface, free of cracks. Interior joints shall be tooled flush in a similar manner.

B. Miscellaneous Precast Vaults

1. All pull boxes, electrical manholes, vaults, meterboxes and other miscellaneous precast concrete boxes shall be installed in accordance with the manufacturer's recommendations, unless otherwise required by the drawings.

3.02 SITE CAST ITEMS

A. Where removable concrete slabs are required by the drawings, they shall be fabricated in accordance with Section 03300 entitled "Cast-in-Place Concrete".

B. Sealant, as specified in the Section 07920 entitled "Sealants and Caulking" shall be provided all around the panels.

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SECTION 04220

CONCRETE BLOCK MASONRY

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall construct all concrete masonry Work for the project, complete, including furnishing, fabricating, and placing of required reinforcing steel and the furnishing and setting of embedded items and all other appurtenant work, all in accordance with the requirements of the Contract Documents. The CONTRACTOR is responsible for coordinating the Work of this section with that of other trades.

B. All concrete block masonry that contains empty cells after installation shall be provided with a foamed-in-place insulation specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 - Submittals

B. Section 03300 - Cast-in-Place Concrete

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the Specifications, all Work specified herein shall conform to or exceed the requirements of the Florida Building Code (FBC) and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of this Section.

B. Products and their installation shall be in accordance with the following trade standards, as applicable:

1. Masonry Design Manual (MDM) shall mean the Masonry Design Manual published by the Masonry Industry Advancement Committee.

2. Manufacturer's published recommendations and specifications.

3. Federal Specifications (FS) as reference herein.

4. American Society for Testing and Materials (ASTM) Specifications, as referenced herein.

5. "Specifications for the Design and Construction of Load Bearing Concrete Masonry" published by the National Concrete Masonry Assoc., P.O. Box 9185, Rossylin Station, Arlington, VA.

6. "Building Code Requirements for Concrete Masonry Structures" (ACI 530/ASCE 5).

7. "Specifications for Masonry Structures" (ACI 530.1/ASCE 6).

1.04 CONTRACTOR SUBMITTALS

A. Samples of concrete masonry unit (CMU) color ranges for each texture, as specified under products, shall be submitted to JEA for selection of color. Full size samples of the blocks selected shall be submitted for final review by JEA after color selection.

B. Submit compressive test reports of concrete block units satisfying the design strength requirements noted on the drawings and a notarized affidavit that the block units conform to the requirements of this Section.

C. Samples of mortar colors shall be submitted for color selection by JEA.

D. Submit manufacturer's product data and installer's detailed descriptive plans for installing the foamed-in-place wall insulation. The insulation shall be installed by installers certified by the manufacturer. Submit manufacturer certification of the installer contracted to perform the work.

E. Manufacturer's literature indicating mortar strength and composition.

F. Submit shop drawings for precast concrete lintels.

G. Mortar mix and water repellant admixture.

H. Reinforcements.

I. Ties.

J. Control joint filler (with manufacturer's literature).

K. Grout mix design - Quantities listed in the mix design shall be listed both by weight and by bulk volume for each component.

L. Accessories.

M. The CONTRACTOR through the manufacturer of the concrete masonry units shall furnish certificates, in triplicate, prior to delivery of any units to the jobsite. Each certificate shall be signed by an authorized officer of the manufacturing company and shall contain the name and address of the CONTRACTOR, the project location, the quantities, and date or dates of shipment and delivery to which the certificate applies. Units shall be certified for conformance with these Specifications.

N. Cold and/or hot weather construction procedures in accordance with ACI 530.1/ASCE 6 sections 2.3.2.2. and 2.3.2.3.

O. Cleaning procedures and cleaner for each masonry type.

P. Shop Drawings, Reinforced Unit Masonry: Submit shop drawings for fabrication, bending, and placement of reinforcing bars. Shop drawings shall comply with ACI 315

"Manual of Standard Practice for Detailing Reinforced Concrete Structures". Shop drawings shall include bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcing for unit masonry work.

1.05 QUALITY ASSURANCE

A. Before any masonry is laid, a sample panel shall be constructed for approval by JEA. The sample panel shall be 6-feet wide by 4-feet high, showing the CMU face, reinforcement, grouting, and type, color and tooling of mortar and bond. The approved wall sample panel shall remain in place for the duration of all masonry work, to serve as the standard of reference for all masonry. The sample panel shall be removed by the CONTRACTOR at the completion of the project.

B. JEA reserves the right to test materials for compliance with these specifications. Sampling and testing will be done in accordance with ASTM standards by an independent testing agency employed by JEA. Materials that fail to meet requirements are considered defective. Subsequent tests to establish compliance (of the same or new materials) shall be paid for by the CONTRACTOR.

1. Mortar testing shall be performed in accordance with ASTM C 109.

2. Masonry grout testing shall be performed in accordance with ASTM C 1019.

1.06 SHIPPING, HANDLING, AND STORAGE

A. All mortar materials shall be delivered, stored, and handled so as to prevent damage, deterioration, or contamination. All materials shall be stored under cover in a dry place and in the original packaging.

B. All concrete masonry units shall be stored under cover, in a dry place and in a manner to prevent damage, breakage, or staining. Blocks shall be delivered to the site dry, in conformance with the specification limitation for moisture content, and kept dry by storing off the ground and under cover. Blocks which have become wet shall be removed from the site by the CONTRACTOR.

C. All accessories shall be delivered to the site and stored in the manufacturers' original packaging. All materials shall be stored above ground and under weathertight cover.

PART 2 -- PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. General

1. All concrete masonry units shall be load bearing blocks conforming to ASTM C 90. Units shall be normal weight units unless shown or specified otherwise. Block shall be smooth finish block. Net area compressive strength of concrete masonry units shall be a minimum of 2,000 psi when tested in accordance with ASTM C 140. Compressive strength F'm shall be minimum of 2000 psi in accordance with ACI

530.1 when these units are tested with the mortar specified, unless otherwise indicated on the structural drawings. Reinforced wall units shall be 2 cell end blocks with cells aligned vertically when constructed.

2. All units shall be obtained from one manufacturer to ensure even color and texture throughout.

3. Nominal face dimensions shall be 8-inch by 8-inch by 16-inch, 12-inch by 8-inch by 16-inch, or "U" shaped CMU as indicated on the Drawings.

4. All bond beam, corner, lintel, sill, and other specially shaped blocks shall be provided and used where required or necessary. Specially shaped nonstructural blocks may be constructed by sawcutting. Color and texture shall match that of the adjacent units.

5. Provide units with integral water repellant admixture. Absorption shall not exceed 10 lbs per cubic foot.

2.02 MORTAR AND GROUT

A. Mortar shall be Type "M" mortar with average compressive strength at 28 days of 2,500 psi; in accordance with ASTM C 270.

B. The mortar shall be dry mixed to laboratory established proportions with only as much water added as required to produce a workable mix.

C. Hydrated lime shall conform to the requirements of ASTM C 207, Type "S", domestic manufactured.

D. Sand shall be clean, durable particles, free from injurious amounts of organic matter. The sand shall conform to the requirements of ASTM C 144.

E. Water shall be from a potable source, suitable for domestic consumption.

F. Admixture for the mortar shall be Master Builders "Omicron Mortarproofing"; Sika Chemical Company "Sika Red Label"; or equal. The admixture shall not be detrimental to the bonding of the mortar.

G. Masonry Grout shall conform to the requirements of ASTM C 476 and ACI 530.1. Grout shall be plant batched peagravel 3000 psi 28 day compressive strength.

H. Sand for grout shall conform to ASTM C 404 or ASTM C 33, as required.

I. Admixture for grout shall be Sika Chemical Company "Sika Grout Aid", Type II; Master Builders "Pozzolith", normal; or equal.

2.03 MASONRY ACCESSORIES

A. The following list of companies manufacture products that are acceptable for this section, subject to conformance with the specified requirements: Dur-O-Wall Products, A.A. Wire Products; Hohman Barnard, Keystone Steel and Wire Company, or equal.

B. Masonry Joint Reinforcement

1. All masonry joint reinforcement shall be fabricated from cold- drawn steel wire, conforming to ASTM A 951.

2. Reinforcement shall consist of two parallel longitudinal deformed wires, not less than 8 gauge, weld-connected with cross-wires, not less than 9 gauge, in a triangular pattern. For vertically reinforced walls, cross wires shall be of a rectangular pattern.

3. Out to out spacing of the longitudinal wires shall be 2 inches less than the nominal width of the wall.

4. The distance between the welded contacts of cross wires with each longitudinal wire shall not exceed 16 inches, staggered.

5. Cross wires shall be in the same plane with the longitudinal wires.

6. Reinforcement shall be provided in minimum 10-foot sections. All corners and tees shall be provided prefabricated, of the same materials as the joint reinforcement.

7. Joint reinforcement shall be Dur-O-Wall, Dur-O-Wall Products; Block-Lok, A.A. Wire Products; Truss-Mesh Lock, Hohman Barnard; Key-Wall Truss, Keystone Steel and Wire Company; or equal .

8. Reinforcing bars shall conform to "Specifications for Deformed Billet Steel Bars for Concrete Reinforcement" (ASTM A 615), grade 60, except 1/4" diameter smooth bars which shall be grade 40.

C. Anchor and Ties

1. Anchors and ties shall be hot-dip galvanized ferrous metals.

2. Wire mesh ties shall be minimum 16-gauge, 1/2-inch mesh of steel wire. Ties shall be a minimum of 12-inches in length, and 1-inch less in width than the wall in which they are placed.

3. Rigid steel anchors shall be 1-1/2-inch by 1/4-inch with ends turned up 1/4-inch at the outer end.

4. Dovetail anchors shall be minimum 16-gauge, 1-inch wide, and turned up 1/4-inch at the outer end.

5. Corrugated or crimped metal ties shall be made of steel sheet not less than 7/8-inch wide, 22 gauge in thickness, 6 inches in length.

2.04 FOAMED-IN-PLACE MASONRY WALL INSULATION

A. Insulation shall be a two-component, foamed-in-place thermal insulation comprising of an amino-plast resin and a catalyst foaming agent surfactant that when injected into open cavities of block will flow and completely fill the open cells.

B. Foamed-in-place insulation shall conform to the requirements of Core-Fill 500 as manufactured by Tailored Chemical Products, Hickory, NC, or approved equal. Tailored Foam of Florida, Inc., Sanford, Florida is an approved applicator of Core-Fill 500 foam insulation.

C. Insulation shall be non-combustible, Class A building material.

D. Insulation shall have an R value of 4.9 per inch at 32 degrees Fahrenheit per ASTM C-177.

PART 3 -- EXECUTION

3.01 GENERAL

A. All Work shall be performed in accordance with the provisions of the FBC for concrete hollow-unit masonry.

B. All masonry shall be laid plumb and true to line. Bond shall be maintained such that the horizontal or vertical alignment of the foundation shall not be more than 1 inch out of plumb.

C. The CONTRACTOR shall set or embed in the Work all anchors, bolts, reglets, sleeves, conduits, and other items as required. Where bolts or other items are anchored into the masonry, those cells shall be grouted solid after the embedded items are in place.

D. No construction support shall be attached to the wall except where specifically permitted by JEA.

E. All masonry slots, chases, or openings required for the proper installation of the Work of other Sections shall be constructed as indicated on the Drawings, or in accordance with information furnished, prior to starting Work in those areas. No chase shall be cut into any constructed hollow unit masonry wall, except as directed or reviewed by JEA.

F. Surfaces shall be brushed as Work progresses, and maintained as clean as is practicable. Unfinished Work shall be raked back where possible, and toothed only where absolutely necessary.

G. All fresh or unfinished Work shall be fully covered and protected against rain and wind. Before continuing work, all previously laid Work shall be swept clean. The tops of walls or other unfinished Work shall be protected against all damage by means of waterproof paper, tarpaulins, boards, or other means satisfactory to JEA.

H. Anchors and ties shall be placed a minimum of 16-inches vertically and 24-inches horizontally, unless otherwise indicated. Anchors and ties for masonry shall be provided into adjacent concrete walls, columns, or beams at the above specified spacings.

I. Over-plumbing and pounding shall be avoided, at corners and jambs, for fitting stretcher units after they are set in position. Where adjustment must be made after mortar has started to harden, the mortar shall be removed and replaced with fresh mortar.

J. Concrete brick shall be used to course out walls which are concealed in the finished work.

K. Masonry units shall be cut straight, and true, using power masonry saws.

L. Cold and hot weather construction

1. No masonry shall be erected when ambient temperature has dropped below 45^0 F unless it is rising and at no time when it has dropped below 40^0 F. Provisions shall be made for heating and drying of materials, and the complete work shall be protected in accordance with ACI 530.1 section 1.8C. Masonry shall not be laid with ice or frost on its surfaces, and no masonry shall be laid on frozen work. Any work which freezes before the mortar has set shall be removed and replaced at the CONTRACTOR's own expense. Do not use any admixtures or antifreeze in the mortar.

2. When temperature is above 100^0 F or 90^0 F with a wind velocity greater than 8 MPH, mortar beds shall be spread no more than 4 feet ahead of masonry and masonry shall be set within one minute of spreading mortar.

3.02 LAYOUTS

A. The CONTRACTOR shall lay out the coursing horizontally and vertically, as shown on the Drawings.

B. Block cuts less than 4-inches wide shall be avoided.

C. Vertical coursing shall be 8-inches, with 3/8-inch thick mortar joints.

D. Bed joints shall be indicated to receive masonry joint reinforcing, ties, and/or anchors.

3.03 REINFORCING

A. All reinforced horizontal joints shall be reinforced continuously with ends lapped 8-inches, and laps staggered vertically. Horizontal reinforcing shall have a vertical spacing of 16-inches on center unless noted otherwise. Prefabricated corners and tees shall be provided at all horizontal wall intersections.

B. Reinforcing shall be provided in the bed joints immediately above and below all masonry openings.

C. Mortar joints with wire reinforcement shall be at least twice the thickness of the wire.

D. Where knock-out openings are indicated on the Drawings, no steel or joint reinforcement shall run continuously through the openings.

E. Prior to placing metal reinforcing, anchors, and ties, all loose rust, tie wires, tags and all other foreign matter that may reduce bond shall be removed.

F. Reinforcing shall be placed as indicated on the Drawings and general notes. Place a minimum of two No. 5 bars in each bond beam or lintel, and a minimum of one No. 5 bar at all jambs, corners, intersections and wall ends of concrete blockwalls, whether indicated or not. Lintels shall extend 8-inches past the openings. Lap reinforcing bars 48 diameters or 30 inches minimum at splices. All cells containing reinforcing shall be filled solid with grout.

G. When a dowel does not line up with a vertical core, it shall not be sloped more than 1 horizontal in 6 vertical. Dowels shall be grouted into a core in vertical alignment, even though they are in adjacent cell to the vertical wall reinforcing.

3.04 BOND AND JOINTS

A. All masonry units shall be laid in running bond by lapping units in successive courses a distance of one-half unit.

B. The starting joint of foundations and floor slab shall be laid with full mortar coverage on the bed except that the area where grout occurs shall be kept free from mortar so that the grout will bond (contact) with concrete already placed.

C. All courses shall be level, with joints of uniform width. Units shall have full mortar coverage of the face shells in both the horizontal and vertical joints. Reinforced cells shall have mortar coverage on cross webs also to prevent grout leakage to adjacent cells.

D. All joints shall be pointed solid with mortar on both sides and wall of block. Joints in exposed Work shall be finished concave with finishing tool, to create a dense surface. Interior and exterior joints in nonexposed or plaster covered masonry shall be flush.

E. All sound absorptive concrete masonry units shall be laid in stack bond with the open ends of the cavities facing downward, and shall be seated in a full bed of mortar.

F. Slots shall be provided to expose the areas where sound absorption is desired, as indicated on the Drawings. Care shall be taken to ensure that the slots are kept free of mortar or debris above mortar joints.

3.05 CONTROL JOINTS

A. Control joints shall be installed as detailed and where shown on the Drawings or needed.

B. The maximum horizontal distance between vertical control joints shall be 30 feet, but joints shall be located only as reviewed by JEA or as shown.

C. Joints shall be equal in width to the standard mortar joints.

D. Horizontal joint reinforcing shall be discontinuous at control joints.

3.06 MORTAR AND GROUT

A. All equipment used in placing, moving, and storing mortar shall be thoroughly cleaned at the end of each day's work.

B. Mortar that, in the opinion of JEA, has begun to set shall not be used.

C. All courses shall be laid in full mortar beds. All units shall be laid with mortar applied to the face shells of blocks previously laid, as well as to blocks being laid, to ensure well filled joints.

D. Where new masonry is joined to existing or partially set work, loose mortar and joints shall first be cleaned. When it is necessary to stop a horizontal run, rack back one-half block length in each course; toothing shall not be permitted.

E. Hollow metal frames, mullions, and spaces around built-in items shall be filled solidly with grout.

F. Proportioning and Mixing of Mortar

1. Measurement of materials shall be such that the specified proportions are controlled and accurately maintained.

2. Workability of consistency of the mortar on the board shall be sufficiently wet to be worked under the trowel. Water for tempering shall be available on the scaffold at all times. Mortar which has begun to set after initial mixing shall be discarded. Mortar which has stiffened due to evaporation shall be retempered to restore its workability. Retempering the mortar at the mixer shall not be permitted.

3. Mortar shall be machine mixed in a type of mortar mixer which is acceptable to JEA, and in which the quantity of water can be accurately and uniformly controlled.

4. The mixing time shall not be less than 5 minutes, approximately 2 minutes of which shall be for mixing the dry materials, and not less than 3 minutes for continuing the mixing after the water has been added.

5. Where hydrated lime is used for mortar requiring a lime content, the CONTRACTOR has the option of using the dry-mix method or first converting the lime into a putty. Where the dry-mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed, dry materials indicates that the cementitious materials have been thoroughly distributed throughout the mass. After this point, the water shall be gradually added.

G. Mortar and grout drippings shall be cleaned from exposed masonry and adjacent surfaces immediately, to prevent surfaces from being permanently stained. Drippings and smears shall be removed before mortar and/or grout sets or hardens. Mortar extruded beyond faces of walls or partitions shall be removed.

H. Grouting

1. Grouting shall not be started until walls have cured a minimum of 24 hours.

2. Reinforcing steel shall be secured in place and inspected before grouting starts. Inform JEA for inspection.

3. Mortar drippings shall be kept out of the grout space.

4. Vertical cells to be filled shall have vertical alignment to maintain a continuous unobstructed cell area not less than 2 inches by 3 inches.

5. All cells to be grouted including those with reinforcing shall be solidly filled with grout. Consolidate at time of pouring by puddling (rodding) or vibrating with mechanical vibrators and reconsolidate again after 5 to 10 minutes and no later than 20 minutes to allow water absorption by concrete block.

6. Grout shall be consolidated by puddling or mechanical vibrating during g placement, and reconsolidated after excess moisture has been absorbed, but before plasticity is lost.

7. All anchor bolts and other embedded items shall be securely held in place during the grouting operation.

8. Grouting shall be done in pours no exceeding 10 feet and lifts of a maximum of 5 feet. Provide pre-cut full block height clean out holes at the first course of all cores containing vertical reinforcement. As successive masonry lifts are laid, remove mortar dripping from the grout space and off the reinforcing steel. Prior to grouting and boarding the cleanout opening, remove all leftover mortar drippings and loose materials and flush out the reinforced cell with water. Board up the opening only after JEA's inspection and approval.

I. Installation of all masonry accessories shall be in strict accordance with manufacturer's recommendations for the particular product. In the event that no specific installation instructions are provided by the manufacturer, accepted industry standard shall be adhered to.

3.07 INSULATION

A. Install foamed-in-place insulation in ungrouted cells of masonry units where shown and/or noted on the drawings.

B. The foamed-in-place insulation shall be pressure injected through a series of 5/8-inch to 7/8-inch holes drilled into every vertical column of block cells beginning at an approximate height of four feet from the finished floor level. Holes shall be patched with mortar and scored to resemble existing surface.

C. Foamed-in-place insulation shall be placed prior to installation of interior finish work, after all masonry and structural concrete work is in place, and once moisture content of

in-place CMU is acceptable to the manufacturer. Installation shall comply with manufacturer's instructions.

D. Remove excess materials and debris promptly. Remove mortar drippings from masonry and adjacent work before final set.

E. All holes and openings in the wall through which insulation can escape shall be permanently sealed or caulked prior to installation of the insulation. Copper, galvanized steel, or fiber glass screening shall be used in all weep holes.

3.08 BUILT-IN WORK

A. Furnish and install all anchor bolts, access doors and frames, and all metal work to be built into masonry which is not specified to be furnished under any other heading of the Specifications.

B. The masonry contractor shall thoroughly familiarize himself with all the requirements of the structural steel and reinforced concrete work and specifications, and he must make his own work conform to the requirements therein illustrated or described. He shall build in all the structural steel and miscellaneous iron work of every description.

C. Thoroughly tie in all anchors and secure masonry work to the concrete work in a careful manner. All pockets and openings must be filled solidly with mortar so as to leave no air space or pockets to collect moisture. No iron work shall be covered or built-in unless thoroughly painted by the CONTRACTOR setting it.

D. The masonry contractor shall build-in items furnished by others.

E. The masonry contractor shall coordinate his work with mechanical and electrical trades in order to accommodate all built-in pipes and conduits.

3.09 LINTELS

A. Furnish and install precast reinforced concrete lintel at all openings in masonry walls not having poured lintel or tie beam at top. Provide 8" minimum bearing either side of opening. Bottom flange of precast lintels shall be pre-cut at bearing to allow passage of reinforcing and grout.

3.10 CLEANING AND POINTING

A. All masonry to be left exposed shall be cleaned thoroughly with 5 percent muriatic acid solution using stiff brush and rinse thoroughly with clear water.

B. Point all holes and chipped areas in exposed masonry. Cut out defective joints and tuck pointed solidly with like mortar.

C. Remove all loose and excess mortar prior to cleaning.

3.11 PARGING

A. Parge masonry walls where shown or indicated on the drawings in two uniform costs of mortar. Maintain 3/4 inch total thickness.

B. Dampen masonry walls prior to application.

C. Scarify base coat to ensure full bond to subsequent coat.

D. Steel trowel surface smooth and flat.

- END OF SECTION

SECTION 05010

METAL MATERIALS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Metal materials not otherwise specified shall conform to the requirements of this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Materials for fasteners are included in Section 05050 entitled "Metal Fastening".

B. Requirements for specific products made from the materials specified herein are included in other sections of the Specifications. See the section for the specific item in question.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A.	ASTM A36	Standard Specification for Structural Steel
B.	ASTM A47	Standard Specification for Malleable Iron Castings
C.	ASTM A48	Standard Specification for Gray Iron Castings
D.	ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
E.	ASTM A167	Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
F.	ASTM A276	Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes
G.	ASTM A307	Standard Specification for Carbon Steel Externally Threaded Standard Fasteners
H.	ASTM A446	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) quality
I.	ASTM A500	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
J.	ASTM A501	Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

K.	ASTM A529	Standard Specification for Structural Steel with 42 000 psi (290 Mpa) Minimum Yield Point (1/2 in. (12.7 mm) Maximum Thickness)
L.	ASTM A536	Standard Specification for Ductile Iron Castings
M.	ASTM A570	Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
N.	ASTM A572/ A572M-94C	Standard Specification for High Strength Low-Alloy Columbium-Vanadium Structural Steel Grade 50
O.	ASTM A666	Standard Specification for Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar for Structural Applications
P.	ASTM A992	Standard Specification for Structural Steel Shapes
Q.	ASTM A1085	Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)
R.	ASTM B26	Standard Specification for Aluminum-Alloy Sand Castings
S.	ASTM B85	Standard Specification for Aluminum-Alloy Die Castings
T.	ASTM B108	Standard Specification for Aluminum-Alloy Permanent Mold Castings
U.	ASTM B138	Standard Specification for Manganese Bronze Rod, Bar, and Shapes
V.	ASTM B209	Standard Specification for Aluminum-Alloy Sheet and Plate
W.	ASTM B221	Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
X.	ASTM B308	Standard Specification for Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded
Y.	ASTM B574	Standard Specification for Nickel-Molybdenum-Chromium Alloy Rod
Z	ASTM F468	Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
AA.	ASTM F593	Standard Specification for Stainless Steel Fasteners

1.04 SUBMITTALS

A. Material certifications shall be submitted along with any shop drawings for metal products and fabrications required by other sections of the Specifications.

1.05 QUALITY ASSURANCE

A. JEA may engage the services of a testing agency to test any metal materials for conformance with the material requirements herein. If the material is found to be in conformance with Specifications the cost of testing will be borne by JEA. If the material does not conform to the Specifications, the cost of testing shall be paid by the CONTRACTOR and all materials not in conformance as determined by the Engineer shall be replaced by the CONTRACTOR at no additional cost to JEA. In lieu of replacing materials the CONTRACTOR may request further testing to determine conformance, but any such testing shall be paid for by the CONTRACTOR regardless of outcome of such testing.

PART 2 -- PRODUCTS

2.01 CARBON AND LOW ALLOY STEEL

A. Material types and ASTM designations shall be as listed below:

1.	Steel W Shapes	A 992
2.	Steel S, M, C, MC Shapes and Angles, Bars, and Plates	A 36
3.	Steel HP Shapes	A 572, Grade 50
4.	Rods	F 1554 Grade 36
5.	Pipe – Structural Use	A53 Grade B
6.	Hollow Structural Sections	A500 Grade C or A1085
7.	Cold-Formed Steel Framing	A 653

2.02 STAINLESS STEEL

A. All stainless steel fabrications shall be Type 316.

B. Material types and ASTM designations are listed below:

1.	Plates and Sheets	ASTM A167 or A666 Grade A
2.	Structural Shapes	ASTM A276
3.	Fasteners (Bolts, etc.)	ASTM F593

2.03 ALUMINUM

A. All aluminum shall be alloy 6061-T6, unless otherwise noted or specified herein.

B. Material types and ASTM designations are listed below:

1.	Structural Shapes	ASTM B308
2.	Castings	ASTM B26, B85, or B108
3.	Extruded Bars	ASTM B221 - Alloy 6061
4.	Extruded Rods, Shapes and Tubes	ASTM B221 - Alloy 6063
5.	Plates	ASTM B209 - Alloy 6061
6.	Sheets	ASTM B221 - Alloy 3003

C. All aluminum shall be provided with mill finish unless otherwise noted.

D. Where bolted connections are indicated, aluminum shall be fastened with Type 316 stainless steel bolts.

E. Aluminum in contact with dissimilar materials shall be insulated with an approved dielectric.

2.04 CAST IRON

A. Material types and ASTM designations are listed below:

1.	Gray	ASTM A48 Class 30B
2.	Malleable	ASTM A47
3.	Ductile	ASTM A536 Grade 60-40-18

2.05 BRONZE

A. Material types and ASTM designations are listed below:

1.	Rods, Bars and Sheets	ASTM B138 - Alloy B Soft

2.06 HASTELLOY

A. All Hastelloy shall be Alloy C-276.

2.07 DISSIMILAR METALS

A. Dielectric isolation shall be installed wherever dissimilar metals are connected according to the following table.

	Zinc	Galvanized Steel	Aluminum	Cast Iron	Ductile Iron	Mild Steel/ Carbon Steel	Copper	Brass	Stainless Steel
Zinc			●	●	●	●	●	●	●
Galvanized Steel			●	●	●	●	●	●	●
Aluminum	●	●		●	●	●	●	●	●
Cast Iron	●	●	●				●	●	●
Ductile Iron	●	●	●				●	●	●
Mild Steel/ Carbon Steel	●	●	●				●	●	●
Copper	●	●	●	●	●	●			●
Brass	●	●	●	●	●	●			●
Stainless Steel	●	●	●	●	●	●	●	●	

1. "●" signifies dielectric isolation is required between the two materials noted.
2. Consult Engineer for items not listed in table.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 05035

GALVANIZING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Where galvanizing is called for in the Contract Documents, the galvanizing shall be performed in accordance with the provisions of this Section unless otherwise noted.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Further requirements for galvanizing specific items may be included in other Sections of the Specifications. See section for the specific item in question.

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Florida Building Code

2. ASTM A123 - Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

3. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

4. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized), or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

5. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

6. ASTM A780 - Standard Practice of Repair of Damaged Hot-Dip Galvanized Coatings

7. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300 entitled "Submittals".

1. Certification that the item(s) are galvanized in accordance with the applicable ASTM standards specified herein. This certification may be included as part of any material certification that may be required by other Sections of the Specifications.

PART 2 -- PRODUCTS

2.01 GALVANIC COATING

A. Material composition of the galvanic coating shall be in accordance with the applicable ASTM standards specified herein.

PART 3 -- EXECUTION

3.01 FABRICATED PRODUCTS

A. Products fabricated from rolled, pressed, and forged steel shapes, plates, bars, and strips, 1/8-inch thick and heavier which are to be galvanized shall be galvanized in accordance with ASTM A123. Products shall be fabricated into the largest unit which is practicable to galvanize before the galvanizing is done. Fabrication shall include all operations necessary to complete the unit such as shearing, cutting, punching, forming, drilling, milling, bending, and welding. Components of bolted or riveted assemblies shall be galvanized separately before assembly. When it is necessary to straighten any sections after galvanizing, such work shall be performed without damage to the zinc coating. The galvanizer shall be a member of American Galvanizers Association.

B. Components with partial surface finishes shall be commercial blast cleaned prior to pickling.

C. Sampling and testing of each lot shall be performed prior to shipment from the galvanizer’s facility per ASTM A123.

3.02 HARDWARE

A. Iron and steel hardware which is to be galvanized shall be galvanized in accordance with ASTM A153.

3.03 ASSEMBLED PRODUCTS

A. Assembled steel products which are to be galvanized shall be galvanized in accordance with ASTM A123. All edges of tightly contacting surfaces shall be completely sealed by welding before galvanizing.

B. Assemblies shall be provided with vent and drain holes as required by the fabricator. Vent and drain hole sizes and locations shall be included in the steel shop drawings. All vent and drain holes shall be plugged and finished to be flush with and blend in with

the surrounding surface. Where water intrusion can occur, the plug shall be carefully melted into the surrounding zinc coating using appropriate fluxing agent.

3.04 SHEETS

A. Iron or steel sheets which are to be galvanized shall be galvanized in accordance with ASTM A924.

3.05 REPAIR OF GALVANIZING

A. Galvanized surfaces that are abraded or damaged at any time after the application of zinc coating shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the cleaned areas shall be painted with 2 coats of zinc rich paint meeting the requirements of Federal Specification DOD-P-21035A and shall be thoroughly mixed prior to application. Zinc rich paint shall not be tinted. The total thickness of the 2 coats shall not be less than 6 mils. In lieu of repairing by painting with zinc rich paint, other methods of repairing galvanized surfaces in accordance with ASTM A780 may be used provided the proposed method is acceptable to the Engineer.

- END OF SECTION -

SECTION 05050

METAL FASTENING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish all materials, labor, and equipment required to provide all metal welds and fasteners not otherwise specified, in accordance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05010 - Metal Materials

B. Section 05035 - Galvanizing

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1.	Florida Building Code	
2.	AC 193	Acceptance Criteria for Mechanical Anchors in Concrete Elements
3.	AC 308	Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements
4.	ACI 318	Building Code Requirements for Structural Concrete
5.	ACI 355.2	Qualifications of Post-Installed Mechanical Anchors in Concrete
6.	ACI 355.4	Qualification of Post-Installed Adhesive Anchors in Concrete
7.	AISC 348	The 2009 RCSC Specification for Structural Joints
8.	AISC	Code of Standard Practice
9.	AWS D1.1	Structural Welding Code - Steel
10.	AWS D1.2	Structural Welding Code – Aluminum

11.	AWS D1.6	Structural Welding Code – Stainless Steel
12.	Aluminum Association	Specifications for Aluminum Structures
13.	ASTM A572/A572M-94C	Standard Specification for High Strength Low-Alloy Columbium-Vanadium Structural Steel Grade 50
14.	ASTM A36	Standard Specification for Carbon Structural Steel
15.	ASTM A325	Standard Specification for High-Strength Bolts for Structural Steel Joints
16.	ASTM A489	Standard Specification for Eyebolts
17.	ASTM A490	Standard Specification for Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints
18.	ASTM A563	Standard Specifications for Carbon and Alloy Steel Nuts
19.	ASTM D1785	Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe
20.	ASTM E488	Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
21.	ASTM F436	Standard Specification for Hardened Steel Washers
22.	ASTM F467	Standard Specification for Nonferrous Nuts for General Use
23.	ASTM F593	Standard Specification for Stainless Steel Bolts; Hex Cap Screws, and Studs
24.	ASTM F594	Standard Specification for Stainless Steel Nuts
25.	ASTM F1554	Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

1.04 SUBMITTALS

A. Submit the following items in accordance with Section 01300 entitled "Submittals":

1. Shop Drawings providing the fastener's manufacturer and type and certification of the fastener's material and capacity.

2. Anchor design calculations sealed by a Professional Engineer currently registered in the State of Florida. Only required if design not shown on Contract Drawings.

3. A current ICC-ES Evaluation Service Report shall be submitted for all anchors that will be considered for use on this project.

4. Manufacturer's installation instructions.

5. Welder certifications for each person who is to perform field welding. Certifications shall be from a recognized testing laboratory.

6. Certified weld inspection reports, when required.

7. Welding procedures.

8. Installer qualification of post-intstalled anchors

9. Certification of Installer Training

10. Inspection Reports

11. Results of Anchor Proof Testing

12. For outdoor equipment, anchorage calculations to resist design wind loads, signed and sealed by a Professional Engineer registered in the State of Florida.

1.05 QUALITY ASSURANCE

A. Fasteners not manufactured in the United States shall be tested and certification provided with respect to specified quality and strength standards. Certifications of origin shall be submitted for all U.S. fasteners supplied on the project.

B. Installer Qualifications: All concrete anchors shall be installed by an Installer with at least three years of experience performing similar installations. Concrete adhesive anchor installer shall be certified as an Adhesive Anchor Installer in accordance with ACI-CRSI Adhesive Anchor Installation Certification Program.

C. Installer Training: For concrete adhesive, expansion and screw anchors, conduct a thorough training with the manufacturer or the manufacturer's representative for the Installer on the project. Training shall consist of a review of the complete installation process for drilled-in anchors, to include but not be limited to the following:

1. Hole drilling procedure.

2. Hole preparation and cleaning technique.

3. Adhesive injection technique and dispenser training/maintenance.

4. Rebar doweling preparation and installation.

5. Proof loading/torquing.

6. Provide a list of names of all installers who are trained by the Manufacturer's Field Representative on this jobsite prior to installation of products. Record must

include the installer name, date of training, products included in the training and trainer name and contact information

7. Provide a copy of the current ACI/CRSI “Adhesive Anchor Installer” certification cards for all installers who will be installing adhesive anchors in the horizontal to vertically overhead orientation.

D. All steel welding shall be performed by welders certified in accordance with AWS D1.1. All aluminum welding shall be performed by welders certified in accordance with AWS D1.2. All stainless steel welding shall be performed by welders certified in accordance with AWS D1.6. Certifications of field welders shall be submitted prior to performing any field welds.

E. Welds and high strength bolts used in connections of structural steel will be visually inspected in accordance with Article 3.04 of this Section.

F. JEA may engage an independent testing agency to perform testing of welded connections and to prepare test reports in accordance with AWS. Inadequate welds shall be corrected or redone and retested to the satisfaction of the Engineer and/or an acceptable independent testing laboratory, at no additional cost to JEA.

G. Provide a welding procedure for each type and thickness of weld. For welds that are not prequalified, include a Performance Qualification Report. The welding procedure shall be given to each welder performing the weld. The welding procedure shall follow the format in Annex E of AWS D1.1 with relevant information presented.

H. Inspections of the adhesive dowel system shall be made by the Engineer or other representatives of the Owner in accordance with the requirements of the ESR published by the manufacturer. Provide adequate time and access for inspections of products and anchor holes prior to injections, installation, and proof testing.

PART 2 -- PRODUCTS

2.01 ANCHOR RODS (ANCHOR BOLTS)

A. For all conditions throughout this Contract, all anchor bolts shall be Type 316 stainless steel conforming to ASTM F-593 unless noted otherwise.

B. Nuts shall conform to ASTM F-594, alloy 316.

C. Where anchor rods are used to anchor galvanized steel or are otherwise specified to be galvanized, anchor rods and nuts shall be hot-dip galvanized. Galvanized anchor rods shall conform to ASTM F1554 Grade 36, and nuts shall conform to ASTM A563 Grade A.

D. Where pipe sleeves around anchor rods are shown on the Drawings, pipe sleeves shall be cut from Schedule 80 PVC plastic piping meeting the requirements of ASTM D1785, unless noted otherwise.

E. Equipment manufacturers, fabricators, and suppliers shall design and furnish anchor bolts as required to install the supplied units. The anchor bolt layout shall be coordinated with concrete work as specified herein.

F. Drilled in type anchor bolts, either adhesive types or mechanical types shall not be used unless approved in writing by the manufacturer/fabricator of equipment or covers, subject to acceptance by the Engineer. All operating pieces of equipment such as pumps, generators, motors etc. shall not be anchored with wedge anchors or other mechanical anchors. Drilled in type anchor bolts shall be Type 316 stainless steel. Drilled in type anchor bolts are specified under Article 2.04 of this Section entitled "Concrete Anchors".

2.02 HIGH STRENGTH BOLTS

A. High strength bolts and associated nuts and washers shall be in accordance with ASTM A325 or ASTM A490. Bolts, nuts and washers shall meet the requirements of AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

B. Where high strength bolts are used to connect galvanized steel or are otherwise specified to be galvanized, bolts, nuts, and washers shall be hot-dip galvanized in accordance with ASTM A325.

2.03 STAINLESS STEEL BOLTS

A. Stainless steel bolts shall conform to ASTM F-593. All underwater fasteners, fasteners in confined areas containing fluid, and fasteners in corrosive environments shall be Type 316 stainless steel. Unless otherwise specified, fasteners for aluminum and stainless steel members shall be Type 316 stainless steel.

B. Stainless steel bolts shall have hexagonal heads with a raised letter or symbol on the bolts indicating the manufacturer, and shall be supplied with hexagonal nuts meeting the requirements of ASTM F594. Nuts shall be of the same alloy as the bolts.

2.04 CONCRETE ANCHORS

A. General

1. Where concrete anchors are called for on the Drawings, one of the types listed below shall be used; except, where one of the types listed below is specifically called for on the Drawings, only that type shall be used. The determination of anchors equivalent to those listed below shall be on the basis of test data performed by an approved independent testing laboratory. There are two types used:

a. Expansion anchors shall be mechanical anchors of the wedge, sleeve, drop-in or undercut type.

b. Adhesive anchors shall consist of threaded rods or bolts anchored with an adhesive system into hardened concrete. Adhesive anchors shall be two part injection type using the manufacturer’s static mixing nozzle and shall be supplied as an entire system.

2. Expansion anchors shall not be used to hang items from above or in any other situation where direct tension forces are induced in anchor.

3. Unless otherwise noted, all concrete anchors which are submerged or are used in hanging items or have direct tension induced upon them, or which are subject to vibration from equipment such as pumps and generators, shall be adhesive anchors.

4. Adhesive anchors shall conform to the requirements of ACI 355.4 or alternately to AC308. Expansion, concrete screw or mechanical anchors shall conform to the requirements of ACI 355.2 or alternately to AC 193.

5. All anchors installed within fire resistant construction shall either be enclosed in a fire resistant envelope, be protected by approved fire-resistive materials, be used to resist wind loads only, or anchor non-structural elements.

6. Engineer's approval is required for use of concrete anchors in locations other than those shown on the Drawings.

B. Concrete Anchor Design: An anchor design consists of specifying anchor size, quantity, spacing, edge distance and embedment to resist all applicable loads. Where an anchor design is indicated on the Drawings, it shall be considered an engineered design and anchors shall be installed to the prescribed size, spacing, embedment depth and edge distance. If all parts of an anchor design are provided on the Drawings except embedment depth, the anchors will be considered an engineered design and the CONTRACTOR shall provide the embedment depth as indicated in Paragraph B.3 unless otherwise directed by JEA. Where an anchor design is not indicated on the Drawings, the CONTRACTOR shall provide the anchor design per the requirements listed below.

1. Structural Anchors: All concrete anchors shall be considered structural anchors if they transmit load between structural elements; transmit load between non-structural components that make up a portion of the structure and structural elements; or transmit load between life-safety related attachments and structural elements. Examples of structural concrete anchors include but are not limited to column anchor bolts, anchors supporting non-structural walls, sprinkler piping support anchors, anchors supporting heavy, suspended piping or equipment, anchors supporting barrier rails, etc. For structural anchors, the CONTRACTOR shall submit an engineered design with signed and sealed calculations performed by an Engineer currently registered in the State of Florida. Structural anchors shall be of a type recommended by the anchor manufacturer for use in cracked concrete and shall be designed by the Contractor in accordance with ACI 318 Appendix D.

2. Non-Structural Anchors: All other concrete anchors may be considered non-structural concrete anchors. The CONTRACTOR shall perform an engineered design for non-structural anchors. JEA may request the CONTRACTOR provide anchor design details for review, but submission of a signed, sealed design is not required. Non-structural anchors shall be designed by the contractor for use in uncracked concrete.

3. Embedment Depth

a. Minimum anchor embedment shall be as indicated on the Drawings or determined by the Contractor's engineered design. Although all manufacturers listed are permitted, the embedment depth indicated on the Drawings is based on "SET XP by Simpson Strong-Tie". If the Contractor submits one of the other concrete adhesives anchors listed, the Engineer shall evaluate the required embedment and the Contractor shall provide the required embedment depth stipulated by the Engineer specific to the approved dowel adhesive.

b. Where the embedment depth is not shown on the Drawings, concrete anchors shall be embedded no less than the manufacturer's standard embedment (expansion or mechanical anchors) or to provide a minimum allowable bond strength equal to the allowable yield capacity of the rod according to the manufacturer (adhesive anchors).

c. The embedment depth shall be determined using the actual concrete compressive strength, a cracked concrete state, maximum long term temperature of 110 degrees F, and maximum short term temperature of 140 degrees F. In no case shall the embedment depth be less than the minimum or more than the maximum stated in the manufacturer's literature.

C. Structural Anchors:

1. Mechanical Anchors:

a. Wedge Anchors: Wedge anchors shall be "Kwik Bolt TZ" by Hilti, Inc., "TruBolt +" by ITW Redhead, "Strong-Bolt 2" by Simpson Strong-Tie Co. or "Powerstud SD-1" or "Powerstud SD-2" by DeWalt.

b. Screw Anchors: Screw anchors shall be "Kwik HUS-EZ" and "KWIK HUS-EZ-I" by Hilti, Inc., "Titen HD" by Simpson Strong-Tie Co., or "Screw-Bolt+" by DeWalt. Bits specifically provided by manufacturer of chosen system shall be used for installation of anchors.

c. Sleeve Anchors: Sleeve anchors shall be "HSL-3 Heavy Duty Sleeve Anchor" by Hilti, Inc. or "Power-Bolt +" by DeWalt.

d. Undercut Anchors: Undercut anchors shall be "HDA Undercut Anchor" by Hilti, Inc., "Torq-Cut Undercut Anchor" by Simpson Strong-Tie Co., "Atomic + Undercut Anchor" by DeWalt.

e. Shallow Embedment Internally Threaded Insert (3/4" max embedment): "Mini-Undercut +Anchor" by Dewalt, "HSC-A" by Hilti, Inc. or equal.

2. Adhesive Anchors:

a. Adhesive anchors shall be “Epcon C6+ Adhesive Anchoring System” by ITW Redhead, “HIT HY-200 Adhesive Anchoring System” by Hilti, Inc., “SET-XP Epoxy Adhesive Anchors” by Simpson Strong-Tie Co., or “Pure 110+ Epoxy Adhesive Anchor System” by DeWalt.

b. Structural adhesive anchor systems shall be IBC compliant and capable of resisting short term wind and seismic loads (Seismic Design Categories A through F) as well as long term and short term sustained static loads in both cracked and uncracked concrete in all Seismic Design Categories. Structural adhesive anchor systems shall comply with the latest revision of ICC-ES Acceptance Criteria AC308, and shall have a valid ICC-ES report in accordance with the applicable building code. No or equal products will be considered unless prequalified and approved by the JEA.

D. Non-Structural Anchors: In addition to the acceptable non-structural anchors listed below, all structural anchors listed above may also be used as non-structural anchors.

1. Mechanical Anchors:

a. Wedge Anchors: Wedge anchors shall be “Kwik Bolt 3” by Hilti, Inc.,”Power-Stud+ SD1” by DeWalt, “Wedge-All” by Simpson Strong-Tie Co. or “TruBolt” by ITW Redhead.

b. Screw Anchors: Screw anchors shall be “Kwik HUS” by Hilti, Inc., “Screw Bolt+” by DeWalt “Large Diameter Tapcon (LDT) Anchor” by ITW Redhead, or “Titen HD” by Simpson Strong-Tie Co. Bits specifically provided by manufacturer of chosen system shall be used for installation of anchors.

c. Sleeve Anchors: Sleeve anchors shall be “HSL Heavy Duty Sleeve Anchors” by Hilti, Inc. “Power-Bolt+” by DeWalt, “Dynabolt Sleeve Anchor” by ITW Redhead, or “Sleeve-All” by Simpson Strong-Tie Co.

d. Drop-In Anchors: Drop-in anchors shall be “Drop-In” by Simpson Strong-Tie Co., “HDI Drop-In Anchor” by Hilti, Inc. , “Smart DI” by DeWalt or “Multi-Set II Drop-In Anchor” by ITW Redhead.

e. Undercut Anchors: Undercut anchors shall be “HDA Undercut Anchor” by Hilti, Inc., “Atomic Undercut+” by DeWalt or “Torq-Cut” by Simpson Strong-Tie Co.

2. Adhesive Anchors:

a. Adhesive anchors shall be “Epcon A7” or “Epcon C6+ Adhesive Anchoring System” by ITW Redhead, “HIT HY-200 Adhesive Anchoring System” by Hilti, Inc., “SET Epoxy Tie High Strength Anchoring Adhesive” or “AT High Strength Anchoring Adhesive” by Simpson Strong-Tie Co., or “AC 100+ Gold” Adhesive Anchoring System by DeWalt.

b. Non-structural adhesive anchors systems shall be IBC compliant and capable of resisting short term wind and seismic (Seismic Design

Categories A and B) as well as long term and short term sustained static loads in uncracked concrete.

c. Non-structural adhesive anchor embedment depth of the rod shall provide a minimum allowable bond strength that is equal to the allowable yield capacity of the rod unless noted otherwise on the Drawings.

d. No or equal products will be considered unless prequalified and approved by the JEA.

E. Concrete Anchor Rod/Bolt Materials:

1. Concrete anchors used to anchor structural steel shall be a threaded steel rod per manufacturer's recommendations for proposed adhesive system, but shall not have a yield strength (fy) less than 58 ksi nor an ultimate strength (fu) less than 72.5 ksi, unless noted otherwise. Where steel to be anchored is galvanized, concrete anchors shall also be galvanized unless otherwise indicated on the Drawings.

2. Concrete anchors used to anchor aluminum, FRP, or stainless steel shall be Type 304 stainless steel unless noted otherwise. All underwater concrete anchors shall be Type 316 stainless steel.

3. Nuts, washers, and other hardware shall be of a material to match the anchors.

2.05 MASONRY ANCHORS

A. Anchors for fastening to solid or grout-filled masonry shall be adhesive anchors as specified above for concrete anchors.

B. Anchors for fastening to hollow masonry or brick shall be adhesive anchors consisting of threaded rods or bolts anchored with an adhesive system dispensed into a screen tube inserted into the masonry. The adhesive system shall use a two-component adhesive mix and shall inject into the screen tube with a static mixing nozzle. Thoroughly clean drill holes of all debris and drill dust with nylon (not wire) brush prior to installation of adhesive and anchor. Contractor shall follow manufacturer's installation instructions. The adhesive system shall be "HIT HY-70 System" as manufactured by Hilti, Inc., or "AC100+ Acrylic Adhesive" by DeWalt, "SET-XP" as manufactured by Simpson Strong-Tie Co.

C. Masonry anchors used to anchor steel shall be a threaded steel rod per manufacturer's recommendations for proposed adhesive system, but shall not have a yield strength (fy) less than 58 ksi nor an ultimate strength (fu) less than 72.5 ksi, unless noted otherwise. All masonry anchors shall be Type 316 stainless steel except where steel to be anchored is galvanized, masonry anchors shall also be galvanized.

D. Masonry anchors used to anchor aluminum, FRP, or stainless steel shall be Type 316 stainless steel unless noted otherwise. All underwater anchors shall be Type 316 stainless steel.

E. Although all manufacturers listed are permitted, the masonry anchor design is based on “SET-XP by Simpson Strong-Tie ER 265 Revised 1-31-2017. If the contractor submits one of the other concrete adhesive anchors listed, the Engineer shall evaluate the proposed product and the Contractor shall provide the conditions stipulated by the Engineer specific to the approved adhesive anchor.

2.06 WELDS

A. Electrodes for welding structural steel and all ferrous steel shall comply with AWS Code, using E70 series electrodes for shielded metal arc welding (SMAW), or F7 series electrodes for submerged arc welding (SAW).

B. Electrodes for welding aluminum shall comply with the Aluminum Association Specifications and AWS D1.2.

C. Electrodes for welding stainless steel and other metals shall comply with AWS code.

2.07 WELDED STUD CONNECTORS

A. Welded stud connectors shall conform to the requirements of AWS D1.1 Type C.

2.08 EYEBOLTS

A. Eyebolts shall conform to ASTM A489 unless noted otherwise.

2.09 HASTELLOY FASTENERS

A. Hastelloy fasteners and nuts shall be constructed of Hastelloy C-276.

2.10 ANTISEIZE LUBRICANT

A. Antiseize lubricant shall be Graphite 50 Anti-Seize by Loctite Corporation, 1000 Anti-Seize Paste by Dow Corning, 3M Lube and Anti-Seize by 3M, or equal.

PART 3 -- EXECUTION

3.01 MEASUREMENTS

A. The CONTRACTOR shall verify all dimensions and review the Drawings and shall report any discrepancies to JEA for clarification prior to starting fabrication.

3.02 ANCHOR INSTALLATION

A. Anchor Bolts, Concrete Anchors, and Masonry Anchors

1. Anchor bolts shall be installed in accordance with AISC "Code of Standard Practice" by setting in concrete while it is being placed and positioned by means of a rigidly held template. Overhead adhesive anchors, and base plates or elements they are anchoring, shall be shored as required and securely held in

place during anchor setting to prevent movement during anchor installation. Movement of anchors during curing is prohibited

2. The CONTRACTOR shall verify that all concrete and masonry anchors have been installed in accordance with the manufacturer's recommendations and that the capacity of the installed anchor meets or exceeds the specified safe holding capacity.

3. Concrete anchors shall not be used in place of anchor bolts without JEA approval.

4. All stainless steel threads shall be coated with antiseize lubricant.

B. High Strength Bolts

1. All bolted connections for structural steel shall use high strength bolts. High strength bolts shall be installed in accordance with AISC 348 "The 2009 RCSC Specification for Structural Joints". All bolted joints shall be Type N, snug-tight, bearing connections in accordance with AISC Specifications unless noted otherwise on the Drawings.

2. All stainless steel bolts shall be coated with antiseize lubricant.

C. Concrete Anchors

1. Concrete at time of anchor installation shall be a minimum age of 21 days.

2. Concrete anchors designed by the Contractor shall be classified as structural or non-structural based on the requirements indicated above.

3. Concrete Anchor Testing:

a. At all locations where concrete anchors meet the requirements for structural anchors at least 5 percent of all concrete anchors installed shall be proof tested to the value indicated on the Drawings, with a minimum of one tested anchor per anchor group. If no test value is indicated on the Drawings but the installed anchor meets the requirements for structural anchors, the Contractor shall notify the Engineer to allow verification of whether anchor load proof testing is required.

b. Contractor shall submit a plan and schedule indicating locations of anchors to be tested, load test values and proposed anchor testing procedure (including a diagram of the testing equipment proposed for use) to the Engineer for review prior to conducting any testing. Testing of anchors shall be in accordance with ASTM E488 for the static tension test. If additional tests are required, inclusion of these tests shall be as stipulated on Contract Drawings.

c. Where Contract Documents indicate anchorage design to be the Contractor's responsibility and the anchors are considered structural per the above criteria, the Contractor shall submit a plan and schedule

indicating locations of anchors to be proof tested and load test values, sealed by a Professional Engineer currently registered in the State of Florida. The Contractor's Engineer shall also submit documentation indicating the Contractor's testing procedures have been reviewed and the proposed procedures are acceptable. Testing procedures shall be in accordance with ASTM E488.

d. Concrete Anchors shall have no visible indications of displacement or damage during or after the proof test. Concrete cracking in the vicinity of the anchor after loading shall be considered a failure. Anchors exhibiting damage shall be removed and replaced. If more than 5 percent of tested anchors fail, then 100 percent of anchors shall be proof tested.

e. Proof testing of concrete anchors shall be performed by an independent testing laboratory hired directly by the Contractor and approved by the Engineer. The Contractor shall be responsible for costs of all testing, including additional testing required due to previously failed tests.

4. All concrete anchors shall be installed in strict conformance with the manufacturer's printed installation instructions. A representative of the manufacturer shall be on site when required by the Engineer.

5. All holes shall be drilled with a carbide bit unless otherwise recommended by the manufacturer. No cored holes shall be allowed unless specifically approved by the Engineer. If coring holes is allowed by the manufacturer and approved by the Engineer, cored holes shall be roughened in accordance with manufacturer requirements. Thoroughly clean drill holes of all debris and drill dust in accordance with manufacturer's recommendations. Degree of hole dampness shall be in strict accordance with manufacturer recommendations. Where depth of hole exceeds the length of the static mixing nozzle, a plastic extension hose shall be used to ensure proper adhesive injection from the back of the hole. Injection of adhesive into the hole shall utilize a piston plug to minimize the formation of air pockets. Wipe rod free from oil that may be present from shipping or handling.

D. Other Bolts

1. All dissimilar metal shall be connected with appropriate fasteners and shall be insulated with a dielectric or approved equal. Unless otherwise specified, where aluminum and steel members are connected together they shall be fastened with Type 316 stainless steel bolts and insulated with micarta, nylon, rubber, or equal.

3.03 WELDING

A. All welding shall comply with AWS Code for procedures, appearance, quality of welds, qualifications of welders and methods used in correcting welded work.

B. Welded stud connectors shall be installed in accordance with AWS D1.1.

3.04 INSPECTION

A. High strength bolting will be visually inspected in accordance with AISC 348 "The 2009 RCSC Specification for Structural Joints". Rejected bolts shall be either replaced or retightened as required. In cases of disputed bolt installation, the bolts in question shall be checked by a calibrated wrench certified by an independent testing laboratory. The certification shall be at the Contractor's expense.

B. Field welds will be visually inspected in accordance with AWS Codes. Inadequate welds shall be corrected or redone as required in accordance with AWS Codes.

C. Post installed anchors shall be inspected as required by ACI 318.

3.05 CUTTING OF EMBEDDED REBAR

A. The Contractor shall not cut embedded rebar cast into structural concrete during installation of post-installed fasteners without prior approval of the Engineer.

- END OF SECTION –

SECTION 05500

METAL FABRICATIONS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish all materials, labor, and equipment required to provide all metal fabrications not specifically included in other Sections, complete and in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05035 - Galvanizing

B. Section 05050 - Metal Fastening

C. Section 05520 - Handrails and Railings

D. Section 05531 - Grating, Floor Plates, and Access Hatches

E. Section 09900 - Painting

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all work specified herein shall conform to or exceed the requirements of the Florida Building Code and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of this Section:

1. American Society for Testing and Materials (ASTM), specifications as referred to herein.

2. American Welding Society (AWS) "Structural Welding Code-Steel" (AWS D1.1) which includes qualification procedures for welders.

3. American Institute of Steel Construction (AISC) "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" and "Commentary on the AISC Specification."

4. American Iron and Steel Institute (AISI) "Specifications for the Design of Cold-Formed Steel Structural Members" and "Commentary on the AISI Specification."

5. Occupational Safety and Health Administration (OSHA) Regulations.

6. Aluminum Association "Specifications for Aluminum Structures" and "Engineering Data for Aluminum Structures."

7. National Association of Architectural Metal Manufacturers "Metal Stairs Manual."

B. References herein to "Building Code" shall mean the Florida Building Code.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Complete fabrication and erection drawings of all metalwork specified herein.

2. Other submittals as required in accordance with Section 05010, Metal Materials, and Section 05050, Metal Fastening.

PART 2 -- PRODUCTS

2.01 METAL MATERIALS

A. Materials are specified in Section 05010 entitled "Metal Materials".

2.02 METAL FASTENING

A. All welds and fasteners used in metal fabrication shall conform to Section 05050, Metal Fastening, unless noted otherwise.

2.03 LINTELS

A. Where metal lintels are shown on the Drawings, provide lintels as specified herein with 8 inches minimum bearing each side unless noted otherwise.

B. All metal lintels shall be steel in accordance with Section 05120, Structural Steel, and shall be galvanized in accordance with Section 05035, Galvanizing, unless noted otherwise.

2.04 GUARD POSTS (BOLLARDS)

A. Guard posts shall be as detailed on the Drawings, including plastic covers, pipe sleeves, concrete fill, crushed fill and grouting to secure parts. If not indicated on the Drawings, guard posts shall be minimum 6-inch diameter steel pipe. Pipe for guards shall be galvanized steel, Schedule 40 pipe that conforms to ASTM A53. Painting shall be in accordance with Section 09900 entitled "Painting".

B. Guard posts shall be concrete filled and crowned, as detailed on the Drawings.

PART 3 -- EXECUTION

3.01 FABRICATION

A. All measurements and dimensions shall be based on field conditions and shall be verified by the Contractor prior to fabrication. Such verification shall include coordination with adjoining work.

B. All fabricated work shall be shop fitted together as much as practicable, and delivered to the field, complete and ready for erection. All miscellaneous items such as stiffeners, fillets, connections, brackets, and other details necessary for a complete installation shall be provided.

C. All work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent shearing of bolts, screws, and other fastenings, ensure rigidity, and provide a close fit of sections.

D. Finished members shall conform to the lines, angles, and curves shown on the Drawings and shall be free from distortions of any kind.

E. All shearings shall be neat and accurate, with parts exposed to view neatly finished. Flame cutting is allowed only when performed utilizing a machine.

F. All shop connections shall be welded unless otherwise indicated on the Drawings or specified herein. Bolts and welds shall conform to Section 05050, Metal Fastening. All fastenings shall be concealed where practicable.

G. Fabricated items shall be shop painted when specified in Section 09900, Painting.

3.02 INSTALLATION

A. Assembly and installation of fabricated system components shall be performed in strict accordance with manufacturer's recommendations.

B. All miscellaneous metalwork shall be erected square, plumb and true, accurately fitted, adequately anchored in place, and set at proper elevations and positions

C. Metal work shall be field painted when as specified in accordance with Section 09900, Painting.

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SECTION 05515

LADDERS

PART 1 -- GENERAL

1.01 REQUIREMENT

A. The CONTRACTOR shall furnish all materials, labor, and equipment required to provide all ladders in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05010 – Metal Materials

B. Section 05500 – Metal Fabrications

C. Section 05520 – Handrails and Railings

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the Specifications, all work specified herein shall conform to the applicable requirements of the following documents.

1. Florida Building Code (FBC)

2. Aluminum Association Specifications for Aluminum Structures

3. Occupational Safety and Health Administration (OSHA) Regulations

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300 entitled "Submittals".

1. Complete fabrication and erection drawings of all metalwork specified herein.

2. Other submittals as required in accordance with Section 05500 entitled "Metal Fabrications".

PART 2 -- PRODUCTS

2.01 METAL MATERIALS

A. Metal materials, fasteners and welds used for ladders shall conform to Section 05010 entitled "Metal Materials", unless noted otherwise.

2.02 METAL FASTENING

A. All welds and fasteners used for ladders shall conform to Section 05050, Metal Fastening, unless noted otherwise

2.03 VERTICAL LADDERS

A. Ladders shall be furnished with all mounting brackets, baseplates, fasteners, and necessary appurtenances for a complete and rigid installation.

B. All ladders shall be aluminum alloy 6061-T6 or 6063-T5 with a clear, anodized finish, Aluminum Association M12C22A41, unless noted otherwise.

C. All ladders shall conform to dimensions indicated on the Drawings and shall comply with OSHA requirements.

D. Side rails shall be 1-1/2 inch diameter Schedule 80 pipe, minimum.

E. Rungs shall be 1-inch wide striated top with semicircular bottom.

F. All exposed connections shall be welded and ground smooth.

G. Ladders shall be as manufactured by Thompson Fabricating Company, or equal.

H. All fixed ladders terminating below a roof, floor or wall shall be provided with safety posts r per Specification 05531 – Gratings, Floor Plates and Access Hatches.

2.04 LADDER SAFETY SYSTEM

A. Ladders with an uninterrupted length exceeding 24 ft between landings or floors shall be installed with a ladder safety system, unless indicated otherwise on the drawings.

B. Ladder safety system shall comply with OSHA requirements and meet ANSI A14.3 requirements.

C. Ladder system shall include all necessary components to provide a fully operational system, including one full body safety harness with a 310 lb. weight capacity for each ladder safety system.

D. Ladder Safety Systems shall be Miller Vi-Go by Honeywell, LAD_SAF by DBI Sala, or approved equal.

PART 3 -- EXECUTION

3.01 FABRICATION

A. All measurements and dimensions shall be based on field conditions and shall be verified by the CONTRACTOR prior to fabrication. Such verification shall include coordination with adjoining work.

B. All fabricated work shall be shop fitted together as much as practicable, and delivered

Commented [SD1]: Need to coordinate what's in this spec with what is listed in 13206 which references this spec for the ladder on the storage tank

Commented [SJP2R2]: Specs are coordinated. Tank spec refers to this spec for the exterior ladder.

to the field, complete and ready for erection.

C. All work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent shearing of bolts, screws, and other fastenings, ensure rigidity, and provide a close fit of sections.

D. Finished members shall conform to the lines, angles, and curves shown on the Drawings and shall be free from distortions of any kind.

E. All shearings shall be neat and accurate, with parts exposed to view neatly finished. Flame cutting is allowed only when performed utilizing a machine.

F. All shop connections shall be welded unless otherwise indicated on the Drawings or specified herein. All fastenings shall be concealed where practicable.

G. Fabricated items shall be shop painted when specified in accordance with Section 09900 entitled "Painting".

3.02 INSTALLATION

A. Assembly and installation of fabricated system components shall be performed in strict accordance with manufacturer's recommendations.

B. All ladders shall be erected square, plumb and true, accurately fitted, adequately anchored in place, and set at proper elevations and positions.

C. Metalwork shall be field painted when specified in accordance with Section 09900 entitled "Painting".

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SECTION 05520

HANDRAILS AND RAILINGS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish, fabricate, and install handrails and railings and appurtenances, complete, all in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05010 - Metal Materials

B. Section 05500 - Metal Fabrications

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Florida Building Code

2. Aluminum Association Specifications for Aluminum Structures

3. Occupational Safety and Health Administration (OSHA) Regulations

1.04 SUBMITTALS

A. Shop drawings of all handrails and railings shall be submitted to the Engineer for review in accordance with Section 01300 entitled "Submittals."

B. Calculations signed and sealed by a Professional Engineer registered in the State of Florida

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain handrails and railing systems from a single manufacturer.

PART 2 -- PRODUCTS

2.01 ALUMINUM RAILING SYSTEM

A. General: Where indicated on the Drawings, pipe handrailing shall be provided. Pipe handrailing shall be supplied as required by the Florida Building Code and OSHA whether indicated on the Drawings or not.

B. Vertical pipe supports shall include cast aluminum base flange or side mount bracket with set screws as indicated on Drawings. Removable posts shall be sleeved. Cast aluminum base flanges and side mount brackets shall be as manufactured by Thompson Fabricating Inc., Hollaender Manufacturing Inc., or equal.

C. Wall brackets for handrail shall be of designs indicated on the Drawings and shall be as manufactured by Mouitrie Manufacturing Company, J.G. Braun Company, Fulton Metal Products Company, or equal.

D. All connections between vertical posts and horizontal railing or between sections of horizontal railings shall be shop welded continuous in as long of sections as practical. Tack welds shall not be accepted. All welds shall be water tight and ground smooth. Field assembly of welded sections may be made by mechanical fasteners.
Location and type of field connections shall be subject to the Engineer's review. Weep holes shall be shop drilled in all vertical posts of external railing.

E. Design Load: All components of the railings and the railing system shall be adequately designed to resist the design loads of the Florida Building Code. In no case shall the spacing of vertical pipe supports exceed five feet.

F. Aluminum Railing: Railing Posts shall be nominal 1-1/2 inch nominal diameter, Schedule 80 (minimum) aluminum alloy 6061-T6. Horizontal railing shall be 1-1/2 inch nominal diameter, Schedule 40 (minimum) aluminum pipe sections. Stainless steel railing may be used in lieu of aluminum railing at the CONTRACTOR's option at no additional cost to JEA.

G. Kickplates: Kickplates shall be furnished and installed typically at the edges of all walkways and at other handrail installations. Kickplates shall be an extrusion that attaches to the posts with clamps that will allow for expansion and contraction between posts, must meet OSHA requirements, shall project 4-inches above walkway surface, shall be set ¼-inch above the walking surface, may not infringe on minimum required walkway width and must be of the same material as that of the handrail construction.

H. Expansion joint splices shall be provided at 30 feet maximum spacing and at all expansion joints in the structure supporting the handrail. Material for the expansion joint shall be the same as railing material.

I. Finish: Aluminum railings and posts shall be provided with a clear anodized finish (215 R1).

J. Where safety chains are required in handrails as shown on the Drawings, chains shall be constructed of Type 304 stainless steel. Chains shall be straight link style, 3/16-inch diameter, with at least twelve links per foot, and with snap hooks on each end. Snap 3/4-inch eye diameter welded to the railing posts. Two (2) chains, four inches longer than the anchorage spacing shall be supplied for each guarded area.

2.02 FASTENERS

A. Fasteners when required or specified shall be Type 316 stainless steel.

PART 3 -- EXECUTION

3.01 FABRICATION

A. All measurements and dimensions shall be based on field conditions and shall be verified by the Contractor prior to fabrication. Such verification shall include coordination with all adjoining work.

B. All fabricated work shall be shop fitted together as much as practicable, and delivered to the field, complete and ready for erection.

C. All work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent shearing of bolts, screws, and other fastenings, ensure rigidity, and provide a close fit of sections.

D. Finished members shall conform to the lines, angles, and curves shown on the drawings and shall be free from distortions of any kind.

E. All shearings shall be neat and accurate, with parts exposed to view neatly finished. Flame cutting is allowed only when performed utilizing a machine.

F. Concrete anchors and bolts for attachment of handrail baseplates to supporting members shall conform to Section 05050 entitled “Metal Fastening”.

G. All fabricated items shall be shop painted in accordance with Section 09900 entitled “Painting”.

3.02 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

3.03 PREPARATION

A. Clean and strip primed items to bare metals where site welding is required.

B. Supply items required to be cast into concrete with setting templates, to appropriate sections.

3.04 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors and plates required for connecting railings to structure.

C. Aluminum Railings: Aluminum railing fabrication shall be performed by craftsmen experienced in the fabrication of architectural metal work. Exposed surfaces shall be free from defects or other surface blemishes. Dimensions and conditions shall be verified in the field. All joints, junctions, miters and butting sections shall be precision fitted with no gaps occurring between sections, and with all surfaces flush and aligned. Electrolysis protection of materials shall be provided. All dissimilar materials shall be isolated.

3.05 ALUMINUM SURFACES

A. Aluminum surfaces in contact with concrete, grout or dissimilar metals shall be protected with a coat of bitumastic or other approved materials.

- END OF SECTION -

SECTION 05531

GRATING, FLOOR PLATES AND ACCESS HATCHES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish, fabricate, and install gratings and floor plates and appurtenances, complete, all in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05010 – Metal Materials

B. Section 05035 - Galvanizing

C. Section 05050 – Metal Fastening

D. Painting and protective coating of metalwork and fabricated items shall, unless otherwise specified herein, be performed in accordance with the requirements of Section 09900 entitled "Painting."

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Florida Building Code

2. Aluminum Association Specifications for Aluminum Structures

3. Occupational Safety and Health Administration (OSHA) Regulations.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300 entitled “Submittals”:

1. Complete fabrication and erection drawings of all gratings, floor plates, access hatches and access doors specified herein.

2. Other submittals as required in accordance with Section 05500 entitled “Metal Fabrications”.

PART 2 -- PRODUCTS

2.01 METAL MATERIALS

A. Metal materials used for gratings, floor plates and hatches shall conform to Section 05010 entitled “Metal Materials”, unless noted otherwise.

2.02 METAL FASTENING

A. All welds and fasteners used for gratings, floor plates and hatches shall conform to Section 05050 entitled “Metal Fastening”, unless noted otherwise.

2.03 GRATING

A. General: Grating, including support frames, fastenings, and all necessary appurtenances for a complete installation shall be furnished as indicated on the Drawings and specified herein.

1. All exposed bearing ends of grating shall be enclosed in a perimeter band of the same dimensions and materials as the main bars, including ends at all cutouts.

2. Grating shall be fabricated into easily removable sections and shall be fastened at each corner and as required with fasteners provided by the grating manufacturer. No section of grating shall weigh in excess of 50 lbs. unless noted otherwise. No fasteners shall be permitted to project above the walking surface.

3. Gratings shall be designed for a loading of 100 psf unless a depth is required by the Drawings. When grating depth is not indicated on the drawings, minimum grating depth shall be 1-1/2 inches and grating deflection shall not exceed L/240 or ¼ inch.

4. All grating shall be furnished with holddowns.

5. Grating installed in cast-in-place concrete shall be provided with embedded support frames on all perimeter and bearing edges. Support frames shall include anchor straps or headed studs at a maximum of 18-inches on-center, a minimum of two each side. Support frames shall be fabricated from the same material as the grating.

6. Cutouts in grating shall be provided for valve operators, conduits, pipes, etc. Edges of cutouts shall be banded.

B. Aluminum Grating

1. Aluminum grating shall be of I-Bar type and shall consist of extruded bearing bars positioned and locked by crossbars. All supports, cross members, etc. shall be aluminum. Plank clips for grating hold downs or other required attachments shall be aluminum or stainless steel. Bolts shall be stainless steel. Provide embedded aluminum support frames for cast-in-place concrete installations.

2. Grating shall be “19-SI-4 I-Bar Swage Locked” by Alabama Metal Industries Corporation (AMICO), “IB” by Harsco Industrial IKG, “I-Bar 19SGI4", by Ohio

Commented [SD1]: There is no grating on this project

Commented [SJP2R2]: There is. The trench in the pump station is covered with stainless steel grating.

Grating Inc., or “I-Bar” by Thompson Fabricating LLC.

3. Grating shall be provided with a mill finish.

C. Aluminum Plank Grating

1. Aluminum plank grating shall be un-punched planks of extruded aluminum welded together to form panels. Panel ends shall have an extruded aluminum end bar welded in place. All support members shall be aluminum. Plank clips for grating holddowns or other required attachments, shall be aluminum or stainless steel. Bolts shall be stainless steel. All planks shall be provided with embedded aluminum support frame for cast-in-place concrete.

2. Removable sections shall be edge banded in sections and provided with stainless steel flush mounted lift handles with necessary plank reinforcing and hold down anchors.

3. Hinged sections shall be shop fabricated ready for field installation. Panels shall be edge banded with a continuous hinge, flush mounted lifting handles (1 section minimum), stainless steel bolts and hardware. Grating frame shall be provided with removable temporary braces to maintain the required opening width during casting. Provide necessary grating reinforcing for lift handles, hinge connections, hold down anchors, etc.

4. Plank grating shall be provided with a mill finish.

5. Aluminum plank grating shall be HD-P manufactured by Harsco Industrial IKG., Heavy Duty Series manufactured by Ohio Gratings, Inc., or Unpunched Duo-Grip Extruded Series manufactured by Alabama Metal Industries Corporation (AMICO).

D. Heavy Duty Steel Grating

1. Heavy duty steel grating shall be welded heavy duty steel grating per ANSI/NAMM MBG 532-000. All supports, cross members, etc. shall be galvanized steel. Plank clips for grating hold downs shall be stainless steel. Bolts shall be galvanized steel.

2. All openings shall be banded.

3. Steel grating shall be galvanized according to the Section entitled “Galvanizing.”

4. Main bearing bars shall conform to ASTM A36. Cross bars shall be flush with the top of the grating.

5. Grating span shall be 36 inches maximum and shall satisfy AASHTO loading for H-20 truck.

6. Grating shall be manufactured by IKG Borden Industries, Leeds, AL or equal.

E. Heavy Duty Stainless Steel Grating

1. Heavy duty stainless steel grating shall be welded heavy duty stainless steel grating per ANSI/NAMM MBG 532-000. Plank clips for grating hold downs shall be stainless steel. Bolts shall be galvanized steel.

2. All openings shall be banded.

3. Stainless steel grating shall be type 316 stainless steel.

4. Main bearing bars shall conform to ASTM A36. Cross bars shall be flush with the top of the grating.

5. Grating span shall be 36 inches maximum and shall satisfy AASHTO loading for H-20 truck.

6. Grating shall be manufactured by Ohio Gratings or equal.

2.04 CHECKERED PLATES

A. Checkered plates shall be aluminum alloy 6061-T6, or galvanized steel as indicated on the Drawings. Aluminum checkered plates shall be provided in mill finish, except when otherwise indicated on the Drawings. Checkered plates shall be designed for a live load of 150 points per square foot of the gross projected area. The allowable deflection under the above loadings shall be L/240 but not more than 1/4-inch. Minimum thickness shall be 3/8-inch, unless otherwise noted on the Drawings.

Commented [SD3]: The only floor plates on this project is the 2.5" stainless steel plates over the pump discharge piping – spec is for aluminum and doesn't cover that it needs to withstand weight of loaded gantry crane

Commented [SJP4R4]: There are no checkered plates over the pump discharge piping (trench cover). These checker plates specified are aluminum for other locations if needed and not intended to support a gantry crane.

B. Checkered plates shall be standard pattern non-slip of the thickness and sizes on the Drawings. Stiffener angles shall be provided as required to meet the load requirements specified above. All checkered plate sections shall be cut that no one section shall weigh more than 100 pounds.

C. Flush type lifting handles and hinges and neoprene seals for airtight construction shall be provided where shown on the Drawings.

D. At locations noted, neoprene gaskets shall be provided between floor plates and frames. Plates shall be screwed into frames when noted on the Drawings.

E. Hinges, where indicated on the Drawings, shall be heavy-duty, cadmium plated bronze with stainless steel pins and fasteners.

F. Removable Sections: Plates shall be fabricated in removable sections each with flush mounted handles and removable hold down stainless steel bolts.

2.05 ACCESS HATCHES

A. General

1. Door opening sizes, number and direction of swing of door leaves, and locations shall be as shown on the Drawings. The Drawings show the clear opening requirements.

2. All doors shall be aluminum (mill finish) unless otherwise noted. All doors in locations subject to direct vehicular traffic shall be galvanized steel designed for H-20 live loads.

3. Openings larger than 42 inches in either direction shall have double leaf doors.

4. Doors shall be designed for flush mounting and for easy opening from both inside and outside.

5. All doors shall be provided with an automatic hold-open arm with release handle.

6. Double leaf doors shall be provided with Type 316 stainless steel safety chains to go across the open sides of the door, when in the open position. Brackets shall be provided on the underside of the doors to hold the safety chains when not in use.

7. All hardware, including but not limited to, all parts of the latch and lifting mechanism assemblies, hold open arms and guides, brackets, hinges, springs, pins, and fasteners shall be Type 316 stainless steel.

8. All doors shall be watertight with a continuous gasket. All single door applications shall include a continuous EPDM odor reduction gasket.

9. Cylinder locks with keyway protected by a cover plug shall be provided with all hatches.

10. Door frames shall be trough-type or angle-type as indicated on the Drawings and equipped with a built-in neoprene cushion. On trough-type frames, the drainpipe shall be provided by the CONTRACTOR and shall extend to the nearest point of discharge acceptable to the ENGINEER.

11. Hatches shall be guaranteed against defects for a period of five years.

B. Floor, Wet Well and Dry Pit Access Hatches

1. Door leaves shall be 1/4 inch, minimum, diamond pattern plate with an approved raised pattern, non-skid surface. Plate shall be stiffened as required to maintain allowable stress and deflection requirements. Stiffeners shall consist of angles or bars welded to the bottom of plate.

2. Doors shall be designed for a 300 psf live load minimum, unless noted otherwise.

3. Exterior doors shall be Type "J-AL" or "JD-AL", by Bilco Company, Type ”W1S” or “W2S” by Halliday Products Inc., Type "TPS" or "TPD", by U.S.F. Fabrication Inc., Type "THG" or "THG-D", by Thompson Fabricating LLC., or equal.

4. Interior doors shall be Type "K" or "KD", by Bilco Company, Type ”S1S” or “S2S” by Halliday Products Inc., Type "APS300" or "APD300", by U.S.F. Fabrication Inc., Type "TH" or "TH-D", by Thompson Fabricating LLC., or equal.

5. Doors rated for H-20 traffic loading shall be “JAL-HD” or “JDAL-HD” by the Bilco Company, Type “H1C” or “H2C” by Halliday Products, Inc., or Type “THS” or “THD” by U.S.F. Fabrication Inc.

6. Retrofit doors shall be Type “S1S” or “S2S” by Halliday Products Inc modified for retrofit application, “APS300 Retrofit” or “APD300 Retrofit” by U.S.F. Fabrication Inc., or equal.

B. Roof Access Hatches

1. Roof access hatches shall be designed for a 50 psf live load minimum, unless noted otherwise.

2. Roof access hatches for service stairs shall be Bilco Type L Roof Scuttles.

3. Roof access hatches for ladder access shall be Bilco Type S or SS Roof Scuttles.

4. Roof access hatches shall include curb for a complete system.

2.06 FIXED LADDERS

A. Where the Contract Documents indicate fixed ladders are required under access hatches, they shall be provided with “LadderUp, Model LU-4” by Bilco Company, “L1E Ladder Extension” by Halliday Products Inc., or “Ladder Climb-out Device” by Thompson Fabricating.

B. The safety posts shall be manufactured of the same material as the access door with telescoping tubular sections that lock automatically when fully extended.

C. Upward and downward movement shall be controlled by a stainless steel balancing mechanism.

D. Safety posts shall be assembled in strict accordance with manufacturer's recommendations.

2.07 FALL THROUGH PREVENTION SYSTEM

A. All access hatches and access doors covering openings measuring 12 inches or more in its least dimension through which persons may fall shall be equipped with a fall through prevention system, except where noted on the Contract Drawings. Access hatches and access doors shall be provided with a permanently installed fall through prevention grate system that provides continuous safety assurance in both its closed and open positions while still allowing for inspection of facilities below the hatch. Fall through prevention grate system shall be hinged to allow access below the grating.

B. The grate system shall be a pre-engineered grating product from a manufacturer with a

Commented [SD5]: Tank spec 13206 references this spec for the tank access hatch. This paragraph is not applicable for that. Need to give more or the tank hatch

Commented [SJP6R6]: These are not intended for the tank

Commented [SD7]: This is covered in Section 05515

Commented [SJP8R8]: Will revise 05515

Commented [SD9]: If this is really to be provided, it needs to be referenced in Section 13206 for the ground storage tank for tank supplier to provide

Commented [SJP10R10]: It is to be provided per OSHA and has been required for some time. We need to accept that it is required. If the tank spec refers to this spec for access hatch, and this spec says that for ALL access hatch the fall prevention system shall be provided, why does it need to be specifically referenced in the tank spec.

minimum of 5 years supplying similar products. Grate system shall have a minimum 10-year warranty.

C. The grate system shall be designed to meet OSHA Standard 29 CFR 1910.23.

D. The grate system shall be made with 6061-T6 aluminum and be designed for a 300 psf minimum live load, unless noted otherwise. Hardware shall be 316 stainless steel and all components shall be corrosion resistant. Grating shall be powder coated OSHA safety orange.

E. Grate system shall be equipped with a spring assist lift and hold-open latch.

F. Field cutting of grate is not permitted.

G. Grating configuration shall be single or dual leaf, determined by the Owner during shop drawing review.

H. Grate system shall be manufactured by Bilco, Nystrom Products Co., USF Fabrication, Xylem Inc., Halliday Products, or approved equal.

PART 3 -- EXECUTION

3.01 FABRICATION

A. All measurements and dimensions shall be based on field conditions and shall be verified by the CONTRACTOR prior to fabrication. Such verification shall include coordination with adjoining work. Fabrication shall begin only after such field measurements.

B. All fabricated work shall be shop fitted together as much as practicable and delivered to the field, complete and ready for erection, unless sections have to be removable. All miscellaneous items such as stiffeners, fillets, connections, brackets, and other details necessary for a complete installation shall be provided.

C. All work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent shearing of bolts, screws, and other fastenings, ensure rigidity, and provide a close fit of sections.

D. Finished members shall conform to the lines, angles, and curves shown on the Drawings and be free from distortions of any kind.

E. All shearings shall be neat and accurate, with parts exposed to view neatly finished. Flame cutting is allowed only when performed utilizing a machine.

F. All shop connections shall be welded unless otherwise indicated on the Drawings or specified herein. Bolts and welds shall conform to Section 05050 entitled “Metal Fastening”. All fastenings shall be concealed where practicable.

3.02 INSTALLATION

A. Assembly and installation of fabricate system components shall be performed in strict accordance with manufacturer's recommendations.

B. All gratings, access hatches, and access doors shall be erected square, plumb and true, accurately fitted, adequately anchored in place and set at proper elevations and positions.

- END OF SECTION -

SECTION 05540

CASTINGS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish all materials, labor, and equipment required to provide all castings in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03480 - Precast Concrete Manholes, Handholes and Vaults

B. Section 05010 - Metal Materials

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Florida Building Code (FBC)

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300 entitled "Submittals".

1. Complete fabrication and erection drawings of all castings specified herein.

2. Other submittals as required in accordance with Section 05010 entitled "Metal Materials", and Section 05050 entitled "Metal Fastening".

PART 2 -- PRODUCTS

2.01 METAL MATERIALS

A. Metal materials used for castings shall conform to Section 05010 entitled "Metal Materials", unless noted otherwise.

2.02 METAL FASTENING

A. All welds and fasteners used for castings shall conform to Section 05050 entitled "Metal Fastening", unless noted otherwise.

2.03 IRON CASTINGS

A. General - Iron Castings shall include, but not be limited to frames, covers, and grates for trench drains, catch basins, and inlets; and stop log grooves.

1. Castings shall be of gray iron of uniform quality, free from defects, smooth and well cleaned by shotblasting.

2. Catalog numbers on the Drawings are provided only to show required types and configuration. All covers shall be cast with raised letters as designated on the Drawings.

3. Castings shall be as manufactured by Neenah Foundry Company, US Foundry, or equal.

B. Covers and Grates

1. Covers and grates shall be provided with matching frames. Cover shall fit flush with the surrounding finished surface. The cover shall not rock or rattle when loading is applied.

2. Round covers and frames shall have machined bearing surfaces.

3. Design loadings:

a. Where located within a structure, a minimum design loading of 300 psf shall be used, unless noted otherwise.

b. At all locations not within a structure, the design loading shall be a standard AASHTO H-20 truck loading, unless otherwise noted.

C. Watertight gasketing, bolting, locking devices, patterns, lettering, pickholes, vents, or self-sealing features shall be as detailed on the Drawings.

PART 3 -- EXECUTION

3.01 FABRICATION

A. All measurements and dimensions shall be based on field conditions and shall be verified by the CONTRACTOR prior to fabrication. Such verification shall include coordination with adjoining work.

B. All fabricated work shall be shop fitted together as much as practicable, and delivered to the field, complete and ready for erection. All miscellaneous items such as stiffeners, fillets, connections, brackets, and other details necessary for a complete installation shall be provided.

C. Finished members shall conform to the lines, angles, and curves shown on the Drawings and shall be free from distortions of any kind.

3.02 INSTALLATION

A. Assembly and installation of fabricated system components shall be performed in strict accordance with manufacturer's recommendations.

B. All castings shall be erected square, plumb and true, accurately fitted, adequately anchored in place, and set at proper elevations and positions.

- END OF SECTION -

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SECTION 05720

ROOF FALL PROTECTION SYSTEM
"ALTERNATE BID ITEM"

PART 1 -- GENERAL

1.01 SUMMARY

A. Provide and install Free Standing, Non-Penetrating Railing System(s) for roof edge fall protection. System shall be tested and documented to meet OSHA Regulations 29 CFR 1926.502 and 29 CFR 1910.23.

1.02 WORK INCLUDED

A. Include all labor, materials, equipment, transportation and services required to complete the installation of the guardrail system as shown on the Drawings.

1.03 SUBMITTALS

A. Submit manufacturer's catalogs cuts for approval prior to order.

B. Provide shop drawings indicating layout of system.

C. Product test results.

1.04 WARRANTY

A. Provide the Owner with a two (2) year manufacturer's warranty.

PART 2 -- PRODUCTS

2.01 ACCEPTED MANUFACTURERS

A. Safety Rail Source, LLC; NextGen 3000 CE

2.02 MATERIALS

A. Furnish and install Roof Fall Protection System on all roof edges as indicated on the Drawings or where equipment, walkways or hatches are within 10'-0" of roof edge. Toe Board brackets must be used when the parapet wall is less than 3-1/2" in height and there is the possibility of human traffic below the roof's edge.

B. Performance Characteristics: Shall meet and exceed OSHA (Standards - 29 CFR) 1926.502 (b).

1. Roof Fall Protection System shall be designed to withstand a minimum 200 pounds of test load in any direction.

2. System shall consist of a top rail and mid rail.

3. System shall extend to a height of at least 42" from the finished roof surface.

4. System shall be free of sharp edges and snag points.

5. Railing sections shall be less than 6 feet long.

C. Railing and Base:

1. Horizontal Rail shall be 1-1/4" Schedule 40 aluminum

2. Vertical Rail shall be 1-1/4” Schedule 80 aluminum

2. Base shall be non-penetrating, Rhino coated galvanized steel with a minimum weight of 58 pounds each.

D. Hardware:

1. Railing fittings shall be aluminum with 316 stainless steel set screws.

2. Railing to base fasteners shall be 316 stainless steel hex bolts and nuts

F. Roof Fall Protection System shall be compatible with Built-up Bituminous Roofing System. Consult with roofing system manufacturer to assure compatibility.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Shall be installed on low slope roof. Installer shall read the installation and safety manual located in the instruction package prior to installation.

B. Install Roof Fall Protection System per manufacturer's instructions and recommendations.

C. Roof Fall Protection System shall extend a minimum of 10'-0" beyond the edge of the equipment, walkway or hatch being protected, unless shown otherwise on the Drawings.

- END OF SECTION -

SECTION 06100

ROUGH CARPENTRY

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment and appliances required for complete execution of Work shown on the Drawings and specified herein.

B. Principal items of work include:

1. Wood blocking, nailers, grounds, furring, ties, centering, etc., necessary or required for attachment or support of work under this Section, and other Sections.

2. Fasteners, including nails, screws, bolts, anchors and other fastenings, required to secure work under this Section.

3. Temporary enclosures and protective boarding.

4. Wood preservative treatment for all wood members in contact with roofing, masonry, concrete, and exposed to the elements.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of these specifications Work shall conform to the applicable requirements of the following documents:

1. AWPA-CA Preservative Standards, Lumber and Plywood.

2. AWPA-C20 Structural Lumber Fire-Retardant Treatment by Pressure Process.

3. AWPC-C27 Plywood Fire-Retardant Treatment by Pressure Process.

4. AWPA-M4 Standards for Care of Preservative Treated Wood Products.

5. APA Guide to Plywood Grades.

6. FM 1-49 Perimeter Flashing

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 - Submittals, submit the following:

1. Certifications of Preservative and Fire Retardant Treatment.

2. Warranty of treatment manufacturer.

3. Certification of type and grade of lumber to be used.

4. Certification of type, rating and conformance to APA Standards.

1.04 SHIPPING, HANDLING AND STORAGE

A. Materials shall be kept dry during delivery and storage. The CONTRACTOR shall protect materials against exposure from weather and contact with damp or wet surfaces. Lumber shall be stacked with provisions for air circulation within stacks.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Blocking, nailers, grounds and the like: Eastern Spruce or Douglas Fir - No. 3 Dimension Lumber or Construction Grade, with a moisture content not to exceed 19%.

B. Plates, blocking, and nailers in contact with concrete or masonry: Pressure treated southern yellow pine.

C. Plywood: Identified with APA Grade trademarks of the American Plywood Association, in thickness as shown on the Drawings.

1. Exterior: AC-EXT-APA where exposed to view or a finish is required, CD-EXT-APA where concealed.

2. Interior: AC-INT-APA where exposed to view or a finish is required, CD-INT-APA where concealed.

D. Structural Framing Lumber: Douglas Fir No.1 grade with fb = 1,500 pounds per square inch and E = 1,700,000 pounds per square inch, 19 percent moisture content.

E. Fasteners: Provide clamps, connectors, straps, nails, bolts, screws, anchors, ties and other accessories and fasteners shown or required to properly secure all rough carpentry. Fasteners and accessories shall be stainless steel, galvanized, or other noncorrosive metal recommended for use. Fasteners used with pressure treated wood shall be compatible with the wood preservative treatment to prevent corrosion of fasteners.

F. Wood Preservative Treatment: Waterborne pressure treatment in conformance with the American Wood Preservers' Association standard P5. Retention shall be in accordance with AWPA Standards and be a minimum of 0.40 pounds per cubic foot for contact with or below ground, concrete, or masonry and 0.25 pounds per cubic foot for above ground. Stamp each piece of treated wood with a trademark identifying the classification of the treatment or a certificate from the processor for each shipment.

G. Fire Retardant Treatment: Fire-retardant lumber and plywood must have an Underwriters Laboratories stamp signifying a FR-S rating and certifying a 25 or less flame spread and smoke developed value, when tested in accordance to UL 723, ASTM E 84, and NFPA 255 "Tunnel Test", and when the test is extended for 20 additional minutes. Treatment formulation shall contain no halogens, sulfates, chlorides or ammonium phosphate. Smoke toxicity shall be no more than that of untreated wood.

PART 3 -- EXECUTION

3.01 COORDINATION

A. Coordinate with all trades as to nailers, blocking, grounds and the like required for the attachment of their work and other items requiring same. Carry out all work as required to cooperate work of other trades.

3.02 INSTALLATION

A. Perform work in conformance manufacturer's recommendations and specifications, industry, national and local standards and codes.

B. Layout, cut, fit and erect rough blocking, nailers, furring and other rough carpentry. Do cutting work in connection with carpentry and finish for other trades. Brace plumb and level all members in true alignment and rigidly secure in place with sufficient nails, spikes, screws and bolts. Defects which render any piece or part unable to serve its intended purpose shall be discarded or, cut out and replaced.

C. Provide all bracing, supports and shoring required to support construction.

D. Protect all masonry including edges of concrete platforms and similar items. Remove protective covering when directed. Take special precautions at masonry openings and corners of the building.

E. Set all rough hardware, such as plates, spikes, bolts, nails, lag screws, lagging bolts, anchors, etc., as required to hold woodwork together or to anchor or secure it to other materials and construction.

F. Provide wood grounds, nailing strips and similar items wherever necessary or required throughout the project for the support, proper erection or installation of the work and support of mirrors, cabinets, shelf cleats, base and similar items. Thoroughly secure in place by approved means.

G. Secure wood grounds, nailing strips and similar items to metal plugs set in masonry, toggle or expansion bolts. Give the mason all necessary information to enable him to lay out correctly the location for metal wall plugs. Wood plugs will not be accepted.

H. Construct joints to support dead loads, live loads, snow loads, wind loads, or combinations in conformance with "National Design Specifications for Stress Grade Lumber and its Fastenings", recommended by National Forest Products Association.

I. Nailers and Blocking: Provide and secure wood nailers, blocking, for the reception of roof curbs, roofing, etc. in accordance with FM I-49, or as required by the Building Code, whichever is most stringent. Coordinate attachment with roofing system, where roofing system design includes design of nailers provide attachment in accordance with engineered roofing design.

1. Provide nailers of sizes, shapes and profiles indicated on the Drawings. Nailers shall not be less than 2 x6. Build up nailers as required to achieve thickness of insulation or as required to provide proper attachment of roofing and curbs. Provide anchors as required for secure attachment of roofing systems, copings, gravel stops or other edge terminations.

3.03 TEMPORARY PROTECTION

A. Provide and install all temporary protection in accordance with applicable provisions of the Contract Documents, OSHA regulations, and as follows:

1. Temporary protection shall include wood doors, railings, protection of floor or roof openings, temporary partitions, and the like; adequately maintained in good repair during the life of the Contract.

2. Furnish and set temporary partitions with wood doors at all exterior doorways, exterior openings or in locations exposed to weather. Substantially build and hang, with proper hinges, locks and other necessary hardware, and remove and reset whenever required to accommodate the Work and keep in good repair.

3. Provide substantial temporary wood covering or guards for openings left in floor or roof slabs for ducts, shafts, etc., using rough planking at least 2 inch thick, cleated together and otherwise made sufficiently strong and put in place wherever required immediately after the forms have been removed.

3.04 JOB CONDITIONS

A. If the installation of metal frames and glass does not promptly follow the completion of the exterior enclosures, and if the absence of enclosures would cause damage, close in all such openings temporarily by the use of heavy polyethylene plastic sheeting, or canvas stretched over and nailed to frames of 1 inch x 2 inch or heavier strips.

3.05 REMOVAL OF TEMPORARY WORK

A. Remove all temporary protection when so directed, or prior to acceptance of this project.

- END OF SECTION -

SECTION 07160

BITUMINOUS DAMPPROOFING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Prepare and prime surfaces to receive dampproofing.

B. Apply bituminous dampproofing on exterior concrete wall surfaces below grade of new tanks, precast vaults and manhholes, and structures that enclose interior areas installed under this Contract, unless otherwise indicated to be coated in Specification 09900 – Painting.

C. Seal/caulk joints and protrusions through dampproofing.

D. Place protective cover over applied dampproofing.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03300 - Cast-in-Place Concrete

B. Section 03400 - Precast Concrete

C. Section 03315 – Grout

D. Section 09900 – Painting

1.03 REFERENCE STANDARDS

A. ASTM D41 - Primer for Use with Asphalt in Dampproofing and Waterproofing.

B. ASTM D449 - Asphalt for Dampproofing and Waterproofing.

C. ASTM D1668 - Glass Fiber Fabric Impregnated with Bitumen.

1.04 SUBMITTALS

A. Submit product data in accordance with Section 01300 - Submittals.

B. Submit manufacturer's product literature, specification data sheets and instructions for application recommendations.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened containers identified with name, brand, type, grade, class and all other qualifying information.

B. Store materials in dry location to prevent damage or intrusion of foreign matter. Remove damaged materials from the job site.

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject with compliance with the Specifications provide products from one of the following:

1. Karnak Corp.

2. W.R. Meadows

3. Koch Materials Co.

4. BASF Master Builders Solutions

2.02 MATERIALS

A. Asphalt Primer: Type recommended by manufacturer.

B. Dampproofing: Non-asbestos, fibrated mastic conforming to ASTM D-1227, Type II, Class 1, compatible with cavity wall insulation.

PART 3 -- EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened containers identified with name, brand, type, grade, class and all other qualifying information.

B. Store materials in dry location to prevent damage or intrusion of foreign matter. Remove damaged materials from the job site.

3.02 SURFACE PREPARATION

A. Ensure surfaces are firm, dry and free from loose particles, cracks, pits, rough projections, grease, oil and other foreign matter detrimental to adhesion and monolithic application of dampproofing.

B. Remove loose particles and foreign matter with scraper, wire brush or other effective means. Remove grease or oil with safety solvent, effective alkaline cleaner or detergent. If safety solvents are used, follow with an application of alkaline cleaner or detergent scrub surfaces clean with water.

3.03 APPLICATION

A. Prime surfaces with manufacturers recommended primer. Apply dampproofing at the rate of 6 gallons per 100 square feet.

B. Apply dampproofing to substrates to provide a complete moisture resistant coating.

C. Each coat shall be color coded with red as the base coat and black as the top coat.

3.04 PROTECTION

A. Protect building from damage resulting from spillage, dripping and dropping of materials. Repair work damages during dampproofing operations.

B. Take precautions against fire and other hazards during delivery, storage and installation of flammable materials. Comply with local ordinances and fire regulations in the installation of hazardous materials.

3.05 CLEANING

A. Clean adjacent materials and finishes which have been soiled.

- END OF SECTION -

SECTION 07190

VAPOR BARRIER

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install a vapor barrier to be placed under all reinforced concrete placed against soil as specified herein or shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03300 - Cast-in-Place Concrete

PART 2 -- PRODUCTS

2.01 VAPOR BARRIER

A. Vapor Barrier: A reinforced laminate membrane with a minimum tensile strength of 75 lbs/in. in accordance with ASTM D-882, vapor transmission rating of 0.02 perms in accordance with E-96, and a puncture resistance of 25 lbs in accordance with ASTM D-4833.

B. Adhesive/Tape: Type approved by the Manufacturer of the vapor material.

C. Penetration sealing: Provide manufacturer's recommended penetration seals at all pipe, conduit, and similar penetrations.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Specifications, provide products from one of the following manufacturers:

1. Viper Vapercheck 10 by Insulation Solutions, Inc.

2. Griffolyn Type-85, by Reef Industries, Inc.

3. Or Equal

2.03 ADHESIVE OR TAPE

A. Adhesive or tape for joining sheets shall be approved by the manufacturer of the vapor barrier material.

PART 3 -- EXECUTION

3.01 VAPOR BARRIER

A. Vapor barrier shall be placed on top of 4 inches minimum of compacted structural fill stone, free of debris and protrusions, as shown on the Drawings for structural slabs.

B. Lap edges 12 inches and seal with adhesive tape. Lay with seams perpendicular to and lapped in the direction of placement. Do not penetrate vapor barrier.

C. Protect from damage until concrete is placed. Punctures and tears in vapor barrier shall be repaired using patches of the material which overlaps puncture or tear a minimum of 12 inches; seal with tape or adhesive.

D. Penetrations through vapor barrier, such as pipe, drains, conduits and similar penetrations, shall be sealed in strict accordance with manufacturer's recommended instructions.

- END OF SECTION -

SECTION 07510

BUILT-UP BITUMINOUS ROOFING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install 20-year guaranteed mineral surfaced SBS modified bitumen built-up roofing system and all appurtenant work, complete, and shall coordinate all of the work hereunder with the related work specified in other Sections, all in accordance with the requirements of the Contract Documents. The new modified bitumen built-up roofing system shall be installed on the roof of the Booster Pump Station.

B. The CONTRACTOR shall retain the services of a licensed roofing contractor who shall inspect the work, prepare and submit the specified submittals to JEA for review. Upon acceptance by JEA, the roofing contractor shall apply for and secure a roofing permit from the Building Department having jurisdiction. The CONTRACTOR shall prepare and submit all documentation as required by the Building Department for a roofing permit. During the roofing contractor's inspections, changes may be required to the shown roofing layouts, accessories and drainage; such changes shall be documented in the submittals and performed at no additional costs to the Contract.

C. The CONTRACTOR shall complete FM Global form X-2688, Checklist for Roofing System, as well as a Contractor's Package from RoofNav for each roof area and submit them to FM Global for review and approval prior to installation. Roofing system shall comply with FM Global Class 1-135 at roof zones 1, and FM Global Class 1-165 at roof zones 2 and 3.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06100 - Rough Carpentry

B. Section 07600 - Flashing and Roofing Accessories

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Federal Specifications

1.	SS-A-701B	Asphalt, Petroleum (Primer, Roofing, and Weatherproofing).
2.	SS-C-153C	Cement, Bituminous, Plastic.

B. Commercial Standards

1.	ASTM D 41	Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

2. ASTM D 226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

3. ASTM D 249 Specification for Asphalt Roll Roofing (Organic Felt) Surfaced with Mineral Granules.

4. ASTM D 250 Specification for Asphalt-Saturated Asbestos Felt Used in Roofing and Waterproofing.

5. ASTM D 312 Specification for Asphalt Used in Roofing.

6. ASTM D 1668 Specification for Glass Fabrics (Woven and Treated) for Roofing and Waterproofing.

7. ASTM D 1863 Specification for Mineral Aggregate Used on Built-up Roofs.

8. ASTM D 1866 Test Method for Translucency of Mineral Aggregate Used on Built-Up Roofs.

9. ASTM D 2178 Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

10. ASTM D 2626 Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing.

11. FM Factory Mutual.

12. U/L Underwriters Laboratories, Inc.

13. FS HH-I-1972/GEN Insulation Board, Thermal, Faced, Polyurethane or Polyisocyanurate.

C. Trade Standards

1. NRCA National Roofing Contractor’s Association.

D. Manufacturer's Standards

1. In addition to the standards listed above, the roofing products and their installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.04 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section entitled "Submittals".

B. Plan layouts of the proposed roofing (minimum scale shall be 1/8 inch = 1 foot) shall be submitted. The layout shall identify the complete scope of work, details of parapet flashings, equipment support area details, pipe and other roofing penetration details as required for a complete installation. The CONTRACTOR shall coordinate all dimensions associated with roof-mounted equipment and identify them on the roofing

layout.

C. The manufacturer's specifications, literature, and published installation instructions for each major roofing element, product or system shall be submitted to the Engineer. Shop drawings showing sizes, shapes, thickness, types of materials, finishes, fabrication details, anchors, connections, expansion joints and installation instructions shall be provided at large scale on full size drawings. Provide samples of each product and color samples of cap sheet.

D. Florida Product Approval, current at the time of submittal.

E. Roofing shall be applied by a roofing contractor, approved by the CONTRACTOR, through the roofing manufacturer, in writing, with a copy of such approval submitted to JEA.

F. A certification from the manufacturer that the proposed roofing accessories are covered by the roof guarantee.

G. After installation of the roofing, the CONTRACTOR shall furnish to JEA a signed affidavit that the roof complies with the requirements of these Specifications and the manufacturer's recommendations for the class and type of roof specified.

H. The CONTRACTOR shall furnish JEA with duplicate signed copies of the Roof Guarantee as specified in Section 01300 entitled "Submittals". A sample copy of the guarantee, on the form that will be used for the actual guarantee, shall be submitted with the shop drawings, for review.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not apply roofing membrane during inclement weather.

B. Do not apply roofing membrane to damp or frozen deck surfaces.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during the same day.

D. At lower air temperatures, to assure sound adhesion, care must be exercised to provide asphalt, at the point of application, at the asphalt's equiviscous temperature (EVT) plus 20 degrees Fahrenheit or at 400 degrees Fahrenheit, whichever is higher.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Manufactured materials shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

B. All materials shall be carefully stored in a manner that will prevent damage of the products and in an area that is protected from the elements.

1.07 QUALITY ASSURANCE

A. The CONTRACTOR shall pay the cost of all test cutting, testing, and repairs. If deviations from written and accepted manufacturer's specifications are found, the CONTRACTOR, at its own expense, shall make all corrections necessary to meet the requirements of the Contract Documents, the roofing manufacturer recommendations, and the requirements of the Engineer.

B. The CONTRACTOR shall provide a minimum of three site visit inspections by an official manufacturer's representative on all roofing and flashing. Inspections are to be made at the beginning of the job and a minimum of once more while the roofing and/or flashing work is in progress to ensure workmanship is in accordance with the manufacturer's specifications.

C. The CONTRACTOR is cautioned that the products specified in these specifications may require the purchase of a minimum quantity from the manufacturer. The minimum purchase quantities may exceed the quantities defined in the Contract Documents. JEA or the Engineer will not consider requests for substitutions of specified products unless equal in physical and performance characteristics and accompanied with appropriate credits. The responsibility of providing quantities required shall remain with the CONTRACTOR.

1.08 TESTING

A. The CONTRACTOR shall retain the services of a testing company to perform testing of the built-up bitumen roofing installed under this Contract.

B. The testing program performed by the testing company will include an infrared imaging test (performed at night) of the roofing membrane and insulation to detect leaks in the system. The test will be conducted in accordance with ASTM C 1153 by a Level III inspector certified by the American Society of Nondestructive Testing, Inc.

C. The roofing system will not be accepted by JEA should the testing company detect any leaks in the system. If moisture is detected in the insulation of the substrate, repairs shall be performed by the Contractor at no additional costs to JEA. Repairs shall be acceptable to the roofing manufacturer to satisfy the specified guarantee requirements. After repairs are performed, the roofing shall be re-tested by the testing company. The CONTRACTOR shall be responsible for the re-testing costs.

D. If the re-tests detect further moisture in the system, then the entire roofing system shall be removed and replaced by the CONTRACTOR at its expense.

1.09 GUARANTEE

A. A manufacturer's "No-Dollar-Limit" Guarantee for a period of 20 years is required for all new roofing applications under this Contract. The CONTRACTOR shall engage the services of a roofing CONTRACTOR approved by the manufacturer to install the roofing system subject to the guarantee requirements specified herein. The roofing CONTRACTOR shall provide the manufacturer with all necessary documentation to ensure the provision of the guarantee. The sources of bitumen shall be acceptable to the roofing manufacturer.

B. All roofing accessories, including flashing, fasteners, roof vents, curb details and other miscellaneous metals and accessories required for the installation shall be supplied by the roofing manufacturer or from other sources acceptable to the manufacturer selected for the installation so that the system guarantee will include all edges, penetrations and other details of the installation.

C. The system guarantee shall promise that for the period of the guarantee, the manufacturer will pay for repairs to stop leaks and remove blisters on the roofing surface resulting from natural deterioration of the membranes or poor workmanship in applying the roofing materials or failure of the system to perform as roofing and providing a waterproof, watertight system.

1.10 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. Inspection and testing will be performed by a Professional Engineering firm or manufacturer’s representative approved by the Engineer.

B. Correct defects and irregularities reported.

1.11 MANUFACTURERS

A. Subject to the compliance with the Specifications, provide products manufactured by Johns Manville, Siplast, or Soprema.

PART 2 -- PRODUCTS

2.01 ROOFING SYSTEM

A. The roofing system shall be a four ply hot asphalt applied modified bitumen membrane system with mineral granule surface cap sheet as the fourth ply over the specified rigid insulation.

2.02 ROOF INSULATION

A. The roof insulation shall consist of rigid roof insulation boards with a minimum total thickness as identified on the drawings, but no less than 3 inches. The boards shall be comprised of a closed cell Polyisocyanurate foam core bonded to fiberglass reinforced facers. The minimum R-value, when tested in accordance with ASTM C1289, shall be 5 (hr-ft2-F)/BTU per inch of thickness. ENRGY 3 by Johns Manville meets the requirements of these Specifications. Insulation shall be FM approved.

B. At locations where tapered roofing is indicated on the Drawings, custom factory-fabricated tapered panels shall be provided over the specified layered roof insulation. The tapered insulation shall be tapered ENRGY 3 by Johns Manville, or equal.

C. Provide manufacturer’s recommended high density fiberboard, 1/2 inches thick, above insulation where required by manufacturer to meet design requirements.

2.03 ASPHALT

A. Asphalt shall meet the requirements of ASTM D 312, Type IV. The sources shall be approved by the roofing manufacturer for the purpose of the guarantee.

B. Asphalt primer shall comply with the requirements of ASTM D 41.

2.04 ROOF PLIES

A. Roof plies shall be approved by the manufacturer for a 20-year no dollar limit roofing guarantee. Roof plies shall comply with ASTM D 2178, Type VI. Roof felts shall be type G-1 coated ply sheets as classified by Underwriters Laboratories. Glas Ply Premier by Johns Manville meets the requirements of this Section. Roof felts shall be FM approved.

2.06 CAP SHEET

A. The cap sheet shall be a premium, fire retarding, fiberglas/polyester-reinforced, modified bitumen, mineral surfaced, cool roof cap, complying with ASTM D 6162, Type III, Grade G. DynaKap FR T1 CR by Johns Manville meets the requirements of this Section. Cap sheet shall be FM approved. The cap sheet shall have the following properties:

1.	Minimum Thickness		140 mils
2.	Tensile Strength	(ASTM D-5147)	400 lb
2.	Tear Strength	(ASTM D-5147)	400 lb.

2.07 ROOFING ACCESSORIES

A. Roofing Accessories are specified in Section 07600 entitled "Flashing and Roofing Accessories".

PART 3 -- EXECUTION

3.01 SHIPPING, HANDLING AND STORAGE

A. Deliver roofing materials to the job site in manufacturer's original unopened packing with seals intact. Store materials off the ground and under cover. Store roof goods on end. Handle materials to avoid damage or contamination. Protect building and adjacent areas from bitumen spillage and repair or replace damage at no additional cost to JEA.

3.02 JOB CONDITIONS

A. Surfaces to which roofing is to be applied shall be smooth, even, sound, thoroughly clean and dry and free of defects which would adversely affect application of this work. Surfaces which do not meet the tolerances imposed within the sections governing their installation or which contain defects shall be repaired or replaced prior to installation of

this work. Application of the roofing will be considered acceptance of the roof deck and approval by the CONTRACTOR as an acceptable base for roofing.

B. Coordinate with sheet metal, plumbing, electrical, HVAC and mechanical subcontractors to insure all roofing penetrations are in place prior to commencement of work.

C. Proceed with the roofing and associated work only when existing and forecasted weather conditions will permit the work to be performed as scheduled.

D. Prior to commencement of installation of the roofing, a pre-roofing conference is to be held by the CONTRACTOR. The CONTRACTOR, Roofing CONTRACTOR, Engineer, JEA's representative and the Roofing Manufacturer Representative shall be present to discuss any and all details, procedures and schedules.

3.03 GENERAL ROOFING INSTALLATION

A. Fabricate and install the built-up roofing system described herein in accordance with the roofing manufacturer's requirements.

B. Install insulation board to roofing in accordance with manufacturer recommendations for the appropriate roof deck. All seams shall be taped. Bends and covers shall be cut to fit snug.

C. Cant strips and tapered edge strips shall be provided at all intersections of roof surfaces with vertical walls, parapets, curbs, and accessories which do not have built-in cants, and shall be miter cut at corners. Cant strips and tapered edge strips shall be firmly attached in place prior to roof application.

D. Heat and apply asphalt to the roofing surface at temperatures recommended by the roofing manufacturer using apparatus capable of providing controlled temperatures. Asphalt which has been burned shall be discarded. Apply asphalt evenly, leaving no bare spots at a rate of 20 pounds per 100 square feet. Lap piles 4-inches at edge and 6-inches at ends. Embed cap sheet and lapped edges and ends in full hot application as steep asphalt. Nail through laps and along center of cap sheet; stagger nails. Broom in each ply to complete embedment. Solid mop heated bitumen under and between felts. Provide complete uniform coating. Felt shall not touch felt. Lay felts parallel to long dimension of roof. Broom or press felts into heated bitumen providing tight, smooth lamination without wrinkles, buckles, kinks, fishmounts, pockets, or busters.

E. Flashing and all other connections of roofing with other work shall be completed before the application of the finishing surface. Bed all metal base flashings, gravel stops and similar items in roofing cement or bitumen after all felts are in place. Base flashings and gravel stops shall be stripped with two piles of roofing felt over the metal and embedded in roofing cement.

F. Coordinate work with sheet metal and the work of other trades. Finish areas as rapidly as practicable after completion of the other work. Incomplete roofing shall be protected from dampness by a light coat of asphalt when final coating is delayed.

3.04 ROOFING

A. Install a complete 20-year guaranteed roof fully complying with the specifications and recommendations of the roofing manufacturer.

B. At all edges and similar locations where seepage of bitumen is possible, the bitumen shall be applied to within 4-inches of such edge or location and this 4-inches is to be coated with a heavy layer of roof cement or asphalt, into which the felt is to be embedded.

3.05 SHEET METAL

A. Coordinate flashing and trim work with the installation of roofing, waterproofing, piping, existing building, and other adjoining and substrate work.

3.06 PROTECTION AND CLEANING

A. The CONTRACTOR shall protect the work of other trades. Work damaged by an operation under this section shall be repaired or replaced at no expense to JEA. All soiled adjoining surfaces shall be carefully cleaned. All debris and surplus material resulting from work under this section shall be removed from the premises.

- END OF SECTION -

SECTION 07600

FLASHING AND ROOFING ACCESSORIES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install roofing sheet metal work and related items necessary for a complete installation, as indicated on the Drawings and specified herein, including, but not limited to the following: base flashings; pitch pans, scuppers, and other sheet metal work in conjunction with roof drainage; pipe and stack flashings, and similar items where furnished by equipment suppliers; flashings for ducts, exhaust piping, equipment piping, conduit, etc., penetrating roofing that may be required.

1.02 SUBMITTALS

A. Submit shop drawings and samples for review in accordance with Section 01300 entitled "Submittals". Provide sizes, shapes, thicknesses and types of materials, finishes fabrication details, anchors, connections and expansion joints in relation to adjacent work.

B. Submit a 12-inch square sample of wall flashing, angle clamping bar and other metal work specified. Deliver samples to a field location as directed by the Engineer.

1.03 APPLICABLE STANDARDS

A. Except as otherwise shown or specified, comply with applicable manual by (SMACNA) Sheet Metal and A/C CONTRACTORs National Association.

B. Except as otherwise shown or specified, comply with the recommendations and instructions of the manufacturer of the sheet metal being installed.

C. All materials and installation shall conform to or exceed the requirement of all local codes.

1.04 GUARANTEE

A. The roofing guarantee specified in Section 07510 entitled "Built-up Bituminous Roofing" shall cover flashings and edges specified in this section. The flashing and edge details shall be as required by the roofing manufacturer to satisfy conditions of the guarantee. The details shown on the Drawings are intended to provide minimum standards required for the guarantee.

B. All roofing accessories, including flashing, fasteners, roof vents, curb details and other miscellaneous metals and accessories required for the installation shall be supplied by the roofing manufacturer or from other sources acceptable to the manufacturer selected for the installation so that the system guarantee will include all edges, penetrations and other details of the installation.

PART 2 -- PRODUCTS

2.01 FLASHING

A. Metal flashing and other cover plates shall be prefinished 0.050 inches aluminum. Finish shall be full-strength Kynar 500 baked-on paint finish with a 20 year warranty. Flashing and other cover plates shall be approved by the roofing system manufacturer and shall comply with the requirements of the full system guarantee.

B. Perimeter flashing shall be FM Global approved with a minimum rating of 1-135 for roof zones 2 and 3.

2.02 FLEXIBLE FLASHING

A. Manufacturer's recommended modified bitumen flashing.

2.03 CANT STRIPS

A. Cant Strips shall be Fes-Cant Plus Cant Strip or Tapered Edge Strips by Johns Manville or equal. Ths strips shall be a high density, laminated board made of high strength fibers and expanded peslites. Cant strips shall be approved by the roofing system manufacturer and shall comply with the requirements of the full system guarantee and the Product Approval.

2.04 ROOF VENTS

A. Roof vents shall be provided for all roofing applications. One vent per 1000 square feet of applications shall be provided. One vent per 1000 square feet of roofing area shall be provided. The vents roofing area shall be provided. The vents shall be FP-10 One Way Roof Vents by Johns Manville or equal.

2.05 PLASTIC CEMENT

A. Plastic cement shall conform to ASTM D 2822 and shall be supplied by the roofing manufacturer.

2.06 FASTENERS

A. Nails, bolts, and nuts, screws, washers, etc., shall be stainless steel and shall be supplied by the roofing manufacturer.

2.07 ANCHORS

A. Anchors for fastening items to concrete shall be stainless steel machine screws or bolts and Rawl plug inserts of Phillips Red Head concrete anchors of the size and type noted or required.

2.08 BITUMINOUS PLASTIC CEMENT

A. Bituminous plastic cement shall conform to FS SS-C-153.

2.09 ASPHALTIC MATERIAL

A. Asphalt primers shall conform to FS S-A-701. Coating asphalt shall have brushing consistency conforming to FS SS-R-451.

2.10 SCUPPERS, GUTTERS AND DOWNSPOUTS

A. Material: Minimum 0.050 inch thick aluminum.

B. Design: Manufacture gutters tapered and notched to provide telescoping joint. Design gutters and downspouts to accommodate expected thermal movement.

C. Supports and Fasteners: Provide manufacturers' standard straps, brackets and fasteners, spaced at maximum 60-inches on center or as recommended by the manufacturer. Finish of supports, brackets and fasteners shall match gutter and downspout.

D. Accessories: Provide end caps, flashing, trim, and other items required for a complete installation.

E. Finish: Baked on Kynar, with 20 year warranty.

F. Color: Color for the downspout shall be selected by the Engineer from the Supplier’s standard color chart.

2.11 ROOF WALKWAY PADS

A. Walkway pads shall be dynatred plus roof walkway by Johns Manville or equal. The pads shall be preformed, skid resistant with a minimum thickness of 3/8-inch. Walkway pads shall be installed along walking path from roof ladder to roof-mounted exhaust fans, and below the bases of the roof fall protection guardrail system of the Alternate Bid Item.

PART 3 -- EXECUTION

3.01 SHIPPING, HANDLING AND STORAGE

A. Store materials off the ground to avoid damage. Protect from bitumen spillage and repair or replace damage at no additional cost to JEA.

3.02 JOB CONDITIONS

A. Coordination: Coordinate with the roofing system, sheet metal, plumbing, electrical, HVAC and mechanical subcontractors to insure that all items are in place prior to commencement of work.

B. Climatic Conditions: Proceed with the roofing and associated work only when existing and forecasted weather conditions will permit the work to be performed as scheduled.

3.03 SHEET METAL INSTALLATION

A. General: Coordinate metal flashing and trim work with the installation of roofing,

waterproofing, piping, existing building, and other adjoining and substrate work. Surfaces to be coated shall be smooth and clean. The installer must examine the substrate and the conditions under which the metal flashing will be installed, and notify the CONTRACTOR in writing of any unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer. Flanges or gravel stops, vent and other flashings, shall be bedded in hot asphalt, set on top of the roofing plies and reinforced with felt strips as specified. Work shall be water tight, with lines, arises and angles sharp and true. Surfaces shall be free from waves and buckles.

B. Fabrication: Fabricate and install work described herein in accordance with the applicable standard described and illustrated in the National Association, Inc. publication "Architectural Sheet Metal Manual".

C. Flashings: Base and all other flashings shall be watertight and of a bondable type.

D. Scuppers: Scuppers and the like, shall be fabricated as indicated on the Drawings, or equal, and properly installed.

E. Accuracy: Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free from buckles, excessive waves and avoidable tool marks, considering the temper and reflectivity of the metal. Provide uniform, neat seams with minimum exposure of solder welds, and sealant. Except as otherwise shown, fold back the sheet metal to form a hem on the concealed side of exposed edges.

F. Fasteners: Conceal fasteners and expansion provisions wherever possible in exposed work, and locate so as to minimize the possibility of leakage. Cover and seal work as required for a tight installation. Fasten sheet metal items as indicated or required to provide rigid, secure installation free of warp. Fastenings shall be made in such a manner as not to impair the watertight integrity of the installation. Exposed face nailing will not be permitted.

G. Laps: For embedment of metal flanges in roofing or composition flashing or stripping, extend flanges for a minimum of 4-inch embedment. Lap seams of sheet metal in direction of flow. Single lock flat seams, heliarc weld or double-lock and mallet flat. Lap seams occurring in members sloping 45 degrees or greater shall be lapped 4-inch minimum and be bedded in flashing cement. Provide loose-locked expansion joints a maximum of 20 feet and a minimum of 8 feet from corners. On vertical surfaces, lap 2 piece flashings a minimum of 3 inches.

H. Protection: Separate dissimilar metals from each other by painting each metal surface in the area of contact with a heavy application of bituminous coating, or by other permanent separation as recommended by the manufacturers of the dissimilar metals. The flashing subcontractor shall advise the CONTRACTOR of required procedures for protection of the completed flashing and trim. Furnish such advice for period of installation of other work, and also for the remainder of the construction period.

3.04 COORDINATION

A. Coordinate flashing work with the work of other trades. Adjacent work shall be kept clean and shall not be injured or defaced in any way.

3.05 PROTECTION AND CLEANING

A. The CONTRACTOR shall protect the work of other trades. Work damaged by an operation under this section shall be repaired or replaced at no expense to JEA. All soiled adjoining surfaces shall be carefully cleaned.

B. All debris and surplus material resulting from work under this section shall be removed from the premises.

- END OF SECTION -

SECTION 07920

SEALANTS AND CAULKING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall provide sealant and caulking work required for a complete installation as is indicated on the Drawings and specified herein. The required applications of sealants and caulking include, but are not necessarily limited to, the following general locations:

1. Masonry joints, exterior and interior.

2. Joints at penetrations of walls, decks by piping, doors, windows, louvers and other services and equipment.

3. Joints between items of equipment and other construction.

4. Joints in concrete.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03290 - Joints in Concrete

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ASTM C-920 Elastomeric Joint Sealants

2. ASTM D-1056 Flexible Cellular Materials - Sponge or Expanded Rubber

3. SWRI Sealant and Caulking Guide Specification

1.04 SUBMITTALS

A. Submit manufacturer’s literature, installation instructions and color samples of sealant for review in accordance with the Section entitled "Submittals".

B. Submit to JEA, in accordance with Section 01300 entitled "Submittals", a two year guarantee on sealant type caulking work against joint failure. Joint failure is defined as leaks of air or water; evidence of loss of cohesion; fading of sealant material; migration of sealant; evidence of loss of adhesion between sealant and joint edge.

1.05 ACCEPTABLE MANUFACTURERS

A. The following list of manufacturer products are acceptable for this Section, subject to conformance with the specified requirements: Tremco, Thiokol, Dymoric or equal.

1.06 QUALITY ASSURANCE

A. Applicator shall be a company specializing in the installation of sealants with a minimum of five years experience.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened labeled packages.

B. Store materials in location protected from freezing or damages.

C. Reject and remove from the site materials within broken or damaged packaging.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Primer: Where required by sealant manufacturer, the primer shall be a compound designed to insure the adhesion of sealant. Material shall be provided by the sealant manufacturer and shall be selected for compatibility with substrate.

B. Sealant

1. Type 1: Multi-component, non-sag, low-modulus polyurethane rubber sealant meeting ASTM C-920, Type M, Grade NS, Class 25, use NT, M, A, and O. Capable of withstanding 50% in extension or compression such as Sikaflex-2C NS/SL, Sika Corporation, or Sonolastic NP-2, Sonneborn, or DynaTrol II by Pecora Corporation, or approved equal.

2. Type 2: Single component polyurethane sealant meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, A, and O. Capable of withstanding 25% in extension or compression such as Sikaflex 1A by Sika Corporation, DynaTrol 1-XL by Pecora Corporation, or Sonolastic NP-1 by BASF Construction Chemicals, or approved equal.

3. Type 3: Single component, low-modulus moisture curing silicone meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, G, and A. Capable of withstanding 50% extension and compression. Pecora 890 by Pecora Corporation, Sonolastic Omni Seal by BASF Construction Chemicals, or approved equal.

4. Type 6: High grade butyl sealant meeting Federal Specification TT-S-00-1657. BC-158 by Pecora Corporation or approved equal.

5. Type 8: Non-sag, Multi Component, traffic grade polyurethane sealant meeting ASTM C920, Type 19, Grate NS, Class 25, use T, M, A, and O. DynaTread by

Pecora Corporation, Sonolastic Ultra by BASF Construction Chemicals, or approved equal.

C. Joint Backing shall be closed cell foam. Material shall be nonreactive with caulking materials and non-oily. Minimum density shall be 3.24 pcf. Use no asphalt or bitumen-impregnated fiber with sealants.

D. Joint cleaner shall be as recommended by sealant or caulking compound manufacturer.

E. Joint Primer shall be as recommended by sealant manufacturer.

F. Bond Breaker tape shall be either polyethylene or plastic as recommended by the sealant manufacturer.

G. Color: Where manufacturer's standard colors do not closely match materials being sealed, provide a custom color.

PART 3 -- EXECUTION

3.01 GENERAL

A. Comply with sealant manufacturer's printed instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.

3.02 QUALITY CONTROL

A. Coordinate work with details shown on approved shop drawings prepared by other trades.

B. Verify conditions in the field.

C. Schedule work to follow closely the installation of other trades.

D. Apply sealants and related items in temperatures and dry conditions recommended by the manufacturers.

E. Do not paint sealant, unless recommended by sealant and paint manufacturer.

3.03 SHIPPING, HANDLING AND STORAGE

A. Store and handle materials so as to prevent the inclusion of foreign matter or the damage of materials by water or breakage. Procure and store in original containers until ready for use. Material showing evidence of damage will be rejected.

B. Store and handle materials so as to prevent the inclusion of foreign matter or the damage of materials by water or breakage. Procure and store in original containers until ready for use. Material showing evidence of damage shall be rejected.

3.04 INSTALLATION

A. Protect finished surfaces adjoining by using masking tape or other suitable materials.

B. Clean and prime joints before starting any caulking or sealing work.

C. Thoroughly clean joints and spaces of mortar and other foreign materials. Cleaning agent shall be Xylol or similar non contaminating solvent to remove any film from metal surfaces. Masonry or concrete surfaces shall be brushed or air jet cleaned.

D. Exercise care before, during, and after installation so as not to damage any material by tearing or puncturing. All finished work shall be approved before covering with any other material or construction.

E. Apply sealant by an approved type of gun except where the use of a gun is not practicable, suitable hand tools shall be used. Avoid applying the compound to any surface outside of the joints or spaces to be sealed. Mask areas where required to prevent overlapping of sealant.

F. All joints shall be waterproof and weathertight.

G. Point sealed joints to make a slightly concave joint, the edges of which are flush with the surrounding surfaces. Exposed joints in the interior side of the door and other frames shall be neatly pointed flush or to match adjacent jointing work.

H. Adjacent materials which have been soiled shall be cleaned immediately and the work left in neat and clean condition.

I. Comply with sealant manufacturer's written instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.

J. Employ only proven installation techniques, which will insure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surface equally on opposite sides. Except as otherwise indicated, the Contractor shall fill the sealant rabbet to a concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

K. Install sealants to depths as specified, or if not, as recommended by the sealant manufacturer and as follows:

1. Moving Joints: For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but not more than 1/2-inch deep or less than 1/4-inch deep.

2. Sealed Joints: For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in the range of 75% to 125% of joint width.

3. Thresholds: Set thresholds in full bed of caulking compound; remove excess materials.

4. All joints and spaces to be sealed in exterior work shall be less than 1/2 inch deep and not less than 1/4 inch wide. If joints in masonry are less than that specified herein, the mortar shall be cut out to the required width and depth. All joints and spaces to receive sealant shall be completely prepared and thoroughly dry before installation of sealant.

5. Unless otherwise specified, joints and spaces which are open to a depth of 1/2 inch or greater shall be solidly filled with back up material to within 1/4 inch of the surface. Back up material shall be packed tightly and made continuous throughout the length of the joints. Bond breaker shall be applied as required. If joints are less than 1/4 inch deep, the back up material may be omitted, a bond breaker substituted and the joint completely filled with sealant. The back up material shall not project beyond the 1/4 inch depth of the open space in any joint. The following width to depth ratio table shall be adhered to, unless otherwise recommended by manufacturer.

	Sealant Depth	
Joint Width	Minimum	Maximum
¼ inch	1/4 inch	1/4 inch
Over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
Over 1/2 inch to 1 inch	1/2 inch	Equal to width
Over 1 inch to 2 inch	1/2 inch	1/2 of width

3.05 ADJUSTMENT

A. Remove misplaced sealant compounds promptly using methods and materials recommended by the manufacturer, as the work progresses.

B. Allow sealants to cure and remove protective edging, of doors, louvers, saddles windows etc. as directed by the Engineer.

3.06 SCHEDULE

Schedule of Sealants

Application	Sealant	Color
Vertical and horizontal joints bordered on both sides by concrete, masonry, precast concrete, EIFS, or other porous building material.	Type 2	To closely match adjacent surfaces or mortar and as selected by the District.
Vertical and horizontal joints bordered on both sides by painted metals, anodized aluminum, mill finished aluminum, PVC, glass or other non-porous building material.	Type 3	To closely match adjacent surfaces and as selected by the District.
Masonry expansion and control joints less than 1¼" wide.	Type 2	To closely match adjacent surfaces and as selected by the District.

Application	Sealant	Color
Masonry expansion and control joints equal or greater than 1¼ inches wide and not to exceed 2”.	Type 1	To closely match adjacent surfaces and as selected by the District.
Perimeter sealing of doors, windows, louvers, piping, ducts, and electrical conduit. See Note 2.	Type 2 OR Type 3	To closely match adjacent surfaces and as selected by the District.
Below thresholds.	Type 6	Manufacturer's standard
Horizontal Joints exposed to vehicular or pedestrian traffic.	Type 8	To closely match adjacent surfaces.
Other joints indicated on the drawings or customarily sealed but not listed.	Type recommended by manufacturer	To closely match adjacent surfaces and as selected by the District.

Note 1. Sealant for Laboratory Countertop shall be as recommended by countertop manufacturer.

Note 2. Provide UL approved sealants for penetrations thru fire-rated walls and as specified in Section 07270.

Note 3. Sealants which will come in contact with potable water shall meet the requirements of NSF 61.

Note 4. Where sealant will be immersed in liquid chemicals verify compatibility prior to installation of sealant.

3.07 PROTECTION OF ADJOINING SURFACES

A. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

3.08 SEALANT BACKER ROD

A. Install sealant backer rod for liquid elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.

3.09 BOND BREAKER

A. Install bond breaker tape as shown and as required by manufacturer's recommendations to insure that elastomeric sealants will perform properly.

3.10 SPILLAGE

A. Sealants or compounds shall not overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces. Masking tape or other precautionary devices shall be used to prevent staining of adjoining surfaces.

3.11 CURING

A. Sealants and caulking compounds shall be cured in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength, and surface durability.

3.12 CLEANING

A. Excess and spillage of compounds shall be promptly removed as the work progresses. Adjoining surfaces shall be cleaned by whatever means may be necessary to eliminate evidence of spillage. Do not damage the adjoining surfaces or finishes.

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SECTION 08225

FRP ALUMINUM HYBRID DOORS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish all labor, materials, equipment and appliances required for the complete execution of the Work as shown on Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 04220 - Concrete Block Masonry

B. Section 08710 - Finish Hardware

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 entitled “Submittals”, submit the following:

1. Product Data.

a. Submit manufacturer’s product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.

2. Shop Drawings.

a. Submit manufacturer’s shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.

3. Samples.

a. Submit manufacturer’s door sample composed of door face sheet, core, framing and finish.

b. Submit manufacturer’s sample of standard colors for door face and frame.

4. Testing and Evaluation Reports.

a. Submit testing reports and evaluations provided by manufacturer conducted by and accredited independent testing agency certifying

doors and frames comply with specified performance requirements listed in Section 2.04.

5. Manufacturer Reports.

   a. Manufacturer's Project References: Submit list of successfully completed projects including project name, location, name of architect, type, and quantity of doors manufactured.

6. Florida Product Approval current at the time of submittal.

B. Closeout Submittals

1. Operation and Maintenance Manual.

   a. Submit manufacturer's maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.

2. Warranty Documentation.

   a. Submit manufacturer's standard warranty.

1.04 WARRANTY

A. Warrant doors, frames, and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering for a period of ten years.

B. Warrant failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation for a period of ten years.

C. Warrant painted finish of face sheet for a period of 5 years.

1.05 DELIVERY, STORAGE AND HANDLING

A. Delivery.

1. Deliver materials to site in manufacturer's original, unopened, containers and packaging.

2. Labels clearly identifying opening, door mark, and manufacturer.

B. Storage.

1. Store materials in a clean, dry area, indoors in accordance with manufacturer's instructions.

C. Handling.

1. Protect materials and finish from damage during handling and installation.

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, provide products from one of the following manufacturers:

1. Special-Lite, Inc.

2. Or equal

2.02 DOORS

A. Model: SL-17 Pebble Grain FRP/Aluminum Hybrid Door

B. Provide doors and frames from the same manufacturer and products meeting Miami Dade and Florida Product Approval.

C. Doors shall be an FRP/Aluminum hybrid flush door with FRP face sheets secured to aluminum stiles and rails.

D. Construction

1. Door Thickness.

a. 1-3/4”.

2. Stiles & Rails.

a. Aluminum extrusions made from 6063 aluminum alloys with a minimum temper of T5.

b. Minimum 2-5/16” deep one-piece extrusion with have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.

c. Screw or snap in place applied caps are not acceptable.

d. Top rails must have integral legs for interlocking continuous extruded aluminum flush cap.

e. Bottom rails must have integral legs for interlocking continuous weather bar with single nylon brush weather stripping or manually adjustable SL-301 door bottom with two nylon brush weather stripping.

f. Meeting stiles to include integral pocket to accept pile brush weather seal.

3. Corners.

a. Mitered.

b. Secured with 3/8” diameter full-width steel tie rod through extruded splines top and bottom which are integral to standard tubular shaped rails.

c. 1-1/4” x 1-1/4” x 3/16” 6061 aluminum angle reinforcement at corner to give strong, flat surface for locking hex nut to bear on.

d. Weld, glue, or other methods of corner joinery are not acceptable.

4. Core.

a. Poured-in-place polyurethane foam.

b. Laid in foam cores are not acceptable.

5. Face Sheet.

a. Exterior

1. 0.120” thick, through color with integral seal film.

b. Interior

1. 0.120” thick, through color with integral seal film.

c. Attachment of face sheet.

1. Extruded stiles and rails to have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.

2. Use of glue to bond face sheet to core or extrusions is not acceptable.

6. Cutouts.

a. Manufacture doors with cutouts for required vision lites, louvers, and panels.

7. Hardware.

a. Pre-machine doors in accordance with templates from specified hardware manufacturers.

b. Surface mounted closures will be reinforced for but not prepped or installed at factory.

c. Factory install door hardware.

8. Reinforcements.

a. Aluminum extrusions made from 6061 or 6063 aluminum alloys.

b. Sheet and plate to conform to ASTM-B209.

c. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.

d. Bars and tubes to meet ASTM-B221.

2.03 FRAMING

A. Framing

1. Aluminum Tube Framing with Applied Stops.

a. Model.

1. SL-50.

b. Materials.

1. See 2.05.A.

c. Perimeter Frame Members.

1. Box type with 4 enclosed sides.

2. Factory fabricated.

3. Open-back framing is not acceptable.

d. Applied Door Stops.

1. 5/8” x 1-1/4” or 5/8” x 1-3/4”, 0.125” wall thickness, with screws and weather-stripping.

2. Provide solid ½” aluminum bar behind door stop for closer shoe attachment.

3. Pressure gasketing for weathering seal.

4. Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.

e. Caulking.

1. Caulk joints before assembling frame members.

f. Frame Member to Member Connections.

1. Secure joints with fasteners.

2. Provide hairline butt joint appearance.

g. Hardware

1. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.

2. Surface mounted closures will be reinforced for but not prepped or installed at factory.

3. Factory install door hardware.

h. Anchors:

1. Anchors appropriate for wall conditions to anchor framing to wall materials.

2. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.

3. Secure head and sill members of transom, side lites, and similar conditions.

2.04 PERFORMANCE

A. Face Sheet.

1. Standard Interior and Exterior Class C 0.120” thick, pebble texture, through color with integral surfaseal film FRP sheet.

a. Flexural Strength, ASTM-D790: 21 x 103 psi.

b. Flexural Modulus, ASTM-D790: 0.7 x 106 psi.

c. Tensile Strength, ASTM-D638: 13 x 103 psi.

d. Tensile Modulus, ASTM-D638: 1.2 x 106 psi.

e. Barcol Hardness, ASTM-D2583: 55.

f. Izod Impact, ASTM-D256: 14.0 ft-lb/in.

g. Gardner Impact Strength, ASTM-D5420: 120 in-lb.

h. Water Absorption, ASTM-D570: 0.20%/24hrs at 77°F.

i. Surface Burning, ASTM-E84: Flame Spread ≤ 200, Smoke Developed ≤ 450.

j. Taber Abrasion Resistance, Taber Test: 0.007% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.

k. Chemical Resistance.

1. Excellent Rating.

a. Acetic Acid, Concentrated.

b. Acetic Acid, 5%.

c. Bleach Solution.

d. Detergent Solution.

e. Distilled Water.

f. Ethyl Acetate.

g. Formaldehyde.

h. Heptane.

i. Hydrochloric Acid, 10%.

j. Hydrogen Peroxide, 3%.

k. Isooctane.

l. Lactic Acid, 10%.

B. Door Core.

1. Density, ASTM-D1622: ≤ 5.0 pcf.

2. Compressive Properties, ASTM-D1621: Compressive Strength ≥ 60 psi, Compressive Modulus ≥ 1948 psi.

3. Tensile and Tensile Adhesion Properties, ASTM-D1623: Tensile Adhesion, 3” x 3” FRP Facers ≥ 53 psi, Tensile Adhesion, 1” x 1” Foam ≥ 104 psi.

4. Thermal and Humid Aging, ASTM-D2126: Volume Change at 158 °F, 100% humidity, 14 days ≤ 13%.

5. Thermal Conductivity, ASTM-C518, Thermal Resistance ≥ 0.10 m2K/W.

C. Door Panel.

1. Thermal Transmittance, AAMA 1503-98: U-Factor = 0.29 Btu/hr·ft²·°F, CRFp = 55.

2. Indoor Air Quality, ASTM-D5116, ASTM-D6607: GreenGuard, GreenGuard Gold.

D. Door and Aluminum Tube Frame Assembly.

1. Physical Endurance, ANSI A250.4: 25,000,000 Cycles, No Damage.

2. Salt Spray, ASTM-B117: 500 hours minimum exposure.

3. Air Leakage, NFRC 400, ASTM-E283.

a. Opaque Swinging Door (< than 50% glass)

1. 0.01 cfm/sqft @ 1.57 psf.

2. 0.01 cfm/sqft @ 6.24 psf.

b. Commercially Glazed Swinging Entrance Door (> than 50% glass)

1. 0.38 cfm/sqft @ 1.57 psf.

2. 0.73 cfm/sqft @ 6.24 psf.

4. Security Test, ASTM-F476: Minimum Grade 40.

5. Blast Test, ASTM-F1642.

a. 6 psi @ 45 psi-msec, minimal hazard, operable.

2.05 MATERIALS

A. Aluminum Members.

1. Aluminum extrusions made 6061 or 6063 aluminum alloys.

2. Sheet and plate to conform to ASTM-B209.

3. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.

B. Fiberglass.

1. See 2.02.D.5.

C. Fasteners.

1. All exposed fasteners will have a finish to match material being fastened.

2. 410 stainless steel or other non-corrosive metal.

3. Must be compatible with items being fastened.

2.06 FABRICATION

A. Factory Assembly.

1. Door and frame components from the same manufacturer.

2. Required size for door and frame units, shall be as indicated on the drawings.

3. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.

4. All cut edges to be free of burs.

5. Welding of doors or frames is not acceptable.

6. Maintain continuity of line and accurate relation of planes and angles.

7. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.

B. Shop Fabrication

1. All shop fabrication to be completed in accordance with manufactures process work instructions.

2. Quality control to be performed before leaving each department.

2.07 FINISHES

A. Door.

1. Aluminum.

a. Anodizing.

1. Class 1 Anodizing, minimum 0.7 mils thick.

2. FRP Face Sheets

a. Through color.

B. Frame

1. Aluminum.

a. Anodizing.

1. Class 1 Anodizing, minimum 0.7 mils thick.

PART 3 -- EXECUTION

3.01 EXAMINATION

A. Examine areas to receive doors.

B. Notify architect of conditions that would adversely affect installation or subsequent use.

C. Do no proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.03 ERECTION

A. Install doors in accordance with manufacturer's instructions.

B. Install doors plumb, level, square, true to line, and without warp or rack.

C. Anchor frames securely in place.

D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.

E. Set thresholds in bed of mastic and back seal.

F. Install exterior doors to be weathertight in closed position.

G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by architect.

H. Remove and replace damaged components that cannot be successfully repaired as determined by architect.

3.04 FIELD QUALITY CONTROL

A. Manufacture's Field Services.

1. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.05 ADJUSTING

A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.06 CLEANING

A. Clean doors promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that would damage finish.

3.07 PROTECTION

A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

- END OF SECTION -

SECTION 08330

ROLL-UP DOORS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install all roll-up door assemblies and frames and all appurtenant work, complete and operable, including manual drive systems and power drive systems, including locking hardware, and control systems, all in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 08710 – Finish Hardware

B. Section 09900 – Painting

C. Electrical connections for motors, and accessories are specified in Division 16.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Codes: All codes, as referenced herein, are specified in the Section entitled "Reference Standards".

B. Commercial Standards:

1. NEMA National Electric Manufacturers' Association

2. NEC National Electric Code

C. Trade Standards:

1. American Rolling Door Institute

2. National Association of Garage Door Manufacturers

D. Manufacturers' Standards: In addition to the standards listed above, the roll-up doors and their installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.04 SUBMITTALS

A. General: All submittals shall be in accordance with the requirements of the Section entitled "Submittals".

B. Manufacturer's Information: Manufacturer's literature, wiring diagrams, manufacturer's installation instructions.

C. Guide and Jamb Details: The manufacturer shall assume responsibility for the design and selection of all anchor bolts and hardware. Details of guide and hood shall be submitted.

D. A complete door schedule indicating openings versus the proposed doors, door frames and the associated door hardware.

E. Operation and Maintenance Instructions: Upon completion, the Contractor shall deliver to the Engineer complete operation and maintenance instructions for the overhead door assemblies.

F. Florida Product Approval.

G. JEA will review and return the submittals to the CONTRACTOR. The CONTRACTOR shall then submit the accepted package to the Building Department having jurisdiction for approval. No fabrication or installation shall begin until the Building Department approval is obtained by the CONTRACTOR. JEA will not assume responsibility for any cut or schedule impacts due to the approval process of the Building Department. It is the CONTRACTOR's responsibility to customize the submittals based on the Building Department's published submittal processes

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products in original and unbroken packages, containers, or bundles bearing the name of the manufacturer.

B. Store materials carefully in an area that is protected from the elements, and in a manner that will prevent damage or marring of the door.

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with these specifications provide products from one of the following manufacturer:
   1. Cornell Iron Works, Inc.
   2. Atlas Roll-lite Door Corporation.
   3. The Cookson Company.
   4. Overhead Door Corporation.

2.02 ROLL-UP DOORS (STEEL)

A. General:

1. Slats: Slats shall be of sufficient shape and thickness for the wind loads specified. Material shall be as identified below. Slats shall be insulated with a foamed-in-place, closed cell urethane material to achieve a flame spread index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84.

2. Endlocks: Each end of every slat shall be fitted with endlocks to act as a wearing surface in the guides and to maintain alignment. Endlocks shall be cast malleable iron or carbon cast steel in accordance with Product Approval.

3. Windlocks: Door guides shall be provided with windlock bars of the same material as endlocks in accordance with Product Approval.

4. Guides: The guide assembly shall be fastened to the masonry opening with stainless steel anchor bolts sized and spaced to the manufacturer's requirements. The guide assembly shall be designed to retain the curtain against specified wind forces. Guides shall be fully weather stripped with the manufacturer's standard vinyl or neoprene weatherstripping. Weatherstripping shall be secured with metal pressure bars.

5. Counterbalance Mechanism: Doors shall be counterbalanced by means of adjustable steel helical torsion springs, mounted around a steel shaft and mounted in a spring barrel and connected to the door curtain with the required barrel rings. Grease-sealed ball bearings or self-lubricating graphite bearings shall be used for all rotating members.

    a. Spring barrel shall be fabricated of hot-formed structural quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support the roll-up of curtain without distortion of slats and limits barrel deflection to not more than 0.03 inches per foot of span under full load. The barrel shall be galvanized.

    b. Spring balance shall be fabricated of one or more oil-tempered, heat-treated steel helical torsion springs.

    c. Torsion rod for counterbalance shaft shall be fabricated of case-hardened steel, of required size to hold the fixed spring ends and carry the torsional load.

    d. Mounting brackets shall be manufacturer's standard design, either cast iron or cold-rolled steel plate with bellmouth guide groove for curtain.

6. Door Hoods: Hoods shall be formed to enclose coiled curtain at opening head, as indicated. Top and bottom edges shall be rolled and reinforced for stiffness. Closed ends shall be provided for surface-mounted hoods. Intermediate support brackets for hoods 18 feet or more wide shall be provided unless closer spacing is required by door manufacturer. Hoods for doors shall be fabricated of not less than 24 gauge stainless steel.

7. Door Operators: Roll-up doors shall be provided with manual door operation. If electrical door operation is indicated on the drawings, the door shall be provided with both power and manual operation.

   a. Each power operated roll-up door shall be equipped with a complete, packaged, prewired power operator unit, designed and built by the door manufacturer. The power unit shall be tested and listed by Underwriters Laboratories.

   b. Motor operator for power operated roll-up door shall be an integral enclosed assembly with high strength torque motor, worm gear reducer operating in an oil bath, self-locking gearing limit switch which breaks the circuit at the termination of travel, solenoid brake, electrical cut-out switch to prevent motor operation during chain operation, internal reversing magnetic starter, internal prewiring to terminal block, 4 position switch O-C-A-STOP. When in Auto mode, loop detector will control the overhead door. The motor shall be a 120VAC, single phase motor and shall have a capacity to operate door at 0.67 feet per second. Manual operation shall be provided on all motor operated doors as specified below.

      1. Loop detector and wiring shall be supplied and installed per manufacturer recommendations as shown on the Drawings in concrete paving on exterior of each overhead door by sawcutting after concrete placement.

      2. When in AUTO, door will open and remain open when loop detector activated upon arrival of a vehicle. When deactivated, door shall close after adjustable time delay.

      3. Detector shall have internal loop diagnostic capabilities and manual sensitivity control and installed in NEMA 4X stainless steel enclosure with Open-Close-Auto-Stop switches.

      4. Loop detector shall be equal to Stanley Model No. 410.1725.

      5. Floor mounted magnetic proximity switch with armed protected cable suitable for roll-up door application. The magnetic proximity switch shall monitor the close status of the roll-up door.

   c. Manual operation shall be by means of an endless stainless steel handchain, sprocket and reduction gears. The bottom of the chain shall be 4' -0" above the finished floor. A pull of 20 lbs. shall be sufficient to raise or lower the door.

   d. All electrical controls shall be in corrosion-resistant enclosure and shall be factory prewired and connected to terminal strips to facilitate field connections to power source and pushbutton station.

   e. Safety feature shall include a pressure bar at the bottom of the door which will reverse the door when closing on an obstruction.

8. Locks: Roll-up doors shall be provided with a slide bolt lock. Interlocks shall be furnished on motor operated doors to prevent operation when the doors are locked.

B. Steel Roll-Up Doors

1. Slats: Door slats shall be galvanized steel, minimum 20 gauge, or thicker if required to meet wind design criteria, ASTM A653, Type B, Grade 40, of sufficient shape and thickness for the wind loads specified in accordance with Product Approval. Finish shall be G90, galvanized coating per ASTM A653.

2. Guides: Guide angles shall be fabricated of structural steel angles, ASTM A36, minimum 1/4-inches thick per Product Approval.

3. Bottom Bar: Bottom bar shall consist of two steel angles, ASTM A36.

PART 3 -- EXECUTION

3.01 GENERAL

A. Installation shall be in accordance with the manufacturer's printed recommendations and instructions.

3.02 INSTALLATION

A. Door and frames shall be accurately cut, fitted, and installed level, square, plumb, and in alignment. Fasteners shall be of sufficient length, and shall be sized for loads imposed. Doors and frames shall be provided with accurately made cutouts, and shall be reinforced for strength where necessary. Doors shall be adjusted to provide smooth, unbinding operation with all hardware fully operable.

3.03 SHOP PAINTING

A. All ferrous metal surfaces, except lubricated surfaces, shall be shop cleaned and primed with the appropriate primer listed under Section 09900 entitled "Painting". All surface preparations shall conform to the requirement of 09900.

3.04 PAINTING

A. Galvanized rolling doors shall be painted in the field, but may be primed in the shop or in the field by the Contractor. The Contractor shall consult with the paint manufacturer about proper surface preparation before applying the paint system, and strictly follow their requirements. The prime coat shall be compatible with the final painting system applied in the field. As a minimum, all galvanized surfaces shall be cleaned with solvent, or steam cleaned free from oil contamination before the application of any paint coating system and shall comply with the following:

B. Galvanized, Zinc and Copper Alloy Surfaces:

All copper, or galvanized metal surfaces shall be given one coat of metal passivator or metal conditioner before applying the prime coat. The passivator or conditioner (Tnemec Epoxoline Primer as shown below) shall be compatible with the complete paint system and shall be identified on the paint schedule submitted by the Contractor. Galvanized steel rolling doors shall receive the following paint system by TNEMEC Protective Coating, Inc. or equal.

Application	**Description**	**Dft**
First - One Coat	66-AY72 Arabis Epoxoline Primer	3.0 - 5.0
Finish Coat	73-AY52 Tourmaline Endurashield	2.0 - 3.0

The minimum Dry Film Thickness for the above paint system shall be 6.5 Mils.

- END OF SECTION -

SECTION 08710

FINISH HARDWARE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are to be installed.

B. This Section includes the following:

1. Hinges.
2. Key control systems.
3. Lock cylinders and keys.
4. Lock and latch sets.
5. Bolts.
6. Exit devices.
7. Push/pull units.
8. Closers.
9. Overhead holders.
10. Miscellaneous door control devices.
11. Door trim units.
12. Protection plates.
13. Weatherstripping for exterior doors.
14. Sound stripping for doors.
15. Automatic drop seals (door bottoms).
16. Astragals or meeting seals on pairs of doors.
17. Thresholds.
18. Jamb Seals.
19. Stops.

20. Padlocks

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 08110 – Steel Doors and Frames

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Codes: All codes, as referenced herein, are specified in Section 01090 – Reference Standards

B. Commercial Standards

1. Underwriters' Laboratories, Inc. (UL) requirements and approvals.

2. Hardware Institute (DHI) Recommended Procedure for Processing Hardware Schedules and Templates and Architectural Hardware Scheduling and Format

3. BHMA, Builder's Hardware Manufacturers' Association

C. Manufacturer's Standards: In addition to the standards listed above, the finish hardware and its installation shall be accordance with the manufacturer's published recommendations and specifications.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Section 01300 entitled "Submittals":

1. Product data including manufacturer's technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

2. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

a. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

i. Type, style, function, size, and finish of each hardware item.

ii. Name and manufacturer of each item.

iii. Fastenings and other pertinent information.

iv. Location of each hardware set, cross-referenced to indications on Drawings, both on floor plans and in door and frame schedule.

v. Explanation of all abbreviations, symbols, and codes contained in schedule.

vi. Door and frame sizes and materials.

vii. Keying information.

b. Submittal Sequence: Submit final schedule at earliest possible date, particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.

c. Keying Schedule: Submit separate detailed schedule indicating clearly how JEA's final instructions on keying of locks has been fulfilled.

3. If requested JEA, submit samples of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.

a. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.

4. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer. All door locks shall be keyed to a keying schedule developed by JEA.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to JEA, Engineer, and CONTRACTOR, at reasonable times during the course of the Work, for consultation.

1. Require supplier to meet with JEA to finalize keying requirements and to obtain final instructions in writing.

2. Supplier shall be an authorized factory distributor of all specified products.

C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

1.05 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.06 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for JEA's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Butts and Hinges:

a. McKinney Products Co

2. Locks:

a. Medeco

3. Exit/Panic Devices:

a. Corbin Russwin

4. Push/Pull Units:

a. H.B. Ives, A Harrow Company.

b. Quality Hardware Mfg. Co., Inc.

c. Rockwood Mfg. Co.

5. Overhead Closers:

a. Corbin Russwin.

6. Bolts:

a. H.B. Ives, A Harrow Company.

b. Quality Hardware Mfg. Co., Inc.

c. Rockwood Mfg. Co.

7. Door Trim Units:

a. H.B. Ives, A Harrow Company.

b. Quality Hardware Mfg. Co., Inc.

c. Rockwood Mfg. Co.

8. Kick, Mop, and Armor Plates:

a. Rockwood Mfg. Co.

b. H.B. Ives, A Harrow Company.

c. Quality Hardware Mfg Co., Inc.

9. Thresholds, Door Stripping and Seals, Automatic Drop Seals, Astragals:

a. National Guard Products, Inc.

b. Pemko Manufacturing Co., Inc.

c. Reese Enterprises, Inc.

2.02 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the “Hardware Schedule” at the end of this Section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer’s Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article “Manufacturers” in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.

2. ANSI/BHMA designations used elsewhere in this Section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this Section.

   a. Butts and Hinges: ANSI/BHMA A156.1.

   b. Bored and Preassembled Locks and Latches: ANSI/BHMA A156.2.

   c. Exit Devices: ANSI/BHMA A156.3.

   d. Door Controls - Closers: ANSI/BHMA A156.4.

   e. Auxiliary Locks and Associated Products: ANSI/BHMA A156.5.

   f. Architectural Door Trim: ANSI/BHMA A156.6.

   g. Template Hinge Dimensions: ANSI/BHMA A156.7.

   h. Door Controls - Overhead Holders: ANSI/BHMA A156.8.

   i. Interconnected Locks and Latches: ANSI/BHMA A156.12.

   j. Mortise Locks and Latches: ANSI/BHMA A156.13.

   k. Sliding and Folding Door Hardware: ANSI/BHMA A156.14.

   l. Closer Holder Release Devises: ANSI/BHMA A156.15.

   m. Auxiliary Hardware: ANSI/BHMA A156.16.

   n. Self-Closing Hinges and Pivots: ANSI/BHMA A156.17.

   o. Materials and Finishes: ANSI/B BHMA A156.18.

2.03 MATERIALS AND FABRICATION

A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Engineer.

   1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation with each hardware item. Provide Phillips flat-head

screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including “prepared for paint” surfaces to receive painted finish.

E. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use hex screw fasteners.

2.04 HINGES, BUTTS, AND PIVOTS

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Screws: Provide Phillips flat-head screws complying with the following requirements:

1. For metal doors and frames install machine screws into drilled and tapped holes.

2. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Out-Swing Exterior Doors: Nonremovable pins.

2. Interior Doors: Nonrising pins.

3. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) is indicated.

D. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.

1. Fire-Rated Doors: Not less than 3 hinges per door leaf for doors 86 inches or less in height with same rule for additional hinges.

E. Hinges shall be full mortise type, with oil bearings, ANSI A 156.1 compliant.

F. Electric transfer hinge shall be provided where identified herein or on the drawings.

2.05 LOCKS AND KEYING

A. Locks shall be Mortise type, ML 2000 Series as manufactured by Corbin Russwin, listed by UL as appropriate for fire doors up to three hours.

B. Electrical locks shall be Mortise type, ML 20600 NAC series as manufactured by Corbin Russwin.

C. Review the keying system with JEA.

D. Hands of mortise locks shall be quiet reversible by means of a socket arrangement accessible without removing the case cover.

E. Mortise locks shall employ an auxiliary deadlocking latchbolt and mechanism to prevent manipulation of the latchbolts when locked for all keyed functions.

F. Mortise locks shall have a lustra design (LWA) and a US32D finish.

G. Mortise locks shall carry a five year limited warranty. All locksets shall be removable core 6 pin and keyed to existing Corbin Russwin 62AZ restricted system. A letter of authorization from JEA must be supplied to purchase locksets.

H. All keys and cores shall have concealed key control (CKCZ).

I. Key Quantity: Furnish 2 change keys for each lock.

1. Deliver keys to JEA.

2.06 KEY CONTROL SYSTEM

A. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for the Project.

1. Provide hinged-panel type cabinet for wall mounting.

2.07 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.

1. Provide flat lip strikes for locks with 3-piece, antifriction latchbolts as recommended by manufacturer.

2. Provide extra long strike lips for locks used on frames with applied wood casing trim.

3. Provide recess type top strikes for bolts locking into frame heads, unless otherwise indicated.

4. Provide dust-proof strikes for foot bolts, except where special threshold construction provides nonrecessed strike for bolt.

5. Provide roller type strikes where recommended by manufacturer of the latch and lock units.

B. Lock Throw: Provide 5/8-inch minimum throw of latch on pairs of doors. Comply with

UL requirements for throw of bolts and latch bolts on rated fire openings.

1. Provide 1/2-inch minimum throw of latch for other bored and preassembled types of locks and 3/4-inch minimum throw of latch for mortise locks. Provide 1-inch minimum throw for all dead bolts.

C. Flush Bolt Heads: Minimum of 1/2-inch-diameter rods of brass, bronze, or stainless steel with minimum 12-inch-long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

D. Rabbeted Doors: Where rabbeted door stiles are indicated, provide special rabbeted front on lock and latch units and bolts.

2.08 PUSH/PULL UNITS

A. Exposed Fasteners: Provide manufacturer’s standard exposed fasteners for installation, thru-bolted for matched pairs but not for single units.

2.09 CLOSERS AND DOOR CONTROL DEVICES

A. All closers shall be constructed with rack and pinion with compression springs. The Closing speed, latching speed and backcheck shall be controlled by key operated valves. The delay action feature shall be a separate key operated valve. The closer body shall be manufactured of high performance cast aluminum silicon alloy. All door closers shall be suitable for standard, top jamb, track, corner bracket and parallel arm applications when provided with proper brackets and arms. The closer should be adjustable to meet the range of sizes required for opening and closing forces.

B. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.

2.10 PANIC HARDWARE

A. Heavy duty push bar exit device, U.L. labeled, with corrosive resistant construction.

B. ANSI A156.3, Grade 1.

C. Exterior trim to closely match locksets.

D. Single/active doors: mortise type.

E. Double doors: surface vertical rod.

F. Acceptable manufacturer's: Corbin/Russwin

G. Series ED 5470 by Corbin Russwin

2.11 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer’s standard exposed fasteners for door trim units

consisting of either machine screws or self-tapping screws.

2.12 WEATHERSTRIPPING AND SEALS

A. General: Provide continuous weatherstripping on exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.13 THRESHOLDS

A. General: Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown or scheduled.

2.14 HARDWARE FINISHES

A. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations:

1. “Recommended Locations for Builders Hardware for Standard Steel Doors and Frames” by the Door and Hardware Institute.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.02 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper

operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Instruct JEA's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

D. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, accompanied by representatives of the manufacturers of latchsets and locksets and of door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:

1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.

2. Consult with and instruct JEA's personnel in recommended additions to the maintenance procedures.

CONTINUED ON NEXT PAGE

3.03 HARDWARE SCHEDULE

A. General: Provide hardware for each door to comply with requirements of this Section, hardware set numbers indicated in the door schedule on the Drawings, and in the following schedule of hardware sets.

Hardware Set No. 1 – Double Leaf Exit Door					
6 EA[1]	Hinge	McKinney	T4A3386-QC12	4.5 x 4.5 NRP	32 D
2 EA	Closer	Corbin Russwin	DC8210 A3		689
2 EA	Exit Device	Corbin Russwin	ED5470 M92		32 D
1 EA	Lock	Corbin Russwin	ML20606 NAC PSA		32 D
2 EA	Stops	Rockwood	460		26 D
1 EA	Threshold	Pemko	2005 AS		AL
1 EA	Jamb Seal	Pemko	303 AS		AL
2 EA	Kickplate	Quality	36		32D

[1]Use 8 Nos. for doors greater than 7'-0" high

Hardware Set No. 2 – Single Leaf Exit Door					
3 EA[1]	Hinge	McKinney	T4A3386-QC12	4.5 x 4.5 NRP	32 D
1 EA	Closer	Corbin Russwin	DC8210 A3		689
1 EA	Lock	Corbin Russwin	ML20606 NAC PSA		32 D
1 EA	Stops	Rockwood	460		26 D
1 EA	Threshold	Pemko	2005 AS		AL
1 EA	Jamb Seal	Pemko	303 AS		AL
1 EA	Kickplate	Quality	36		32D

[1]Use 8 Nos. for doors greater than 7'-0" high

Hardware Set No. 3 – Single Leaf Interior Door

3 EA[1]	Hinge	McKinney	T4A3386	4.5 x 4.5 NRP	32 D
1 EA	Closer	Corbin Russwin	DC8210 A3		689
1 EA	Lock	Corbin Russwin	ML2000		32 D
1 EA	Stops	Rockwood	460		26 D
1 EA	Threshold	Pemko	2005 AS		AL
1 EA	Jamb Seal	Pemko	303 AS		AL
1 EA	Kickplate	Quality	36		32D

[1]Use 8 Nos. for doors greater than 7'-0" high

- END OF SECTION -

SECTION 09900

PAINTING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish all labor, tools, materials, supervision and equipment necessary to do all the work specified herein and as required for a complete installation, including surface preparation, priming and painting of CONTRACTOR furnished equipment, materials, and structures.

B. Section includes:

1. Paint Materials

2. Shop Painting

3. Field Painting

a. Surface Preparation

b. Piping and Equipment Identification

c. Schedule of Colors

d. Work in Confined Spaces

e. OSHA Safety Colors

1.02 GENERAL INFORMATION AND DESCRIPTION

A. The term "paint," as used herein, includes emulsions, enamels, paints, stains, varnishes, sealers, cement filler, cement-latex filler and other coatings, whether used as prime, intermediate, or finish coats.

B. All paint for concrete and metal surfaces shall be especially adapted for use around wastewater treatment plants and shall be applied in conformance with the manufacturer's published specifications.

C. All paint for final coats shall be fume resistant, compounded with pigments suitable for exposure to sewage gases, especially to hydrogen sulfide and to carbon dioxide. Pigments shall be materials which do not tend to darken, discolor, or fade due to the action of sewage gases. If a paint manufacturer proposes use of paint which is not designated "fume resistant" in its literature, it shall furnish full information concerning the pigments used in this paint.

D. Coatings used in conjunction with potable water supply systems shall have U.S. Environmental Protection Agency (EPA) and FDA approval for use with potable water and shall not impart a taste or odor to the water.

E. Coatings used in conjunction with potable water supply systems shall have U.S. Environmental Protection Agency (EPA) and FDA approval for use with potable water and shall not impart a taste or odor to the water

F. All building, facilities, structures, and appurtenances, as indicated on the Drawings and as specified herein, shall be painted with not less then one shop coat and two field coats, or one prime coat and two finish coats of the appropriate paint. Items to be painted include, but are not limited to, exterior and interior concrete, structural steel, miscellaneous metals, steel and aluminum doors and frames, concrete block, ductwork, sluice gates, operators, pipe fittings, valves, mechanical equipment, motors, conduit, and all other work which is obviously required to be painted unless otherwise specified.

G. Baked-on enamel finishes and items with standard shop finishes such as graphic panels, electrical equipment, toilet partitions, lockers, instrumentation, etc., shall not be field painted unless the finish is damaged during shipment or installation. Aluminum, stainless steel, fiberglass and bronze work shall not be painted unless color coding and marking is required or otherwise specified. A list of surfaces not to be coated is included in Article 1.09 of this Section.

H. Ensure compatibility of total paint system for each substrate. Test shop primed equipment delivered to the site for compatibility with final paint system. Provide an acceptable barrier coat or totally remove shop applied paint system when incompatible with system specified, and repaint with specified paint system

I. The CONTRACTOR shall obtain all permits, licenses and inspections and shall comply with all laws, codes, ordinances, rules and regulations promulgated by authorities having jurisdiction which may bear on the work. This compliance will include Federal Public Law 91-596 more commonly known as the "Occupational Safety and Health Act of 1970".

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03350 – Concrete Finishes

B. Section 03370 – Concrete Curing

C. Section 15030 - Piping and Equipment Identification Systems

1.03 MANUFACTURERS

A. All painting materials shall be as manufactured by Tnemec, Carboline, Sherwin Williams, or approved equal.

1.04 REFERENCE SPECIFICATION, CODES AND STANDARDS

A. Without limiting the generality of these specifications the Work shall conform to the applicable requirements of the following documents:

1. SSPC - The Society for Protective Coatings Standards

   a. SSPC-Vis 1 Pictorial Surface Preparation Standards for Painting Steel Structures

   b. SSPC-SP2 Hand Tool Cleaning

   c. SSPC-SP3 Power Tool Cleaning

   d. SSPC-SP5 (NACE No. 1) White Metal Blast Cleaning

   e. SSPC-SP6 (NACE No. 3) Commercial Blast Cleaning

   f. SSPC-SP10 (NACE No. 2) Near-White Metal Blast

   g. SSPC-SP13 (NACE No. 6) Surface Preparation of Concrete

2. NACE - National Association of Corrosion Engineers

3. ASTM D1737 - Test Method for Elongation of Attached Organic Coatings with Cylindrical Mandrel Apparatus

4. ASTM B117 - Method of Salt Spray (Fog) Testing

5. ASTM D4060 - Test Method for Abrasion Resistance of Organic Coating by the Taber Abraser

6. ASTM D3359 - Method for Measuring Adhesion by Tape Test

1.05 MANUFACTURERS

A. All painting materials shall be as manufactured by Tnemec, Carboline, Sherwin Williams, or equal.

1.06 SUBMITTALS

A. The CONTRACTOR shall submit paint manufacturer's data sheets, application instructions, and samples of each finish and color to JEA for review, before any work is started in accordance with Section 01300 entitled, "Submittals."

B. Submitted samples of each finish and color shall be prepared in a step-down format so that the area of each sample indicates the appearance of the various coats. For example, where a three-coat system is specified, the sample shall be divided into three areas indicating one coat only, two coats and all three coats. JEA will provide written authorization constituting a standard, as to color and finish only, for each coating

system.

C. The CONTRACTOR shall prepare a complete schedule of surfaces to be coated and shall identify the surface preparation and paint system he proposes to use. The Paint Schedule shall be in conformance with Article 3.03 of this Section. The schedule shall contain the name of the paint manufacturer, and the name, address and telephone number of the manufacturer's representative that will inspect the Work. The schedule shall be submitted to JEA for review as soon as possible following the Notice to Proceed so that the schedule may be used to identify colors and to specify shop painting systems on order for fabricated equipment.

D. Name and detailed qualifications of the protective coating applicator or subcontractor. Qualifications shall include, but not be limited to, five (5) project references which show that the painting applicator or subcontractor has previous successful experience with the specified or comparable coating systems, a list of installations that are currently in service and documentation that applicator or subcontractor is currently a qualified applicator of the proposed coatings by the manufacturer. Include the name, address and telephone number of the owner of each installation for which the coating applicator provided the coating.

E. CERTIFICATIONS: The coating manufacturer shall submit the following certifications:

1. A letter from the coating manufacturer stating that the specified material is suitable for the application.

2. Inspection reports of coating manufacturer certifying that all inspections by the manufacturer as specified in 09900-1.07(B) showed satisfactory performance of the work by the coating applicator.

3. A letter from the coating manufacturer certifying that the surface preparation has been properly completed.

4. A letter from the coating manufacturer certifying that the coating system has been properly applied and acknowledging that their warranty is in effect.

5. A sample copy of the warranty to be issued after completion of the work.

6. Test reports of all testing and inspections during the work.

1.07 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. The CONTRACTOR shall purchase paint from an acceptable manufacturer. The manufacturer shall assign a representative to inspect the application of his product both in the shop and field. The CONTRACTOR, through the manufacturer's representative, shall submit his report to JEA at the completion of his Work identifying the products used and verifying that said products were properly applied and that the paint systems were proper for the exposure and service.

B. Services shall also include, but not be limited to, inspecting prior coatings of paint, determination of best means of surface preparation, inspection of complete work, and

re-inspection of painted work to be performed six months after the job is completed.

1.08 MANUFACTURER'S INSTRUCTIONS

A. The manufacturer's published instructions for use as a guide in specifying and applying the manufacturers proposed paint shall be submitted to JEA. Paint shall not be delivered to the job before acceptance of the manufacturer's instructions is given by JEA.

B. A manufacturer's paint will not be considered for use unless that manufacturer's published instructions meets the following requirements:

1. The instructions must have been written and published by the manufacturer for the purpose and with the intent of giving complete instruction for the use and application of the proposed paint in the locality and for the conditions for which the paint is specified or shown to be applied under this Contract.

2. All limitations, precautions, and requirements that may adversely affect the paint; that may cause unsatisfactory results after the painting application; or that may cause the paint not to serve the purpose for which it was intended; that is, to protect the covered material from corrosion, shall be clearly and completely stated in the instructions. These limitations and requirements shall, if they exist, include, but not be limited to the following:

a. Methods of application

b. Number of coats

c. Thickness of each coat

d. Total thickness

e. Drying time of each coat, including primer

f. Primer required to be used

g. Primers not permitted

h. Use of a primer

I. Thinner and use of thinner

j. Temperature and relative humidity limitations during application and after application

k. Time allowed between coats

l. Protection from sun

m. Physical properties of paint including solids content and ingredient analysis

n. Surface preparation

o. Touch up requirements and limitations

C. Concrete surfaces specified by the paint manufacturer to be acid etched shall be etched in accordance with the manufacturer's instructions. The surface shall then be thoroughly scrubbed with clean water, rinsed, and allowed to dry. The surface shall be

tested with a
moisture meter to determine when dry before coating. The surface shall also be tested for pH to determine the acid has been properly neutralized.

1.09 QUALITY ASSURANCE

A. The CONTRACTOR shall give JEA a minimum of three days advance notice of the start of any field surface preparation work of coating application work.

B. All such Work shall be performed only in the presence of JEA, unless JEA has specifically allowed the performance of such Work in his absence.

C. Review by JEA, or the waiver of review of any particular portion of the Work, shall not relieve the CONTRACTOR of his responsibility to perform the Work in accordance with these Specifications.

D. The CONTRACTOR shall provide references of the coating applicator or subcontractor per article 1.06, D.

1.10 SAFETY AND HEALTH REQUIREMENTS

A. Require that personnel perform work in strict accordance with the latest requirements of OSHA Safety and Health Standards for construction. Meet or exceed requirements of regulatory agencies having jurisdiction and the manufacturer's published instructions and recommendations. Maintain a copy of all Material Safety Data Sheets at the job site of each product being used prior to commencement of work. Provide and require that personnel use protective and safety equipment in or about the project site. Provide respiratory devices, eye and face protection, ventilation, ear protection, illumination and other safety devices required to provide a safe work environment.

B. Respirators shall be worn by persons engaged or assisting in spray painting. The CONTRACTOR shall provide ventilating equipment and all necessary safety equipment for the protection of the workmen and the work.

C. All paint shall comply with all requirements of the Air Pollution Regulatory Acts concerning the application and formulation of paints and coatings for an area in which the paints are applied. Specifically, paints shall be reformulated as required to meet the local, State and Federal requirements.

1.11 SURFACES NOT TO BE COATED

A. The following items shall not be coated unless otherwise noted:

1. Encased piping or conduit.
2. Stainless steel work.
3. Clear PVC secondary containment piping.
4. Galvanized checkered plate.

Commented [SD1]: Hopefully should be no galvanized. There are four other references in this spec to galvanized. If you don't want any galveanized, take these reference all out or it gives contractor an excuse to go cheap.

Commented [SJP2R2]: This is the coatings spec and we are stating that any galvanized metal shall not be coated. This spec does not require the use of galvanized metals.

5. Aluminum handrails, walkways, windows, louvers, grating and checkered plate.

6. Flexible couplings, lubricated bearing surfaces and insulation.

7. Packing glands and other adjustable parts of mechanical equipment.

8. Finish hardware.

9. Steel encased in concrete or masonry

10. Plastic switch plates and receptacle plates.

11. Signs and nameplates.

12. Any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.

13. Any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts, unless otherwise indicated.

1.12 QUALITY WORKMANSHIP

A. The CONTRACTOR shall be responsible for the cleanliness of his painting operations and shall use covers and masking tape to protect work whenever such covering is necessary, or if so requested by JEA. Any unwanted paint shall be carefully removed without damage to any finished paint or surface. If damage occurs, the entire surface, adjacent to and including the damaged area, shall be repainted without visible lapmarks and without additional cost to JEA.

B. Painting found defective shall be scraped or sandblasted off and repainted as JEA may direct. Before final acceptance of the work, damaged surfaces of paint shall be cleaned and repainted as directed by JEA.

1.13 ADDITIONAL PAINT

A. At the end of the project, the CONTRACTOR shall turn over to JEA a one gallon can (single component material) or small kit (multi component material – minimum of one gallon yield) of each type and color of paint, primer, thinner or other coating used in the field painting. The material shall be delivered in unopened, labeled cans as it comes from the factory. The manufacturer's literature describing the materials and giving directions for their use shall be furnished in three bound copies. A type-written inventory list shall be furnished at the time of delivery.

1.14 WARRANTY

A. The coating manufacturer shall provide a standard material product warranty for a period of 10 years from the date of substantial completion.

1.15 SHIPPING, HANDLING AND STORAGE

A. All painting materials shall be brought to the job site in the original sealed labeled containers of the paint manufacturer and shall be subject to review by JEA. Where thinning is necessary, only the product of the manufacturer furnishing the paint shall be used. All such thinning shall be done strictly in accordance with the manufacturer's instructions, and with the full knowledge of JEA.

B. Materials and their storage shall be in full compliance with the requirements of pertinent codes and fire regulations. Receptacles shall be placed outside buildings for paint gates and containers. Paint waste shall not be disposed of in plumbing fixtures, process drains or other plant systems or process units.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Table 09900-1 depicts the coatings referenced in Article 3.03 of this Section entitled, "Paint Schedule". Table 09900-1 lists Tnemec products as a reference. Equivalent products by the manufacturers listed in Article 1.03 of this Section may be submitted for review.

Commented [SD3]: Need to verify JEA is good with this. Some clients have a standard paint system.

Commented [SJP4R4]: JEA uses Tnemec products

TABLE 09900-1
PRODUCT LISTING

Ref. No.	Description	Manufacturer's Reference Tnemec
102	Water Based Block Filler	1254 Epoxoblock WB
104	Polyamidoamine Epoxy Primer	N69 – 1211
105	Polyamidoamine Epoxy	N69 – Color
110	Aliphatic Acrylic Polyurethane	1095 – Color
111	Modified Waterborne Acrylate	156 - Envirocrete (Smooth Texture)
114	Acrylic Concrete Primer	6 Tneme-Cryl
115	Modified Polyamine Epoxy	215 Surfacing Epoxy
118	Epoxy Modified Cementitious Mortar	218 MortarClad
119	Cycloaliphatic Amine Epoxy	104 H.S. Epoxy
120	Polyamide Epoxy	20HS Pota-Pox
122	Modified Polyamine Epoxy	22 Epoxoline

PART 3 -- EXECUTION

3.01 SURFACE PREPARATION

A. General

1. Surfaces to be painted shall be clean and dry, and free of dust, rust, scale and all foreign matter. No solvent cleaning, power or hand tool cleaning shall be permitted unless acceptable to JEA or specified herein.

2. Threaded portions of valve and gate stems, machined surfaces which are limited for sliding contact, surfaces which are to be assembled against gaskets, surfaces or shafting on which sprockets are to fit, or which are intended to fit into bearings, machined surfaces of bronze trim on slide gates and similar surfaces shall be masked off to protect them from the sandblasting of adjacent surfaces. Cadmium-plated or galvanized items shall not be sandblasted unless hereinafter specified, except that cadmium-plated, zinc-plated, or sherardized fasteners used in assembly of equipment to the sandblasted shall be sandblasted in the same manner as the unprotected metal. All installed equipment, mechanical drives, and adjacent painted equipment shall be protected from sandblasting. Protection shall prevent any sand or dust from entering the mechanical drive units or equipment where damage could be caused.

3. Hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place prior to cleaning and painting, and not intended to be painted, shall be protected or removed during painting operations and repositioned upon completion of painting operations.

4. Examine surfaces to be coated to determine that surfaces are suitable for specified surface preparation and painting. Report to JEA surfaces found to be unsuitable in writing. Do not start surface preparation until unsuitable surfaces have been corrected. Starting surface preparation precludes subsequent claim that such surfaces were unsuitable for the specified surface preparation or painting.

5. Surface preparation shall be in accordance with specifications and manufacturer's recommendations. Provide additional surface preparation, and fill coats where manufacturer recommends additional surface preparation, in addition to requirements of specification.

6. Touch-up shop or field applied coatings damaged by surface preparation or any other activity, with the same shop or field applied coating; even to the extent of applying an entire coat when required to correct damage prior to application of the next coating. Touch-up coats are in addition to the specified applied systems, and not considered a field coat.

7. Protect motors and other equipment during blasting operation to ensure blasting material is not blown into motors or other equipment. Inspect motors and other equipment after blasting operations and certify that no damage occurred, or where damage occurred, the proper remedial action was taken

8. Sand from sandblasting shall be thoroughly removed, using a vacuum cleaner if necessary. No surface which has been sandblasted shall be painted until inspected by JEA.

9. Field paint shop painted equipment in compliance with Color Coding and as approved by JEA.

B. Metal Surfaces

1. Conform to current The Society for Protective Coatings Standards (SSPC) Specifications for metal surface preparation. Use SSPC-Vis-1 pictorial standards or NACE visual standards TM-01-70 or TM-01-75 to determine cleanliness of abrasive blast cleaned steel.

2. Perform blast cleaning operations for metal when following conditions exist:

   a. Moisture is not present on the surface.

   b. Relative humidity is below 80%.

   c. Ambient and surface temperatures are 5°F or greater than the dew point temperature.

   d. Painting or drying of paint is not being performed in the area.

   e. Equipment is in good operating condition.

   f. Proper ventilation, illumination, and other safety procedures and equipment are being provided and followed.

3. Weld flux, weld spatter and excessive rust scale shall be removed by power tool cleaning as per SSPC-SP-3.

4. All ferrous metal surfaces not required to be galvanized shall be cleaned of all oil grease, dirt, rust and tight and loose mill scale by blasting in accordance with the following: SSPC-SP-5 White Metal Blast Cleaning and comply with the visual standard NACE No. 1, for shop prepared and shop primed metal to be submerged or in a corrosive environment, SSPC-SP10 Near White Metal Blast Cleaning, and comply with the visual standard NACE No. 2 for field prepared metal to be submerged or in a corrosive environment, SSPC-SP6 and comply with the visual standard NACE No. 3 for metal in all other locations. Pickling, complying with SSPC-SP-8, may be substituted for Near White Blast in areas as determined by JEA. Priming shall follow sandblasting before any evidence of corrosion occurs, before nightfall and before any moisture is on the surface.

5. Field surface preparation of small, isolated areas such as field welds, repair of scratches, abrasions or other marks to the shop prime or finish shall be cleaned by power tools in accordance with SSPC-SP-3, or in difficult and otherwise inaccessible areas by hand cleaning in accordance with SSPC-SP-2 and spot primed.

6. All coated surfaces shall be cleaned prior to application of successive coats. All non-ferrous metals not to be coated shall be cleaned. This cleaning shall be done in accordance with SSPC-SP-1, Solvent Cleaning.

7. All shop-coated surfaces shall be protected from damage and corrosion before and after installation by treating damaged areas immediately upon detection. Abraded or corroded spots on shop-coated surfaces shall be prepared in

accordance with SSPC-SP-2, Hand Tool Cleaning and then touched up with the same materials as the shop coat.

8. All shop coated surfaces which are faded, discolored, or which require more than minor touch-up, in the opinion of JEA, shall be repainted. Cut edges of galvanized sheets, electrical conduit, and metal pipe sleeves, not to be finish painted, shall be cleaned in accordance with SSPC-SP-1, Solvent Cleaning and primed with zinc dust-zinc oxide metal primer.

9. Prime cleaned metals immediately after cleaning to prevent rusting.

10. Clean rusted metals down to bright metal by sandblasting and immediately field primed.

C. Concrete Surfaces

1. Concrete surfaces are to be cured for at least 28 days prior to surface preparation, unless coatings are recommended for application over green concrete surfaces.

2. Test concrete for moisture content, pH and salts using test method recommended by the paint manufacturer. Do not begin surface preparation, or painting until moisture content is acceptable to manufacturer.

3. Non-submerged concrete and masonry surfaces to be painted shall be prepared by removing efflorescence, chalk, dust, dirt, grease, oil, form coating, tar and by roughening to remove glaze. All surfaces shall be repaired prior to commencement of the coating operation.

4. Concrete immersion surfaces that are to be coated shall be prepared in accordance to SSPC-SP13/NACE No. 6 to remove all laitance, curing compounds, hardeners, sealers, contaminants, open bugholes, surface voids, air pockets, and other subsurface irregularities using blasting or grinding. Do not expose underlying aggregate. Use dry, oil-free air for blasting operations. Surface texture after blasting shall achieve profile as required by manufacturer or where not defined by manufacturer similar to that of medium grit sandpaper. Remove residual abrasives, dust, and loose particles by vacuuming or other approved method. Refer to manufacturer's recommendation for specific coating being applied and adhere to ICRI Concrete Surface Preparation Profiles (CSP 1-10) when reviewing concrete surface preparation.

5. Surface defects, such as hollow areas, bugholes, honeycombs, and voids shall be filled with polymeric filler compatible with painting system. Complete fill coats may be used in addition to specified painting system and as approved by JEA. Fins, form marks, and all protrusions or rough edges shall be removed.

6. Repair existing concrete surfaces which are deteriorated to the point that surface preparation exposes aggregate with fill coats or patching mortar as recommended by paint manufacturer and as directed by JEA.

7. Clean concrete of all dust, form oils, curing compounds, oil, tar, laitance, efflorescence, loose mortar, and other foreign materials before paints are applied.

D. Masonry

1. Cure for a minimum of 28 days prior to surface preparation or paint application.

2. Clean masonry surfaces free from all dust, dirt, oil, grease, loose mortar, chalky deposits, efflorescence, and other foreign materials.

3. Test masonry for moisture content. Use test method recommended by paint manufacturer. Do not begin painting until moisture content is acceptable to manufacturer.

E. Wood

1. Clean wood surfaces free of all foreign matter, with cracks and nail holes and other defects properly filled and smoothed. Remove sap and resin by scraping and wipe clean with rags dampened with mineral spirits.

2. Saturate end grain, cut wood, knots, and pitch pockets with an appropriate sealer before priming.

3. Prime and backprime wood trim before setting in place.

4. After prime coat has dried, fill nailholes, cracks, open joints, and other small holes with approved spackling putty. Lightly sand wood trim prior to applying second coat of paint.

F. Exposed Pipe, Valves and Pumps

1. Bituminous coated pipe shall not be used in exposed locations. Pipe which shall be exposed after project completion shall be primed in accordance with the requirements herein. Any bituminous coated ferrous pipe which is inadvertently installed in exposed locations shall be sandblasted to SSPC-SP-5 White Metal before priming and painting.

2. After installation and prior to finish painting, all exterior, exposed flanged joints shall have the gap between adjoining flanges and gaps between the pipe wall and threaded-on flanges sealed with a single component Thiokol caulking to prevent rust stains.

G. PVC Pipe Surfaces

1. All pipe surfaces shall be cleaned and lightly sanded before painting.

H. Existing Painted Surfaces

1. Totally remove existing paint when: surface is to be submerged in a severe environment, paint is less than 75% intact, brittle, eroded or has underfilm rusting.

2. Surfaces which are greater than 75% intact require removal of failed paints and then spot primed. Spot priming is in addition to coats specified.

3. Remove surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers.

4. Clean and dull glossy surfaces prior to painting in accordance with the manufacturer's recommendations.

5. Check existing paints for compatibility with new paint system. If incompatible, totally remove existing paint system or apply a barrier coat recommended by the paint manufacturer. Remove existing paints of undetermined origin. Prepare a test patch of approximately 3 square feet over existing paint. Allow test patch to dry thoroughly and test for adhesion. If proper adhesion is not achieved remove existing paint and repaint.

I. Castings

1. Prepare castings for painting by applying a brush or a knife-applied filler. Fillers are not to be used to conceal cracks, gasholes, or excessive porosity.

2. Apply one coat of primer with a minimum thickness of 1.2 mils in addition to coats specified. Allow sufficient drying time before further handling.

3.02 SHOP PAINTING

A. All fabricated steel work and equipment shall receive at the factory at least one shop coat of prime paint compatible with the paint system required by these Specifications. The CONTRACTOR shall coordinate all shop priming to ensure compatibility with paint system specified. Surface preparation prior to shop painting shall be in strict accordance with pain manufacturer’s recommendations and as specified herein. Finish coats may be applied in the shop if acceptable to JEA. All shop painted items shall be properly packaged and stored until they are incorporated in the Work. Any painted surfaces that are damaged during handling, transporting, storage or installation shall be cleaned, scraped, and patched before field painting begins so that Work shall be equal to the original painting received at the shop. Equipment or steel Work that is to be assembled on the site shall likewise receive a minimum of one shop coat of paint at the factory. Surfaces of exposed members that will be inaccessible after erection shall be prepared and painted before erection.

B. The CONTRACTOR shall specify the shop paints to be applied when ordering equipment in order to assure compatibility of shop paints with field paints. The paints and surface preparation used for shop coating shall be identified on shop drawings submitted to JEA for review. Shop paint shop drawings will not be reviewed until the final project paint system has been submitted by the CONTRACTOR and reviewed by JEA.

C. Shop finish coats may be the standard finish as ordinarily applied by the manufacturer if it can be demonstrated to JEA that the paint system is equal to and compatible with

the paint system specified. However, all pumps, motors and other equipment shall receive at least one field applied finish coat after installation.

3.03 PAINT SCHEDULE

A. The CONTRACTOR shall adhere to this paint schedule, providing those paints named or equal. DFT shall mean the minimum dry film thickness per application measured in mils. Products are referenced by numbers listed in Article 2.01 of this Section entitled "Product Listing." The paint schedule identifies the minimum DFT required per coat. If the CONTRACTOR does not achieve the specified DFT range in a single coat, he shall provide additional coats as necessary at no additional cost to JEA.

B. Metal Surfaces, Atmospheric (Exterior) Exposure

1. Metal surfaces exposed to the atmosphere that do not come into contact with wastewater, reclaimed water, or corrosive atmosphere including the following types of surfaces shall be painted as described below:

a. Pumps, motors, process equipment, machinery, etc.

b. Above ground piping, valves and pipe supports.

c. Miscellaneous steel shapes, angles, etc.

d. Exposed surfaces of conduit, ductwork, etc.

Ferrous Metal

Application	No.	Description	DFT
First -1 coat	104	Polyamidoamine Epoxy Primer	3.0 - 5.0
Second - 1 coat	105	Polyamidoamine Epoxy	2.0 - 3.0
Finish - 1 coat	110	Aliphatic Acrylic Urethane	3.0 - 4.0
		Min. Total	10.0 Mils

Non-Ferrous Metal

Application	No.	Description	DFT
First - 1 coat	105	Polyamidoamine Epoxy	2.0 - 3.0
Second - 1 coat	110	Aliphatic Acrylic Urethane	3.0 - 4.0
		Min. Total	6.0 Mils

C. Metal Surfaces, Interior Exposure

1. Interior metal surfaces (nonsubmerged) that do not come in contact with wastewater, reclaimed water, or the corrosive atmosphere including the following types of surfaces shall be painted as follows:

a. Pumps, motors, process equipment, machinery, etc.

Commented [SD5]: Reclaimed water?? There is no wastewater on this project.

Commented [SJP6R6]: Will add reclaimed water

Commented [SD7]: Hopefully there will be no exterior ferrous metal surfaces to coat if someone searches full spec and makes everything aluminum or stainless

Commented [SJP8R8]: Pumps, valves, misc stuff may be ferrous

Commented [SD9]: Same thing about wastewater vs reclaimed water but what about areas near the hypochlorite tanks and pumps? Again, maybe just don't have anything but aluminum or stainless (although hypo attacks stainless as well)

Commented [SJP10R10]: This is for metals inside the pump station, like piping, pumps, or other.

b. Piping, valves and supports.

c. Miscellaneous steel shapes, angles, rails, etc.

d. Exposed surfaces of conduit, ductwork, etc.

Application	No.	Description	DFT
First - 1 coat	104	Polyamidoamine Epoxy Primer	3.0 - 5.0
Finish - 1 coat	105	Polyamidoamine Epoxy	4.0 - 6.0
		Min. Total	9.0 Mils

D. Metal Surfaces, Submerged Exposure

1. Metal surfaces that are submerged in wastewater or subjected to wastewater gases shall be painted as described below. Metal surfaces within ground storage tank are not included in this system and shall be coated as described in system E below.

Application	No.	Description	DFT
Stripe coat	119	Cycloaliphatic Amine Epoxy	3.0 – 5.0
First – 1 coat	119	Cycloaliphatic Amine Epoxy	4.0 – 6.0
Finish - 1 coat	119	Cycloaliphatic Amine Epoxy	4.0 – 6.0
		Min. Total (excluding stripe coat)	10.0 Mils

E. Metal Surfaces, Interior of Ground Storage Tank

1. Metal surfaces within the Ground Storage Tank shall be coated as follows:

Application	No.	Description	DFT
Prime coat	120	Polyamide Epoxy	4.0 - 6.0
Stripe / Spot Prime	120	Polyamide Epoxy	4.0 - 6.0
Finish - 1 coat	122	Modified Polyamine Epoxy	18.0 - 22.0
		Min. Total	25.0 Mils

F. Ductile Iron Pipe, Submerged, Exterior or Interior Exposure

1. Ductile iron pipe, submerged within the storage tank as well as exposed exterior and interior pipeshall receive the following types of paint:

Application	No.	Description	DFT
First - 1 coat	105	Polyamidoamine Epoxy	6.0 - 10.0
Finish - 1 coat	110	Aliphatic Acrylic Polyurethane	3.0 - 5.0
		Min. Total	12.0 Mils

G. PVC Pipes, Exterior or Interior Exposure

1. Exposed exterior or interior PVC pipes, valves, and accessories, shall receive the

Commented [SD11]: There should be no metal surfaces inside the tank that aren't stainless or aluminum which don't get painted. Delete this one.

Commented [SJP12R12]: Will leave in case something is missed that is not stainless or aluminum

Commented [SD13]: How is this different from paragraph D. above?? Again, not needed as should be no surfaces to coat other than the DIP piping which is covered in paragraph F

Commented [SJP14R14]: It's a different coating system.

following types of paint:

Application	No.	Description	DFT
First - 1 coat	105	Polyamidoamine Epoxy	2.0 - 3.0
Finish - 1 coat	110	Aliphatic Acrylic Polyurethane	3.0 - 4.0
		Min. Total	6.0 Mils

H. New Concrete, Masonry and Stucco, Exterior Exposure

1. The exterior above grade concrete, masonry, and stucco surfaces of all new structures shall be coated as described below. Exterior concrete surfaces of the Ground Storage Tank are not included in this system and shall be coated as described in system I below:

Application	No.	Description	DFT
Block Filler *	102	Water Based Epoxy Block Filler	100-150 SF/Gal
Primer **	114	Acrylic Concrete Primer	300-400 SF/Gal
First - 1 coat	111	Modified Waterborne Acrylate	4.0 - 6.0
Finish - 1 coat	111	Modified Waterborne Acrylate	4.0 - 6.0
		Min. Total	10.0 Mils

* *Block filler only to be used on new CMU*
** *Concrete primer for non-CMU applications*

I. Exterior of Ground Storage Tank

1. Exterior surfaces of the Ground Storage Tank shall be painted as identified herein.

Surface preparation: Pressure wash with a minimum 2,500 psi.

Application	No.	Description	DFT
Finish - 2 coats	111	Modified Waterborne Acrylate	4.0 - 6.0
		Min. Total	10.0 Mils

J. New Concrete and Masonry Surfaces, Interior Exposure

1. Interior exposed masonry and concrete wall and ceiling surfaces, including beam and column surfaces of all new non-water retaining structures shall be painted as follows:

Application	No.	Description	DFT
Block Filler (*)	102	Water Based Epoxy Block Filler	100-150 SF/Gal
Primer (**)	114	Acrylic Concrete Primer	300-400 SF/Gal
First - 1 coat	105	Polyamidoamine Epoxy	4.0 - 6.0
Finish - 1 coat	105	Polyamidoamine Epoxy	4.0 - 6.0

			Min. Total	10.0 Mils

* *Block Filler shall only be used on new masonry.*
** *Concrete primer for non-CMU applications*

K. Interior concrete surfaces of the Ground Storage Tank.

1. Interior concrete surfaces (walls, and underside of dome) shall be painted as described below:

Surface preparation for walls and underside of dome: CSP5.

Surface preparation for floor: CSP3

Application	No.	Description	DFT
Surfacer *	118	Epoxy Modified Mortar	1/16" to 1/8"
Surfacer **	115	Modified Polyamine Epoxy	As req'd
Prime coat	120	Polyamide Epoxy	4.0 - 6.0
Surfacer ***	115	Modified Polyamine Epoxy	As req'd
Stripe coat	120	Polyamide Epoxy	4.0 - 6.0
Finish - 1 coat	122	Modified Polyamine Epoxy	18.0 - 22.0
		Minimum Total	25.0 Mils

* *Surfacer shall only be applied on walls and underside of dome.*
** *Surfacer shall be applied to all areas where bug holes or pinholes are discovered after application of first surfacer.*
*** *Surfacer shall be applied to all areas where bug holes or pinholes are discovered after application of prime coat.*

3.04 PAINTING

A. Application: All paint shall be applied by experienced painters with brushes or other applicators acceptable to JEA.

1. Paint shall be applied without runs, sags, thin spots, or unacceptable marks. Paints shall be applied at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. Additional coats of paint shall be applied, if necessary, to obtain thickness specified.

2. Paint shall be applied with spraying equipment only on those surfaces approved by JEA. If the material has thickened or must be diluted for application by spray gun, each coat shall be built up to the same film thickness achieved with undiluted brushed-on material. Where thinning is necessary, only the products of the particular manufacturer furnishing the paint shall be used; and all such thinning shall be done in strict accordance with the manufacturer's instructions, as well as with the full knowledge of JEA.

3. Surfaces not accessible to brushes or rollers may be painted by spray by dauber or sheepskins and paint mitt. If any of these methods is to be used, it shall be

done in strict accordance with the manufacturer's instructions, as well as with the full knowledge of JEA.

4. Special attention shall be given to nuts, bolts, edges, angles, flanges, etc., where insufficient film thicknesses are likely. Stripe paint prior to applying prime coat. Stripe painting shall be in addition to coats specified.

5. Perform thinning in strict accordance with the manufacturer's instructions, and with the full knowledge and approval of JEA and paint manufacturer.

B. Drying Time: A minimum of twenty-four hours drying time shall elapse between applications of any two coats of paint on a particular surface unless shorter time periods are a requirement of the manufacturer or specified herein. Longer drying times shall be required for abnormal conditions as defined by the manufacturer.

C. Weather Restrictions:

1. No painting whatsoever shall be accomplished in rainy or excessively damp weather when the relative humidity exceeds 85 percent, or when the general air temperature cannot be maintained at 50 degrees Fahrenheit or above throughout the entire drying period. No paint shall be applied when it is expected that the relative humidity will exceed 85 percent or that the air temperature will drop below 50 degrees Fahrenheit within 18 hours after the application of the paint.

2. Dew or moisture condensation should be anticipated; and if such conditions are prevalent, painting shall be delayed until midmorning to be certain the surfaces are dry. The day's painting shall be completed well in advance of the probable time-of-day when condensation will occur.

D. Inspection of Surfaces

1. Surface preparation and every field coat of priming and finishing paint shall be inspected by JEA or his authorized representative before the succeeding coat is applied. The CONTRACTOR shall follow a system of tinting successive paint coats so that no two coats for a given surface are exactly the same color. Areas to receive black protective coatings shall in such cases be tick-marked with white or actually gauged as to thickness when finished.

2. Before application of the prime coat and each succeeding coat, any defects or deficiencies in the prime coat or succeeding coat shall be corrected by the CONTRACTOR before application of any subsequent coating.

3. Samples of surface preparation and of painting systems shall be furnished by the CONTRACTOR to be used as a standard throughout the job, unless omitted by JEA.

4. When any appreciable time has elapsed between coatings, previously coated areas shall be carefully inspected by JEA, and where, in his opinion, surfaces are damaged or contaminated, they shall be cleaned and recoated at the

CONTRACTOR's expense. Recoating times of manufacturer's printed instructions shall be adhered to.

5. Coating thickness shall be verified by the use of a dry film thickness digital gauge. Gauge shall be Elcometer 456 or equal and shall be properly calibrated. Coating thickness on non-metal surfaces shall be verified by the use of an ultrasonic gauge. Ultrasonic gauge shall be Positector 200 or equal. Gauges shall include the entire range of coating thicknesses required in this section.

6. The CONTRACTOR shall provide free of charge to JEA two new digital dry film gauges and two wet film gauges to be used to inspect coating by JEA and CONTRACTOR. One gauge may be used by CONTRACTOR and returned each day to JEA. JEA will return gauges to CONTRACTOR at completion of job.

7. Coatings shall pass a holiday detector test.

8. Determination of Film Thickness: Randomly selected areas, each of at least 107.5 contiguous square feet, totaling at least 5% of the entire control area shall be tested. Within this area, at least 5 squares, each of 7.75 square inches, shall be randomly selected. Three readings shall be taken in each square, from which the mean film thickness shall be calculated. No more than 20 percent of the mean film thickness measurements shall be below the specified thickness. No single measurement shall be below 80 percent of the specified film thickness. Total dry film thickness greater than twice the specified film thickness shall not be acceptable. Areas where the measured dry film thickness exceeds twice that specified shall be completely redone unless otherwise approved by JEA. When measured dry film thickness is less than that specified additional coats shall be applied as required.

9. Holiday Testing: Holiday test painted ferrous metal surfaces which will be submerged in water or other liquids, or surfaces which are enclosed in a vapor space in such structures. Mark areas which contain holidays. Repair or repaint in accordance with paint manufacturer's printed instructions and retest.

    a. Dry Film Thickness Exceeding 20 Mils: For surfaces having a total dry film thickness exceeding 20 mils: Pulse-type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the specified coating thickness.

    b. Dry Film Thickness of 20 Mils or Less: For surfaces having a total dry film thickness of 20 mils or less: Tinker & Rasor Model M1 non-destructive type holiday detector, K-D Bird Dog, shall be used. The unit shall operate at less than 75-volts. For thicknesses between 10 and 20 mils, a non-sudsing type wetting agent, such as Kodak Photo-Flow, shall be added to the water prior to wetting the detector sponge.

10. Paint manufacturer or his representative shall provide their services as required by JEA. Services shall include, but not be limited to, inspecting existing paint,

determination of best means of surface preparation, inspection of completed work, and final inspection of painted work 11 months after the job is completed.

H. Special Areas

1. All surfaces which are to be installed against concrete, masonry etc., and will not be accessible for field priming and/or painting shall be back primed and painted as specified herein, before erection. Anchor bolts shall be painted before the erection of equipment and then the accessible surfaces repainted when the equipment is painted.

I. Special attention shall be given to insure that edges, corners, crevices, welds and rivets receive a film thickness equivalent to that of the adjacent painted surfaces.

J. Safety

1. Respirators shall be worn by persons engaged or assisting in spray painting. The CONTRACTOR shall provide ventilating equipment and all necessary safety equipment for the protection of the workmen and the Work.

K. Quality Workmanship

1. The CONTRACTOR shall be responsible for the cleanliness of his painting operations and shall use covers and masking tape to protect the Work whenever such covering is necessary, or if so requested by JEA. Any unwanted paint shall be carefully removed without damage to any finished paint or surface. If damage does occur, the entire surface, adjacent to and including the damaged area, shall be repainted without visible lap marks and without additional cost to JEA.

L. Painting found defective shall be scraped or sandblasted off and repainted as JEA may direct. Before final acceptance of the Work, damaged surfaces of paint shall be cleaned and repainted as directed by JEA.

M. Take all necessary precautions to contain dispersion of sandblasting debris and paint to the limits of the work. Take into account the effect of wind and other factors which may cause dispersion of the sandblasting debris and paint. Suspend painting operations when sanding debris or paint cannot be properly confined. Assume all responsibilities and cost associated with damage to adjacent structures, vehicles, or surfaces caused by the surface preparation and painting operations.

3.05 SCHEDULE OF COLORS

A. All colors shall be as designated by JEA at the shop drawing review. The CONTRACTOR shall submit color samples including custom color choices as required to JEA as specified in Article 1.04 of this Section. The CONTRACTOR shall submit suitable samples of all colors and finishes for the surfaces to be painted, or on portable surfaces when required by JEA. JEA shall decide upon the choice of colors and other finishes when alternates exist. No variation shall be made in colors without the acceptance from JEA. Color names and/or numbers shall be identified according to the appropriate color chart issued by the manufacturer of the particular product in question.

3.06 COLOR CODING AND LETTERING OF PIPING

A. The CONTRACTOR shall paint all piping, valves, equipment, exposed conduits and all appurtenances which are integral to a complete functional mechanical pipe and electrical conduit system, in accordance with Table 09900-1 entitled "Pipe Color Coding Schedule". Where colors are not designated for piping and conduit systems they will be selected during the shop drawing review from the paint manufacturer's standard color charts.

B. In general, the pumps and equipment shall be painted the same color as the piping system to which it is connected unless otherwise directed by JEA. Where colors are not designated for piping and conduit systems they will be selected during the shop drawing review from the paint manufacturer's standard color charts.

C. Lettering of Piping

1. The CONTRACTOR shall apply identification titles and arrows indicating the direction of flow of liquids to all types and sections of all new and existing plant piping. Titles shall be as directed by JEA. Identification titles shall be located midway between color coding bands where possible. Identification lettering and arrows shall be placed as directed by JEA, but shall generally be located each fifteen feet in pipe length and shall be properly inclined to the pipe axis to facilitate easy reading. Titles shall also appear directly adjacent to each side of any wall or slab the pipeline passes through.

D. The titles shall be painted by use of stencils and shall identify the contents by complete names at least once in each area through which it passes and thereafter be abbreviated. Stencils shall be provided for titles and abbreviations listed in Table 09900-2.

E. Title color shall be black or white as directed and shall have an overall height in inches in accordance with Table 09900-3. Letter type shall be Helvetica Medium upper case. The manufacturer's instructions shall be followed in respect to storage, surface preparation and application. For piping less than 3/4-inch diameter (as identified in Table 09900-2), the CONTRACTOR shall furnish and attach corrosion resistant color tags with the required lettering.

F. Banding

1. Where bands are indicated in the Pipe Color Coding Schedule, the pipe is to be painted for its full circumference with a band of the color indicated. The bands shall be six inches wide, neatly made by masking, and spaced eight feet apart. The CONTRACTOR may substitute precut prefinished bands on piping subject to acceptance by JEA. Where banded pipes are running concurrently in a space, bands shall be located so that on adjacently located pipes, bands will be grouped beside each other.

3.07 OSHA SAFETY COLORS

A. Items listed in ANSI Z53.1-1971, Section 2.1 shall be painted ANSI Red. In general, these items shall include fire protection equipment and apparatus; wall mounted breathing apparatus, danger signs and locations; and stop bars, buttons or switches. In addition all hose valves and riser pipes, fire protection piping and sprinkler systems, and electrical stop switches shall be painted ANSI Red.

B. Items listed in ANSI Z53.1-1971, Section 2.3 shall be painted ANSI Yellow. Yellow shall be the basic color for designating caution and for marking physical hazards such as striking against, stumbling, falling, tripping, and "caught in between". In addition, an 8-inch wide strip on the top and bottom tread of stairways shall be coated.

3.08 WORK IN CONFINED SPACES

A. The CONTRACTOR shall provide and maintain safe working conditions for all employees. Fresh air shall be supplied continuously to confined spaces through the combined use of existing openings, forced-draft fans, or by direct air supply to individual workers. Paint fumes shall be exhausted to the outside from the lowest level in the contained space.

B. Electrical fan motors shall be explosion proof if in contact with fumes. No smoking or open fires will be permitted in, or near, confined spaces where painting is being done.

3.09 CLEANING

A. The buildings and all other Work area shall be at all times kept free from accumulation of waste material and rubbish caused by the Work. At the completion of the painting, all tools, equipment, scaffolding, surplus materials, and all rubbish around the inside the buildings shall be removed and the Work left broom clean unless otherwise specified.

TABLE 09900-2
PIPE COLOR CODING SCHEDULE

Equipment/Piping	Suggested Color
Reclaimed Water	Blue with Black Bands
Potable Water	Blue
Emergency Shower Eyewash	Safety Yellow, BV57
Sanitary and Process Drains	Fossil, BG12
Sodium Hypochlorite	Safety Yellow, BV57
Secondary Effluent	Color to Match Existing
Aeration Influent	Gray

Equipment/Piping	Suggested Color
Internal Recycle	Gray
Return Activated Sludge	Brown

TABLE 09900-3
PIPE IDENTIFICATION SCHEDULE*

PIPE TITLE	PIPE ABBREVIATION
DRAIN	DR
DRAIN VENT	VENT
POLYMER SOLUTION – THICKENING	PS-T
POLYMER SOLUTION – DEWATERING	PS-D
POTABLE WATER	PW
THICKENED SLUDGE	TS
RECLAIMED WATER	RW
SODIUM HYPOCHLORITE	CLS
SECONDARY EFFLUENT	SE
AERATION INFLUENT	AEI
INTERNAL RECYCLE	IR
RETURN ACTIVATED SLUDGE	RAS

**Refer to Section 15000, Pipe Schedule for additional pipe titles*

TABLE 09900-4
HEIGHT OF PIPING LETTERING

Diameter of Pipe or Pipe Covering	Height of Lettering
3/4 to 1-1/4 inches	1/2 inch
1-1/2 to 2 inches	3/4 inch
2-1/2 to 6 inches	1-1/4 inches
8 to 10 inches	2-1/2 inches
Over 10 inches	3-1/2 inches

Notes:

1. *Letter type shall be Helvetica Medium upper case. The manufacturer's instructions shall be followed in respect to storage, surface preparation and application.*
2. *For piping less than 3/4-inch diameter (as identified in Table 09900-2), the CONTRACTOR shall furnish and attach corrosion resistant color tags with the required lettering.*

- END OF SECTION –

SECTION 10200

LOUVERS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install aluminum louvers, as shown on the Drawings and specified herein, required for a complete installation. Louvers shall conform to the requirements on the Louver Schedules shown on the Drawings and the Specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03300 – Cast-In-Place Concrete

B. Section 04200 – Unit Masonry

C. Section 05010 – Metal Materials

D. Section 06100 – Rough Carpentry

E. Section 07920 – Sealants and Caulking

F. Section 09900 – Painting

G. Section 15800 – Heating, Ventilation and Air Conditioning

1.03 MANUFACTURERS

A. The following lists of companies manufacture products that are acceptable for this Section, subject to conformance with the specified requirements: Ruskin; Airolite Co.; Industrial Louvers Inc.; American Warming and Ventilating Inc.; or approved equal.

1.04 SUBMITTALS

A. The CONTRACTOR shall submit shop drawings and other information to the Engineer for review in accordance with Section entitled "Submittals". Shop drawings shall indicate location, materials finishes, size, accessories, color charts, appurtenances, and details of construction and installation of louvers.

B. Submit one representative sample of each type louver proposed showing construction, finish, and all accessories and appurtenances. Resubmit until acceptable. Upon their acceptance, they will become the standard for the project with regard to construction and finish for each item.

C. Submit Air Movement and Control Association, Inc. (AMCA) licensed test data where indicated.

D. Submit Miami-Dade product approvals.

1.05 QUALITY ASSURANCE

A. All louver components will be inspected by the Engineer before installation. All components which are abraded, dented, bent, bowed or show other structural damage or distortion will be rejected and marked and shall be removed from the site. No component will be allowed to be straightened and then incorporated in the work.

B. Louvers shall bear the AMCA Label as indicated, or when the specified Model or Type bears such a label.

C. Louvers shall be designed for a minimum wind pressure indicated on the Louver Schedules shown on the Drawings, in accordance with the Florida Building Code.

1.06 SHIPPING, HANDLING AND STORAGE

A. Handle materials to avoid injury to persons and to avoid damage to materials or to work in place. Protect while storing during installation and until work is completed. Cover exposed surfaces of metal to prevent damage to finish.

PART 2 -- PRODUCTS

2.01 FIXED LOUVERS

A. Fixed louvers shall be the stationary drainable storm proof type, conforming to the design and construction of Type ELF6375DXD as manufactured by Ruskin or equal. The entire assembly including structural supports and connections shall be designed and installed to resist a minimum pressure as shown on plans. Louvers shall be approved for use in areas subject to hurricane force wind and rain conditions. Louvers shall be certified for use in areas subject to hurricane conditions through the following Miami-Dade Product Control Division testing criteria:

1. PA201-94 Large Impact Missile Test.

2. PA202-94 Uniform Static Air Pressure Test Design Load.

3. PA203-04 Cycle Wind Pressure Test Design Load.

B. Louver blades and frames shall be constructed of 0.081-inch thick minimum extruded aluminum. Frames shall be factory assembled completely by the manufacturer by welding. Louvers too large to ship shall be assembled by the CONTRACTOR as per the manufacturer’s recommendations.

C. Louvers shall bear AMCA Certified Rating Seals for air performance and water penetration. Water penetration shall be zero when tested for 15 minutes at less that 900 FPM free area velocity per AMCA Standard 500. Data shall also show that a 4 ft x 4 ft louver provides a minimum of 8.08 square feet of free area and shall pass 800 FPM free air velocity at a pressure drop not exceeding 0.12 inches water gauge.

E. Where required, the louvers shall be provided with motorized parallel-bladed control dampers and installed in a common flanged sleeve provided by the manufacturer. The louver/damper combined installation shall be an approved assembly by the Miami Dade Product Control Division and bare a Notice of Acceptance (NOA) number.

2.02 MULLIONS

A. Mullions shall be continuous line (CONCEALED) type employing an extruded concealed blade brace of the same material and thickness of the louvers.

2.03 FINISH

A. All material shall be factory finished after assembly with Kynar 500 finish. Coatings shall be factory applied. Color shall be as selected by Engineer from the manufacturer's list of colors during shop drawing review. The manufacturer shall provide a minimum twenty year warranty on applied finish.

2.04 SCREENS

A. Unless otherwise noted on the Drawings, each louver shall be provided with ½-inch mesh, 14 gauge aluminum wire bird screen secured within a replaceable frame attached to interior face of louver. At non-ducted louvers, provide a fiberglass insect screen in same frame, in contact with and supported by the bird screen. Where non-ducted louvers have window fans, place the bird screen on proper side to support insect screen against air flow caused by the fan. Screen shall have a minimum free area of 80% of gross area.

2.05 CONTROL DAMPER (where required)

A. Provide motorized industrial control damper where scheduled on the Drawings. Where provided, damper and louver shall be mounted in flanged common stainless steel sleeve with damper mounted behind louver.

B. Control damper shall be multi-blade parallel type.

C. Blades

1. Minimum 0.080-inch thick extruded aluminum alloy 6063-T5, airfoil shape.

2. Pivot Rods: Stainless steel, minimum 1/2-inch diameter or hex.

3. Maximum length 60-inches; maximum width 8-inches.

D. Seals

1. Blade: Mechanically attached, compressible neoprene or extruded vinyl blade seals, designed for temperature of minimum 40 degrees F at specified leakage rate. Adhesive attached seals are non-acceptable.

2. Jamb: Compressible stainless steel seals between blade edge and jamb.

E. Frames:

1. Minimum 0.125-inch thick extruded aluminum alloy 6063-T5 hat channel 5-inches x 1-inches wide.

2. Corner bracing.

3. Full size of louver, duct, sleeve, or opening in which installed.

F. Bearings:

1. Non-corrosive molded synthetic or stainless steel sleeve, or stainless steel ball type.

2. Vertically Mounted: Thrust bearings.

3. Maximum Spacing: 60-inches.

G. Linkage: Side linkage out of airstream, concealed in damper frame.

H. Actuator: Electric, 120 V, single phase, 60 Hz, two-position, spring-return type.

I. Leakage When Closed: Guaranteed less than 6 cfm per square foot at both 1-inch and 4-inches WG static pressure.

J. Damper shall be equal to Ruskin Model CD50.

PART 3 -- EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which louvers are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: All louvers shall be installed as shown on the shop drawings in accordance with manufacturer's recommendations and in accordance with recognized industry practices to insure that products serve intended functions. Louvers shall be caulked and sealed at the frame and flanges to make the installation weathertight. Fasteners shall be stainless steel.

B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.

C. The CONTRACTOR shall field verify opening dimensions to ensure that fabrication meets installation requirements.

D. Motorized louver dampers shall be installed with required damper operators and linkage mechanisms (furnished by louver/damper manufacturer) and shall be field adjusted for full opening/closure stroke. Louvers shall be interlocked with exhaust fans as scheduled on the Drawings and as described in Section 15800.

3.03 CLEANING

A. Upon completion of the louver installation, all louvers shall be cleaned of foreign material to the satisfaction of the Engineer.

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SECTION 10400

IDENTIFYING DEVICES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install all identifying devices, as shown on the Drawings and specified herein, required for a complete installation.

B. Description: Provide the following:

1. Construction Signs

2. Warning and Caution Signs

3. Plaque

1.02 QUALITY ASSURANCE

A. Reference Codes and Specifications:

1. Florida Building Code

1.03 SUBMITTALS

A. Shop Drawings: Submit shop drawings for all items in this Section including all accessories under the provisions of the Section 01300 entitled "Submittals".

B. Samples: Submit samples under provisions of the Section 01300 entitled "Submittals". Illustrating full size sample sign of type, style and color and method of attachment.

1.04 DELIVERIES, STORAGE AND HANDLING

A. Deliver, store and protect products under provisions of Division 1.

B. Package sign, labeled in name groups.

PART 2 -- PRODUCTS

2.01 EXIT SIGNS

A. Furnish and install lighted exit signs as specified in Division 16.

2.01 ELECTRICAL EQUIPMENT

A. Furnish and install electrical equipment signs as specified in Division 16.

2.02 METAL SIGNS

A. Metallic signs shall be furnished as noted on the following schedule or as shown on the Drawings:

Legend	Location
DIESEL FUEL – NO SMOKING NO OPEN FLAMES	THREE (3) SIGNS TO BE LOCATED BY JEA.
CAUTION - NO SMOKING	PROVIDE AND INSTALL THREE (3) SIGNS TO BE LOCATED BY JEA.
CAUTION - HIGH VOLTAGE AREA	Two (2) SIGNS AT ELECTRICAL BUILDING DOORS
CAUTION – EAR PROTECTION MUST BE WORN IN THIS AREA	THREE (3) SIGNS TO BE LOCATED BY JEA.

B. Materials shall be baked enamel on aluminum. Signs shall conform to OSHA standards and directions. Locations, sizes and colors shall be as reviewed by the Engineer. Lettering size shall be three inches unless otherwise accepted by the Engineer. Provide all supports/stands for signs as necessary.

C. Provide sign labeling function of each buried and exposed valve.

2.03 FIRE EXTINGUISHER SIGNS

A. Furnish and install signs above each fire extinguisher. Signs shall have white raised letters chemically fused to 1/8-inch red acrylic plastic background. Signs to be 1 1/2-inch high x length required reading "FIRE EXTINGUISHER".

2.04 SAFETY SIGNS

A. Safety signs shall comply with ANSI Z S35 requirements.

Wording	Size	Quantity
EMERGENCY PORTABLE EYEWASH AND SHOWER (with pictogram)	7x7	Note 1
SODIUM HYPOCHLORITE (with pictogram)	14 X 14	Note 1

Note 1: Furnish and install signs at each location.
Coordinate location with JEA and Field Engineer.

PART 3 -- EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts existing surfaces.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs after doors and surfaces are finished, in locations indicated.

C. Clean signs and polish.

- END OF SECTION -

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SECTION 10522

FIRE EXTINGUISHERS AND SAFETY EQUIPMENT

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Fire extinguishers and accessories shall be furnished and installed at locations scheduled herein. Locations shall be as shown on the life safety plan or as otherwise directed by JEA in the field.

1.02 REFERENCES

A. NFPA 10 - Portable Fire Extinguishers.

B. Underwriters Laboratories - U.L.

1.04 QUALITY ASSURANCE

A. Conform to NFPA 10 requirement for extinguishers.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 01300 entitled "Submittals".

B. Include physical dimensions, operational features, color and finish, wall mounting brackets with mounted measurements, anchorage details, location, and details.

C. Submit manufacturer's installation instructions under provisions of Section 01300 entitled "Submittals".

1.06 OPERATION AND MAINTENANCE DATA

A. Include test, refill or recharge schedules, procedures, and re-certification requirements.

PART 2 -- PRODUCTS

2.01 FIRE EXTINGUISHERS

A. Fire extinguishers shall be 20 lbs. capacity, dry chemical type, rated for A, B and C class fires. Extinguishers shall be Model No. 423 with heavy duty steel cylinders as manufactured by Amerex Corporation, equivalent model as manufactured by Larsen's Manufacturing Company, or equal. Extinguishers shall be red epoxy painted and be furnished with an indicating gauge. Minimum rating shall be 20A – 120 BC.

B. Brackets, as manufactured by extinguisher manufacturer, shall be furnished for all wall hung fire extinguishers. All brackets shall be stainless steel.

2.02 FIRST AID EQUIPMENT

A. First aid wall cabinet kits shall be furnished by JEA for CONTRACTOR installation.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Fire extinguishers, brackets and laminated plastic stand off signs shall be installed at project locations in accordance with the following schedule:

Location	Quantity
As shown on life safety plan	3

- END OF SECTION -

SECTION 11000

EQUIPMENT GENERAL PROVISIONS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish, install, test, and place in acceptable operation all mechanical equipment and all necessary accessories as specified herein, as shown on the Drawings, and as required for a complete and operable system.

B. The mechanical equipment shall be provided complete with all accessories, special tools, spare parts, mountings, and other appurtenances as specified, and as may be required for a complete and operating installation.

C. It is the intent of these Specifications that the CONTRACTOR shall provide JEA complete and operational equipment/systems. To this end, it is the responsibility of the CONTRACTOR to coordinate all interfaces with related mechanical, structural, electrical, instrumentation and control work and to provide necessary ancillary items such as controls, wiring, etc., to make each piece of equipment operational as intended by the Specifications.

D. The complete installation shall be free from excessive vibration, cavitation, noise, and oil or water leaks.

E. The requirements of this section shall apply to equipment furnished under Divisions 11 and 15.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. All equipment, materials, and installations shall conform to the requirements of the most recent editions with latest revisions, supplements, and amendments of the specifications, codes, and standards listed in Section 01090, Reference Standards.

1.03 PERFORMANCE AFFIDAVITS

A. When required in the individual equipment Specifications, the CONTRACTOR shall submit manufacturer's Performance Affidavits for equipment to be furnished.

B. By these affidavits, each manufacturer must certify to the CONTRACTOR and JEA, jointly, that he has examined the Contract Documents and that the equipment, apparatus, or process he offers to furnish will meet in every way the performance requirements set forth or implied in the Contract Documents.

C. The CONTRACTOR must transmit to the Engineer three (3) original copies of the affidavit given him by the manufacturer or supplier along with the initial Shop Drawing submittals.

D. The Performance Affidavit must be signed by an officer of the Basic Corporation, partnership, or company manufacturing the equipment and witnessed by a notary public.

E. The Performance Affidavit shall have the following format:

Addressed to: (CONTRACTOR) and JEA (Owner)

Reference: Radio Avenue Reclaimed Water Ground Storage Tank and Booster Pump Station project

Text: (Manufacturer's Name) has examined the Contract Documents and hereby state that the (Product) meets in every way the performance requirements set forth or implied in Section _____ of the Contract Documents.

Signature: Corporate Officers shall be Vice President, or higher. (Unless statement authorizing signature is attached.)

1.04 SHOP DRAWINGS

A. Shop Drawings shall be submitted to the Engineer for all equipment in accordance with Section 01300, Submittals and shall include the following information in addition to the requirements of Section 01300, Submittals:

1. Performance characteristics and descriptive data.

2. Detailed equipment dimensional drawings and setting plans.

3. General lifting, erection, installation, and adjustment instructions, and recommendations.

4. Complete information regarding location, type, size, and length of all field welds in accordance with "Standard Welding Symbols" AWS A2.0 of the American Welding Society. Special conditions shall be fully explained by notes and details.

5. The total uncrated weight of the equipment plus the approximate weight of shipped materials. Support locations and loads that will be transmitted to bases and foundations. Exact size, placement, and embedment requirements of all anchor bolts.

6. Details on materials of construction of all components including applicable ASTM designations.

7. Information on bearing types and bearing life.

8. Gear box design and performance criteria and AGMA service factor.

9. Piping schematics.

10. Motor data sheet indicating motor horsepower; enclosure type; voltage; insulation

class; temperature rise and results of dielectric tests; service-rating; rotative speed; motor speed-torque relationship; efficiency and power factor at ½, ¾, and full load; slip at full load; running, full load, and locked rotor current values; and safe running time-current curves.

11. Equipment and motor protective device details. Connection diagrams for motor and all protective devices.

12. Equipment shop coating systems, interior and exterior.

13. Panel layout drawings, schematic wiring diagrams, and component product data sheets for control panels.

14. A list of spare parts and special tools to be provided.

15. Any additional information required to show conformance with the equipment specifications.

16. Warranty documentation including statement of duration of warranty period and contact phone numbers and addresses for warranty issues.

B. SHOP DRAWINGS ON ITEMS REQUIRING PERFORMANCE AFFIDAVITS WILL NOT BE REVIEWED UNTIL ACCEPTABLE PERFORMANCE AFFIDAVITS ARE RECEIVED.

1.05 OPERATION AND MAINTENANCE INSTRUCTION/MANUALS

A. Operation and Maintenance (O&M) manuals shall be submitted in accordance with Section 01300, Submittals and Section 01730 Operation and Maintenance Manuals.

1.06 GENERAL INFORMATION AND DESCRIPTION

A. All parts of the equipment furnished shall, be designed and constructed for the maximum stresses occurring during fabrication, transportation, installation, testing, and all conditions of operation. All materials shall be new, and both workmanship and materials shall be entirely suitable for the service to which the units are to be subjected and shall conform to all applicable sections of these Specifications.

B. All parts of duplicate equipment shall be interchangeable without modification. Manufacturer's design shall accommodate all the requirements of these Specifications.

C. Equipment and appurtenances shall be designed in conformity with ASTM, ASME, AIEE, NEMA, and other generally accepted applicable standards.

D. All bearings and moving parts shall be adequately protected by bushings or other approved means against wear, and provision shall be made for accessible lubrication by extending lubrication lines and fittings to approximately 30 inches above finished floor elevation.

E. Details shall be designed for appearance as well as utility. Protruding members, joints,

corners, gear covers, etc., shall be finished in appearance. All exposed welds on machinery shall be ground smooth and the corners of structural shapes shall be rounded or chamfered.

F. Machinery parts shall conform within allowable tolerances to the dimensions shown on the working drawings.

G. All machinery and equipment shall be safeguarded in accordance with the safety codes of the USA and the State in which the project is located.

H. All rotating shafts, couplings, or other moving pieces of equipment shall be provided with suitable protective guards of sheet metal or wire mesh, neatly and rigidly supported. Guards shall be removable as required to provide access for repairs.

I. All equipment greater than 100 pounds shall have lifting lugs, eyebolts, etc., for ease of lifting, without damage or undue stress exerted on its components.

J. All manufactured items provided under this Section shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.

1.07 EQUIPMENT WARRANTIES

A. Warranty requirements may be added to or modified in the individual equipment specifications.

B. The equipment furnished under this Contract shall be guaranteed to be free from defects in workmanship, design and/or materials for a period of one (1) year unless otherwise specified in the individual equipment specifications. The period of such warranties shall start on the date the particular equipment is placed in use by JEA with corresponding start-up certification provided by the manufacturer's technical representative as specified herein, provided that the equipment demonstrates satisfactory performance during the thirty day operational period after the equipment startup. If the equipment does not perform satisfactorily during the thirty day operational period, the start of the warranty period will be delayed until the equipment demonstrates proper operation. The Equipment Supplier shall repair or replace without charge to JEA any part of equipment which is defective or showing undue wear within the guarantee period, or replace the equipment with new equipment if the mechanical performance is unsatisfactory; furnishing all parts, materials, labor, etc., necessary to return the equipment to its specified performance level.

C. The CONTRACTOR shall provide an equipment warranty log book prepared specifically for this project and submit two (2) copies of the document to the Engineer prior to final payment. The equipment warranty log book shall include a summary listing of all equipment warranties provided, date received, and start date and end date of warranty period. A copy of each equipment warranty and equipment start-up certification shall also be provided in the document.

D. The Equipment Supplier shall guarantee to JEA that all equipment offered under these specifications, or that any process resulting from the use of such equipment in the

manner stated is not the subject of patent litigation, and that he has not knowingly offered equipment, the installation or use of which is likely to result in a patent controversy, in which JEA as user is likely to be made the defendant.

E. Where patent infringements are likely to occur, each Equipment Supplier shall submit, as a part of his bid, license arrangements between himself, or the manufacturer of the equipment offered, and the patent JEA or the controller of the patent, which will permit the use in the specified manner of such mechanical equipment as he may be bidding.

F. Each Equipment Supplier, by submitting his bid, agrees to hold and save JEA and Engineer or its officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the work under this contract, including the use of the same by JEA.

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The materials covered by these Specifications are intended to be equipment of proven reliability, and as manufactured by reputable manufacturers having experience in the production of such equipment. The CONTRACTOR shall, upon request of the Engineer, furnish the names of not less than 5 successful installations of the manufacturer's equipment of the same size and model of that offered under this contract. The equipment furnished shall be designed, constructed, and installed in accordance with the industry accepted practices and shall operate satisfactorily when installed as shown on the Drawings and operated per manufacturer's recommendations.

2.02 ANCHORS AND SUPPORTS

A. The CONTRACTOR shall furnish, install, and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for the installation of the devices included in the equipment specified. Working Drawings for installation shall be furnished by the equipment manufacturer, and suitable templates shall be used by the CONTRACTOR when required in the detailed equipment Specifications.

B. Anchor bolts and fasteners shall be furnished in accordance with Section 05050, Metal Fastening, and with the individual equipment Specifications. All anchor bolts shall be a minimum of 1/2-inch diameter. All anchor bolts, handrail bolts, washers, clips, clamps, and fasteners of any type shall be constructed of 316 stainless steel, unless otherwise specified in the individual equipment Specifications.

C. The CONTRACTOR shall provide all concrete pads or pedestals required for equipment furnished. All concrete equipment pads shall be a minimum of 6” high, unless otherwise shown on the Drawings and shall be doweled.

D. Pipe sleeves or other means of adjusting anchor bolts shall be provided where

indicated or required. Equipment shall be leveled by first using sitting nuts on the anchor bolts, and then filling the space between the equipment base and concrete pedestal with non-shrink grout, unless alternate methods are recommended by the manufacturer and are acceptable to the Engineer (such as shim leveling pumps, or chemical grout). Non-shrink grout shall be as specified in Section 03315, Grout.

2.03 STRUCTURAL STEEL

A. Structural steel used for fabricating equipment shall conform to the requirements of Section 05120, Structural Steel.

B. All materials shall conform to applicable provisions of the AISC Specifications for the design and fabrication of structural steel, and to pertinent ASTM Standard Specifications.

2.04 DISSIMILAR METALS

A. All dissimilar metals shall be properly isolated to the satisfaction of the Engineer.

2.05 GALVANIZING

A. Where required by the equipment specifications, galvanizing shall be performed in accordance with Section 05035, Galvanizing.

2.06 STANDARDIZATION OF GREASE FITTINGS

A. The grease fittings on all mechanical equipment shall be such that they can be serviced with a single type of grease gun. Fittings shall be “Zerk” type.

2.07 ELECTRICAL REQUIREMENTS

A. All electrical equipment and appurtenances, including but not limited to motors, panels, conduit and wiring, etc., specified in the equipment specifications shall comply with the applicable requirements of the Division 16 specifications and the latest National Electric Code.

B. Motors shall conform to the applicable requirements of Section 15170, Electric Motors.

C. In the individual equipment specifications, specified motor horsepower is intended to be the minimum size motor to be provided. If a larger motor is required to meet the specified operating conditions and performance requirements, the CONTRACTOR shall furnish the larger sized motor and shall upgrade the electrical service (conduit, wires, starters, etc.) at no additional cost to JEA.

D. Where variable frequency drives (VFDs) are specified, the CONTRACTOR shall be responsible for coordinating between equipment supplier and VFD supplier to ensure a complete and operational system. VFDs shall be furnished under Division 16 and shall be as specified in Section 16495, Variable Frequency Drive Systems.

E. Motor starters and controls shall be furnished and installed under Division 16 and Division 17 unless otherwise specified in the individual pump specifications.

2.08 ACCESSORIES, SPARE PARTS, AND SPECIAL TOOLS

A. Spare parts for equipment shall be furnished where indicated in the equipment Specifications or where recommended by the equipment manufacturer.

B. Spare parts shall be identical and interchangeable with original parts.

C. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

D. Painting requirements for spare parts shall be identical to those for original, installed parts. Where no painting or protective coating is specified, suitable provisions shall be made to protect against corrosion.

E. Spare parts shall be delivered at the same time as the equipment to which they pertain. Spare parts shall be stored separately in a locked area, maintained by the CONTRACTOR, and shall be turned over to JEA in a group prior to substantial completion. All of these materials shall be properly packed, labeled, and stored where directed by JEA and Engineer.

F. The CONTRACTOR shall furnish all special tools necessary to operate, disassemble, service, repair, and adjust the equipment in accordance with the manufacturers operation and maintenance manual.

G. The CONTRACTOR shall furnish a one year supply of all recommended lubricating oils and greases. The manufacturer shall submit a list of at least four manufacturer's standard lubricants which may be used interchangeably for each type of lubricant required. All of these materials shall be properly packed, labeled and stored where directed by the Engineer.

2.09 EQUIPMENT IDENTIFICATION

A. All mechanical equipment shall be provided with a substantial stainless steel nameplate, mechanically fastened with stainless steel hardware in a conspicuous place, and clearly inscribed with the manufacturer's name, year of manufacture, serial number, and principal rating data.

B. All equipment provided under Divisions 11 through 15 including motorized and manual gates and valves (aboveground and buried) shall also be identified as to the equipment name and equipment tag number by a suitable stainless steel nameplate mechanically fastened with stainless steel hardware; for example, "Clarifier 5 RAS Pump No. 8: #P-801". Equipment names and equipment tag numbers shall match the names provided for the equipment as identified on the Drawings and in the Specifications. Equipment names and tag numbers not currently identified in the Drawings and Specifications shall be provided to the CONTRACTOR prior to the fabrication of the nameplates. Coordinate name and number with same on remotely located controls, control panel,

and other related equipment. For buried valve applications, the valve name and number shall be included in the bronze disc embedded in the valve's concrete collar as identified on the Drawings.

C. Nameplates shall not be painted over.

PART 3 -- EXECUTION

3.01 SHOP TESTING

A. All equipment shall be tested in the shop of the manufacturer in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents and that it will operate in the manner specified or implied.

B. No equipment shall be shipped to the project until the Engineer has been furnished a certified copy of test results and has notified the CONTRACTOR, in writing, that the results of such tests are acceptable.

C. Five (5) certified copies of the manufacturer's actual test data and interpreted results thereof shall be forwarded to the Engineer for review.

D. If required by the individual equipment Specifications, arrangements shall be made for JEA/Engineer to witness performance tests in the manufacturer's shop. The Engineer shall be notified ten working days before shop testing commences. Expenses are to be paid by the CONTRACTOR.

E. Shop testing of electric motors shall be in accordance with applicable requirements of Section 15170, Electric Motors and Section 16000, Basic Electrical Requirements.

3.02 STORAGE OF EQUIPMENT AND MATERIALS

A. CONTRACTOR shall store his equipment and materials at the job site in strict accordance with the manufacturer's recommendations and as directed by JEA or Engineer, and in conformity to applicable statutes, ordinances, regulations, and rulings of the public authority having jurisdiction. Equipment and materials shall not be delivered to the site prior to 90 days in advance of the scheduled installation. Partial payment requests will not be processed for materials delivered prior to 90 days before installation or for materials that are not properly stored.

B. Material or equipment stored on the job site is stored at the CONTRACTOR's risk. Any damage sustained of whatever nature shall be repaired to the Engineer's satisfaction at no expense to JEA. Stored electrical equipment is to be protected from the elements and shall have space heaters energized.

C. CONTRACTOR shall not store unnecessary materials or equipment on the job site and shall take care to prevent any structure from being loaded with a weight which will endanger its security or the safety of persons.

D. CONTRACTOR shall observe all regulatory signs for loadings on structures, fire safety,

and smoking areas.

E. CONTRACTOR shall not store materials or encroach upon private property without the written consent of owners of such private property.

3.03 MANUFACTURER'S FIELD SERVICES

A. The CONTRACTOR shall arrange for a qualified Technical Representative from each manufacturer or supplier of equipment who is regularly involved in the inspection, installation, start-up, troubleshooting, testing, maintenance, and operation of the specified equipment. Qualification of the Technical Representative shall be appropriate to the type of equipment furnished and subject to the approval of the Engineer and JEA. Where equipment furnished has significant process complexity, furnish the services of engineering personnel knowledgeable in the process involved and the function of the equipment. When necessary, the CONTRACTOR shall schedule multiple Technical Representatives to be present at the same time for the purpose of coordinating the operation of multiple pieces of related equipment.

B. For each site visit, the Technical Representative shall submit jointly to JEA, the Engineer, and the CONTRACTOR a complete signed report of the results of his inspection, operation, adjustments, and testing. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified.

C. The manufacturer's Technical Representative shall provide the following services.

1. Installation: The Technical Representative shall inspect the installed equipment to verify that installation is in accordance with the manufacturer's requirements. Where required by individual equipment specifications, the Technical Representative shall also supervise the installation of the equipment.

2. Testing: After installation of the equipment has been completed and the equipment is presumably ready for operation, but before it is operated by others, the Technical Representative shall inspect, operate, test, and adjust the equipment as required to prove that the equipment is in proper condition for satisfactory operation under the conditions specified. Unless otherwise noted in the signed site visit report, the report shall constitute a certification that the equipment conforms to the requirements of the Contract and is ready for startup and that nothing in the installation will render the manufacturer's warranty null and void. The report shall include date of final acceptance field test, as well as a listing of all persons present during tests.

3. Startup: The Technical Representative shall start up the equipment for actual service with the help of the CONTRACTOR. In the event that equipment or installation problems are experienced, the CONTRACTOR and the representative shall provide the necessary services until the equipment is operating satisfactorily and performing according to the specifications at no additional cost to JEA. Unless otherwise noted in the signed site visit report, the report shall constitute a certification that the equipment conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

4. Training: The Technical Representative shall instruct JEA's operating personnel in correct operation and maintenance procedures. The instruction shall demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment. Such instruction shall be scheduled at a time arranged with JEA at least 2 weeks in advance of the training and shall be provided while the respective Technical Representative's equipment is fully operational. The CONTRACTOR shall have submitted, and had accepted, the O&M Manuals prior to commencement of training. Training shall be provided to four separate shifts of JEA's personnel between the hours of 6:00 A.M. and 6:00 P.M. as necessary. The CONTRACTOR shall provide professional video recordings of all training sessions. Completed, labeled recordings shall be provided to JEA for each type of training session.

5. Services after Startup: Where required by the individual equipment specifications, the Technical Representative shall return to the project site thirty (30) days after the start up date to review the equipment performance, correct any equipment problems, and conduct operation and maintenance classes as required by JEA. This follow-up trip is required in addition to the specified services of Technical Representative prior to and during equipment startup. At this time, if there are no equipment problems, each manufacturer shall certify to JEA in writing that his equipment is fully operational and capable of meeting operating requirements. If the equipment is operating incorrectly, the Technical Representative will make no certification to JEA until the problems are corrected and the equipment demonstrates a successful thirty (30) days operating period.

D. Services of the Technical Representative will require a minimum of two (2) site visits, one for installation and testing and one for startup and training, and will be for the minimum number of days recommended by the manufacturer and approved by the Engineer but will not be less than the number of days specified in individual equipment sections.

E. The Contract amount shall include the cost of furnishing the Technical Representative for the minimum number of days specified, and any additional time required to achieve successful installation and operation. The times specified for services by the Technical Representative in the equipment Specifications are exclusive of travel time to and from the facility and shall not be construed as to relieve the manufacturer of any additional visits to provide sufficient service to place the equipment in satisfactory operation.

F. The CONTRACTOR shall notify the Engineer at least 14 days in advance of each equipment test or JEA training session.

G. The Technical Representative shall sign in and out at the office of the Engineer's Resident Project Representative on each day he is at the project.

3.04 INSTALLATION

A. The CONTRACTOR shall obtain written installation manuals from the equipment manufacturer prior to installation. Equipment shall be installed strictly in accordance with recommendations of the manufacturer. A copy of all installation instructions shall

be furnished the Engineer's field representative one week prior to installation.

B. The CONTRACTOR shall have on hand sufficient personnel, proper construction equipment, and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character. To minimize field erection problems, mechanical units shall be factory-assembled insofar as practical.

C. Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Drawings.

D. All equipment sections and loose items shall be match-marked prior to shipping.

E. For equipment such as pumping units, which require field alignment and connections, the CONTRACTOR shall provide the services of the manufacturer's qualified mechanic, millwright, or machinist, to align the pump and motor prior to making piping connections or anchoring the pump base. Alignment shall be as specified herein.

F. The CONTRACTOR shall furnish oil and grease for initial operation and testing. The manufacturer and grades of oil and grease shall be in accordance with the recommendations of the equipment manufacturer.

3.05 ALIGNMENT

A. Set equipment to dimensions shown on drawings. Dimensions shall be accurate to +/- 1/16 inch unless otherwise noted on the drawings. Wedges shall not be used for leveling, aligning, or supporting equipment.

B. General Equipment Leveling: Non-rotating equipment shall be set level to +/- 1/16 inch per 10 foot length (.005 inch per foot) unless otherwise noted on the drawings. Shims shall be used unless equipment is furnished with leveling feet. Set shims flush with equipment baseplate edges. When grouting is required, equipment shall be shimmed to allow a minimum of one inch grout thickness. Grout shall cover shims at least 3 inches. Final level check shall be held for inspection and approval by Engineer before proceeding.

C. Grouting

1. Fill anchor bolt holes or sleeves with grout, after bolt alignment is proven, and prior to placing grout under equipment bases.

2. Surface Preparation. Roughen surface by chipping, removing laitance, and unsound concrete. Clean area of all foreign material such as oil, grease, and scale. Saturate area with water at least 4 hours prior to grouting, removing excess water ponds.

3. Application. Place grout after the equipment base has been set and its alignment and level have been approved. Form around the base, mix grout, and place in accordance with the grout manufacturers published instructions. Eliminate all air or water pockets beneath the base using a drag chain or rope.

4. Finishing. Point the edges of the grout to form a smooth 45 degree slope.

5. After grout has cured (not before 3 days after placement) paint exposed surfaces of grout with shellac.

6. Level Verification. After grout has cured, and immediately prior to drive alignment, recheck equipment for level and plumb. Re-level and square as necessary. Hold final checks for inspection and approval by Engineer.

D. Inspect for and remove all machining burrs or thread pulls in female holes on mating surfaces of mounting frame and machine feet.

E. Inspect and clean equipment mounting base pads, feet, and frames to remove all grease, rust, paint and dirt.

F. Assembled equipment shafts shall be set level to .0015 inches per foot of shaft length (+/- .0005 inches) up to a maximum of 0.015 inches for any length shaft unless the manufacturers requirements are more stringent or unless otherwise noted in the equipment specifications. Use the machined surfaces on which the equipment sets for the base/mounting frame leveling plane. Use the machined shaft surface for equipment leveling plane.

G. Sprocket and Sheave Alignment. Check shaft mounted components for face runout and eccentricity (outside diameter) runout by magnetically mounting a dial indicator on a stationary base and indicating over 360 degrees on a continuous machined surface at the outside diameter of the component. Maximum allowable total indicated face runout and eccentricity for sprockets and sheaves will be per ANSI Standard B29.1-1975.

H. Belt tensioning. Set drive belt tension to manufacturer's specification for the belt type. Recheck alignment after drive tensioning.

I. Thermal/Mechanical Growth. Thermal/mechanical growth corrections for driver and driven machines will be used in vertical and horizontal alignment where applicable. The equipment manufacturer will determine thermal/mechanical growth applicability for any machine and provide the correction offsets to be used.

J. Rotating Shaft Alignment

1. Fixtures will be set up on the driver and driven machine, machines shaft surfaces. Machined coupling hubs may be used only if there is no clearance to mount fixtures directly on the shafts.

2. Primary alignment method for direct drive machines is when coupled. Uncoupled alignment will be used only when approved by the Engineer.

3. Account for possible coupling flex by always rotating coupled machines in the same direction during alignment.

4. Uncoupled machines must be connected so that both shafts turn together without relative motion during alignment.

5. Indicator bar sag will be measured and included for each reverse indicator alignment setup.

6. Reverse Dial Indicator. The final maximum allowable misalignment: vertical and horizontal from the desired targets of .000 inches (for a non-thermal growth machine) or from the given target readings (for a thermal growth machine) must meet BOTH of the following conditions simultaneously: 1/2 the final total indicator reading at each indicator will be no more than shown in the table below AND the final remaining correction at each machine foot be no more than .001 inches of required movement.

Machine Speed (RPM)	Total Misalignment* (inches)
Up to 1800	.002
1800 and greater	.001

** 1/2 indicator reading*

3.06 FIELD TESTING

A. All equipment shall be set, aligned and assembled in conformance with the manufacturer's drawings and instructions. Provide all necessary calibrated instruments to execute performance tests. Submit report certified by the pump manufacturer's representative.

B. Preliminary Field Tests, Yellow Tag

1. As soon as conditions permit, after the equipment has been secured in its permanent position, the CONTRACTOR shall:

   a. Verify that the equipment is free from defects.

   b. Check for alignment as specified herein.

   c. Check for direction of rotation.

   d. Check motor for no load current draw.

2. CONTRACTOR shall flush all bearings, gear housings, etc., in accordance with the manufacturer's recommendations, to remove any foreign matter accumulated during shipment, storage or erection. Lubricants shall be added as required by the manufacturer's instructions.

3. When the CONTRACTOR has demonstrated to the Engineer that the equipment is ready for operation, a yellow tag will be issued. The tag will be signed by the Engineer, or his assigned representative and attached to the equipment. The tag shall not be removed.

4. Preliminary field tests, yellow tag, must be completed before equipment is subjected to final field tests, blue tag.

C. Final Field Tests, Blue Tag

1. Upon completion of the above, and at a time approved by the Engineer, the equipment will be tested by operating it as a unit with all related piping, ducting, electrical and controls, and other ancillary facilities.

2. The equipment will be placed in continuous operation as prescribed or required and witnessed by the Engineer or his assigned representative and JEA or his assigned representative.

3. The tests shall prove that the equipment and appurtenances are properly installed, meet their operating cycles and are free from defects such as overheating, overloading, and undue vibration and noise. Operating field tests shall consist of the following:

a. Check equipment for excessive vibration and noise as specified herein.

b. Check motor current draw under load conditions. The rated motor nameplate current shall not be exceeded.

c. Recheck alignment with dial indicators where applicable, after unit has run under load for a minimum of 24 hours.

D. In addition to the above described field tests, any other tests specifically required by Section 11100, Pumps-General, the individual equipment Specifications, or by the manufacturer shall be performed.

E. Until final field tests are acceptable to the Engineer, the CONTRACTOR shall make all necessary changes, readjustments and replacements at no additional cost to JEA.

F. Upon acceptance of the field tests, a blue tag will be issued. The tag will be signed by the Engineer and attached to the unit. The tag shall not be removed and no further construction work will be performed on the unit, except as required during start-up operations and directed by the Engineer.

G. Defects which cannot be corrected by installation adjustments will be sufficient grounds for rejection of any equipment.

H. All costs in connection with field testing of equipment such as lubricants, temporary instruments, labor, equipment, etc., shall be borne by the CONTRACTOR. Power, fuel, chemicals, water, etc. normally consumed by specific equipment shall be supplied by JEA unless otherwise specified in the individual equipment specifications.

I. The CONTRACTOR shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when JEA formally takes over

the operation thereof.

J. Field testing of electric motors shall be in accordance with Section 15170, Electric Motors and Section 16000, Basic Electrical Requirements.

3.07 VIBRATION TESTING

A. Unless specified otherwise in the detailed equipment specifications, each pump, motor or similar item of stationary rotating equipment having a rated power in excess of 40HP shall be tested after installation for acceptable vibration levels.

B. Vibration testing shall be performed by an experienced factory-trained and authorized third-party analysis expert (not a sales representative) retained by the CONTRACTOR and approved by the Engineer. Each unit or pump system 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 (4) certified copies of vibration test data for each test performed.

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 drive, tests shall be conducted under various loading conditions as determined by the Engineer.

D. All field vibration tests shall be performed with the equipment operating on the product for which it is intended, or a substitute acceptable to the Engineer.

E. The term displacement, as used herein, shall mean total peak-to-peak movement of vibrating equipment, in mils; velocity or speed of the vibration cycle, measured in G's. Displacement and velocity shall be measured by suitable equipment equal to IRD Mechanalysis, Bentley, Nevada.

E. 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.

F. For all equipment tested, vibration shall be checked in the radial and axial directions. Unless otherwise specified elsewhere, axial vibration shall not exceed 0.1 in/sec; and radial vibration shall not exceed 0.2 in/sec. For pumps radial vibration shall not exceed that permitted by the Hydraulic Institute Standards except that, at vibration frequencies in excess of 8,000 cpm, the velocity shall not exceed 0.2 in/sec.

G. Copies of test results shall be submitted to the Engineer for review. Should the vibration field test results exceed shop test results, the manufacturer's recommendations, or the limits specified herein, the CONTRACTOR shall correct the deficiencies within thirty (30) days. After corrections have been completed, the vibration testing shall be re-run and the results re-submitted to the Engineer for review.

H. Noise or vibration in any rotating equipment which the Engineer determines to be excessive or damaging, and falls outside of the acceptable limits for that particular

piece of equipment, shall be cause for rejection.

3.08 FAILURE OF EQUIPMENT TO PERFORM

A. Any defects in the equipment, or failure to meet the guarantees or performance requirements of the Specifications shall be promptly corrected by the CONTRACTOR by replacements or otherwise.

B. If the CONTRACTOR fails to make these corrections, or if the improved equipment shall fail again to meet the guarantees or specified requirements, JEA, notwithstanding his having made partial payment for work and materials which have entered into the manufacture of said equipment, may reject said equipment and order the CONTRACTOR to remove it from the premises at the CONTRACTOR's expense.

C. The CONTRACTOR shall then obtain specified equipment to meet the contract requirements or upon mutual agreement with JEA, adjust the contract price to reflect not supplying the specific equipment item.

D. In case JEA rejects said equipment, then the CONTRACTOR hereby agrees to repay to JEA all sums of money paid to him for said rejected equipment on progress certificates or otherwise on account of the lump sum prices herein specified.

E. Upon receipt of said sums of money, JEA will execute and deliver to the CONTRACTOR a bill of sale of all his rights, title, and interest in and to said rejected equipment; provided, however, that said equipment shall not be removed from the premises until JEA obtains from other sources other equipment to take the place of that rejected.

F. Said bill of sale shall not abrogate JEA's right to recover damages for delays, losses, or other conditions arising out of the basic contract.

3.09 PAINTING

A. All surface preparation, shop painting, field repairs, finish painting, and other pertinent detailed painting specifications shall conform to applicable sections of Section 09900, Painting.

B. All shop coatings shall be compatible with proposed field coatings.

C. All inaccessible surfaces of the equipment, which normally require painting, shall be finished painted by the manufacturer. The equipment and motor shall be painted with a high quality epoxy polyamide semi-gloss coating specifically resistant to chemical, solvent, moisture, and acid environmental conditions, unless otherwise specified.

D. Gears, bearing surfaces, and other unpainted surfaces shall be protected prior to shipment by a heavy covering of rust-preventive compound sprayed or hand applied which shall be maintained until the equipment is placed in operation. This coating shall be easily removable by a solvent.

3.10 WELDING

A. The Equipment Manufacturer's shop welding procedures, welders, and welding operators shall be qualified and certified in accordance with the requirement of AWS D1.1 "Structural Welding Code - Steel" or AWS D1.2 "Structural Welding Code - Aluminum" of the American Welding Society, as applicable.

B. The CONTRACTOR's welding procedures, welders, and welding operators shall be qualified and certified in accordance with the requirements of AWS D1.1 "Structural Welding Code - Steel" or AWS D1.2 "Structural Welding Code - Aluminum" of the American Welding Society, as applicable.

C. The CONTRACTOR shall perform all field-welding in conformance with the information shown on the Equipment Manufacturer's drawings regarding location, type, size, and length of all welds in accordance with "Standard Welding Symbols" AWS A2.0 of the American Welding Society, and special conditions, as shown by notes and details.

- END OF SECTION -

SECTION 11100

PUMPS - GENERAL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish, install, test, and make fully operational all pumping equipment, complete with all necessary accessories, in compliance with the Contract Documents.

B. All pumping equipment shall be provided in accordance with the requirements of Section 11000, Equipment General Provisions.

C. The provisions of this section shall apply to all pumps and pumping equipment specified except where specifically noted otherwise in the Contract Documents.

D. The pumps shall be provided complete with all accessories, shims, sheaves, couplings, and other appurtenances as specified, and as may be required for a complete and operating installation.

1.02 SHOP DRAWINGS

A. Shop Drawings shall include the following information in addition to the requirements of Section 01300, Submittals and Section 11000, Equipment General Provisions.

1. Details of shaft sealing system

2. Pump performance curves at rated speed and reduced speed (if reduced speeds are specified). Curves shall indicate flow, head, efficiency, brake horsepower, NPSH required, and minimum submergence. Curves shall include limits (minimum and maximum flows) for stable operation without cavitation, overheating, recirculation, or excessive vibration.

3. General cutaway sections, materials, dimension of shaft projections, shaft and keyway dimensions, shaft diameter, dimension between bearings, general dimensions of pump, suction head bolt orientation, and anchor bolt locations and forces.

4. Foundry certificates and results of Brinnell hardness testing showing compliance to ASTM A 532 (where required in the individual pump specifications).

5. Pump submittals shall also include:

a. Product data sheets for power and control cables and length of cables.

b. Details on pump guide rail system and mounting requirements.

1.03 SPARE PARTS

A. Standard spare parts shall be furnished by the CONTRACTOR for all new pumps. Spare parts shall be stored at the Arlington East WRF site (approximately 30 miles from project site) as directed by JEA.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. All materials employed in the pumping equipment shall be suitable for the intended application. Material not specifically called for shall be high-grade, standard commercial quality, free from all defects and imperfection that might affect the serviceability of the product for the purpose for which it is intended, and shall conform to the following requirements unless otherwise specified in individual pumping equipment Specifications:

1. Cast iron pump casings and bowls shall be of close-grained gray cast iron, conforming to ASTM A 48, or equal.

2. Bronze pump impellers shall conform to ASTM B 584, “G” bronze.

3. Stainless steel pump shafts shall be of Type 400, Series. Miscellaneous stainless steel parts shall be of Type 316.

B. Suction and discharge flanges shall conform to ANSI standard B16.1 or B16.5 dimensions.

C. Handholes on pump casings shall be shaped to follow the contours of the casing to avoid any obstructions in the water passage.

2.02 APPURTENANCES

A. Pressure Gauges

1. The CONTRACTOR shall furnish and install pressure gauges on the suction and discharge of each pump

2. Suction gauges shall be of the single scale compound type to indicate both pressure and vacuum. Each suction gauge shall be graduated in feet of water over the span of 34 feet below and above zero.

3. Discharge gauges shall be graduated in feet from zero to a minimum of five (5) feet of water above the respective pump shutoff head or to a minimum of 30% above the maximum operation pressure, whichever is greater. Graduation shall be in feet of water.

4. All gauges shall be supplied under Division 17 by one manufacturer and shall be as specified in Section 17650, Pressure Gauges.

5. All gauges shall be provided with diaphragm seals as specified in Section 17698, Instrumentation and Control System Accessories.

B. Flexible couplings for direct driven pumps shall be as manufactured by Falk, Dodge, Woods Corp., or equal and shall be furnished with guards in accordance with OSHA Rules and Regulations. Spacer couplings shall be provided where necessary to allow removal of the pump rotating element without disturbing the driver.

2.02 ELECTRICAL REQUIREMENTS

A. All pumps shall be furnished with motors such that the motor shall not be overloaded throughout the full range of the pump operation, unless otherwise specifically approved by the Engineer.

B. Where variable frequency drives (VFDs) are specified, the CONTRACTOR shall be responsible for coordinating between pump supplier and VFD supplier to ensure a complete and operational system. VFDs shall be furnished under Division 16 and shall be as specified in Section 16495, Variable Frequency Drive Systems.

C. Motor starters and controls shall be furnished and installed under Division 16 and Division 17 unless otherwise specified in the individual pump specifications.

2.03 EQUIPMENT IDENTIFICATION

A. In addition to the requirements of Section 11000, Equipment General Provisions, nameplate data for each pump shall include the rating in gallons per minute, rated head, speed, and efficiency at the primary design point.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Drains: All gland seals, air valves, and drains shall be piped to the nearest floor drain or trench drain with galvanized steel pipe or copper tube, properly supported with brackets.

B. Solenoid Valves: Where required, the pump manufacturer shall furnish and install solenoid valves on the water or oil lubrication lines. Solenoid valve electrical rating shall be compatible with the motor control voltage and shall be furnished complete with all necessary conduit and wiring installation from control panel to solenoid.

3.02 SHOP TESTING

A. Shop tests shall be performed in accordance with Section 11000, Equipment General Provisions, and except where stated otherwise herein, shall be conducted in

accordance with applicable methods and standards of the American National Standard for Centrifugal Pump Tests by the Hydraulic Institute.

B. Pump testing shall be witnessed by JEA/Engineer where specified in the individual pump specifications. The testing procedure shall be submitted to the Engineer for review before scheduling the testing. The Engineer shall be given at least 2 weeks advanced notice of the scheduled testing date.

C. Certified test curves shall be provided for all centrifugal pumps unless otherwise specified in the individual pump specifications.

D. Pumps shall be within the tolerances specified by the Hydraulic Institute Standards with the following exceptions:

1. At design heads, +10% of design capacities or at design capacities, +5% of design heads.

2. No minus tolerances shall be allowed with respect to capacity, head, or efficiency at the design points.

E. Where required in the individual pump specifications, each individual casting shall be Brinnell tested in a minimum of two places, in an area of representative casting thickness to ASTM Method E-10. Results shall be certified by a Registered Professional Engineer. Test results shall verify the satisfaction of the required Brinnell hardness of the finished product as specified in respective subsections.

3.03 FIELD TESTING

A. Field tests shall be performed in accordance with in Section 11000, Equipment General Provisions and additionally as specified below and in the individual pump specifications.

B. Final acceptance tests shall demonstrate the following:

1. The pumps have been properly installed and are in proper alignment.

2. The pumps operate without overheating or overloading of any parts and without objectionable vibration. Vibration shall be within the Hydraulic Institute limits, or manufacturer's limits if more stringent.

3. The pumps can meet the specified operating conditions. All pumps shall be checked at maximum speed for a minimum of four points on the pump curve for capacity, head, and amperage. The rated motor nameplate current shall not be exceeded at any point. Pumps with drive motors rated at less than five horsepower shall only be tested for overcurrent when overheating or other malfunction becomes evident in general testing.

3.04 PUMP SCHEDULE

A. The following is a list of pumping equipment to be provided under this Section:

Pump Designation	Location	Type of Pump	Specification Section
Booster Pump No. 01	Booster Pump Station Building	Horizontal Self-Priming Centrifugal	11115
Booster Pump No. 02	Booster Pump Station Building	Horizontal Self-Priming Centrifugal	11115

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SECTION 11115

HORIZONTAL SELF-PRIMING CENTRIFUGAL PUMPS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish self-priming, centrifugal pumps at the locations shown on the Drawings and as specified herein. All pumps shall be supplied by the same manufacturer.

B. Equipment shall be provided in accordance with the requirements of Section 11000, Equipment General Provisions and Section 11100, Pumps - General.

1.02 OPERATING CONDITIONS AND PERFORMANCE REQUIREMENTS

Booster Pumps No. 1 – No. 2	
Number of Units	2
Design Capacity (gpm)	700
Total Dynamic Head (feet)	160
Maximum Brake Horsepower	50
Maximum Pump Speed (rpm)	1750
Minimum Suction Diameter (In.)	6
Minimum Discharge Diameter (In.)	6

1.03 DEFINITIONS

A. The following definitions are used to clarify restart requirements.

1. Priming shall refer to the start-up at any time when the pump casing is full of water or sewage.

2. Repriming shall refer to start-up when, for whatever reason, a portion of liquid is lost from the pump casing with the resultant loss of suction head in the suction leg.

3. Static Suction Lift shall be the vertical distance, measured in feet, from the centerline of pump suction to the water surface elevation.

1.04 SUBMITTALS

A. The following items shall be submitted with the Shop Drawings in accordance with, or in addition to the submittal requirements specified in Section 01300, Submittals; and

Section 11000, Equipment General Provisions:

1. Performance Affidavit

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Each pump shall be a horizontal, non-clog, self-priming, centrifugal pump, as manufactured by Gould's or Peerless.

2.02 CONSTRUCTION

A. Each pump shall be designed to retain adequate liquid in the pump casing to insure unattended, automatic repriming of the pump at its rated speed.

B. The openings and passages of the pump shall be large enough to permit the passage of a sphere of the specified diameter including any trash or stringy material. The pump must be equipped with a removable suction inlet cover, allowing access to pump interior to permit the clearing of stoppages and to provide easy access for service and repairs without disturbing the suction or discharge piping.

C. Each pump shall incorporate a molded one-piece suction flap check valve that can be removed or installed through the removable cover plate opening, without disturbing the suction piping. The suction flap check valve shall be formed Buna-N or neoprene with a stainless steel hinge.

D. The pump casing and volute and all areas exposed to sewage shall be constructed of cast iron, no lesser grade than ASTM A-48 Class 30 and contain no openings of a lesser diameter than the sphere size specified. O-ring material shall be BUNA-N or Viton. Screens or any internal devices that interfere with priming and performance of the pump will not be permitted. Dimensional drawings indicating size and locations of the priming recirculation port or ports shall be submitted with shop drawings. An easily accessed tapped drain plug, minimum of 1 inch, shall be provided in the bottom of the casing to facilitate draining the pumps for maintenance purposes. The bearing cavity and the seal cavity shall have individual oil level sight gauges to monitor the level and condition of cavity oil.

E. The impellers and impeller wear plates shall be austempered ductile iron. The impellers and wear plates shall have a minimum Brinell hardness of 400. Foundry certificates and results of Brinell hardness testing shall be submitted. Each individual impeller and wear plate casting shall be Brinell Tested to ASTM method E-10, reflecting a minimum 400 Brinell hardness. Each casting shall be checked in a minimum of two places, in an area that is representative of casting thickness. Results of the Brinell test shall be certified by a Registered Professional Engineer, and submitted for approval before final shipment. Such tests may be witnessed by the Owner, at his option.

F. The impeller shall be two-vaned, semi-open, non-clog, with integral pump out vanes on the back shroud. The impeller shall thread onto the pump shaft and be secured with a sockethead self-locking capscrew and conical washer. Pump shall be designed with pusher bolts to allow disassembly of rotating elements. Pumps using the straight bore keyed attachment requiring "pullers" for removal shall not be considered.

G. Means shall be provided for external adjustment of the clearance between the impeller and wear plate without requiring disassembly of the pump.

H. The pump shall be fitted with a replaceable wear plate. Replacement of the wear plate, impeller, and seal shall be accomplished through the removable suction inlet cover without disturbing the pump volute or piping. The entire rotating assembly, which includes bearings, shaft, seal and impeller, shall be removable as a unit from both the front and rear of the pump casing without disturbing the pump volute or piping. Openings into pump shall provide a line of sight for the adjustment of clearance for the wear plate and impeller.

I. The shaft shall be ANSI 17-4PH stainless steel. The shaft shall be contained within a bearing pedestal of ample size to contain roller-type radial and thrust ball bearings. The maximum distance between the bearing and the impeller shall be 5 inches. These ball bearings shall be rated B-10 by the AFBMA and have a 100,000 hour life. The bearings shall be oil lubricated. The bearing cavity shall be externally cooled by the pumped liquid.

J. The pump shaft shall be sealed against leakage by a balanced mechanical seal. Both the stationary sealing member and mated rotating member shall be of Tungsten-Titanium carbide alloy. Each of the mated carbide surfaces must be ground and polished to produce a flatness tolerance not to exceed one half a light band, or 5.8 millionths of an inch, as measured by an optical flat and monochromatic light. To insure the seal faces are in full contact at all times, the stationary seal seat must be double floating and self-aligning during periods of shock loads that will cause deflection, vibration, and axial or radial movement of the pumps shaft. The seal shall be installed within a separate oil-filled reservoir of the pump pedestal, the oil being both the lubricating and the cooling media. Seal shall be accessible by removing the suction inlet cover. Drain plug opening shall be provided to check oil for contamination in case of inner seal failure.

K. Pumps shall be supplied with a drain kit for ease of maintenance. The kit shall contain 10 feet of reinforced plastic hose with a female quick connect fitting a one end, and factory installed drain fittings in each pump. Fittings shall include a pipe nipple, bushing, bronze ball valve and male quick connect fitting.

L. Automatic Air Release Valves:

1. An automatic air release valve shall be furnished for each pump. Valves shall be designed to permit the escape of air to the atmosphere during initial priming or unattended re-priming cycles. Upon completion of the priming cycle or re-priming cycle, the valve shall close to prevent re-circulation. Valves shall

provide visual indication of valve closure, and shall operate solely on discharge pressure. Valves, which require connection to the suction line, shall not be acceptable.

2. All valve parts exposed to sewage shall be constructed of cast iron, stainless steel, or similar corrosion resistant materials. Diaphragms, if used, shall be of fabric-reinforced neoprene or similar inert material.

3. A cleanout port, three inches in diameter, shall be provided for ease of inspection, cleanout, and service.

4. Valves shall be field adjustable for varying discharge heads.

M. Pump shaft connections to drives shall be connected through a flexible coupling.

2.04 ELECTRICAL AND CONTROL REQUIREMENTS

A. Electrical Requirements

	Booster Pumps
Motors	
Rating	230/460V, 3 ph, 60 Hz
Horsepower	50
Speed, rpm	1750
Enclosure	TEFC
Insulation	Class H
Inverter Duty	Yes
Service Factor	1.0
Space Heater	Yes
Motor Winding Temperature Switches	Yes

PART 3 -- EXECUTION

3.01 MANUFACTURER'S FIELD SERVICES

A. The services of a qualified manufacturer's technical representative shall be provided in accordance with Section 11000, Equipment General Provisions. For each series of pumps, field services shall include the following site visits:

Service	**Number of Trips**	**Number of Days/Trip**
Installation and Testing	1	1
Startup and Training	1	1
Services after Startup	1	1

3.02 SHOP TESTING

A. Shop testing shall be in accordance with Section 11000, Equipment General Provisions.

B. Certified Reprime Test

1. The Contractor shall furnish a certified reprime test for a minimum of one pump for each pump model submitted. Each pump shall be capable of the reprime lift as listed below. Reprime lift shall be defined as the static height of the pump suction centerline above the liquid level that will prime utilizing the liquid remaining within the pump casing after a pumping cycle with the suction check valve removed. The reprime cycle, pump on to liquid discharge, shall be accomplished within five minutes, maximum.

2. Additional requirements are as follows:

a. A ten foot length of one-inch pipe shall be installed between the pump and the first bend of the discharge piping. This line shall be open to atmosphere to duplicate the action of an air release valve.

b. Suction pipe configuration for the reprime test shall incorporate a minimum horizontal run of 4 feet and one 90 degree bend.

c. The impeller shall be set at the clearances recommended by the pump manufacturer.

d. Reprime lift repeatability shall be demonstrated by a minimum of five (5) sequential reprime cycles.

e. Liquid to be used in the reprime testing shall be water, free of debris.

3. Reprime performance test data shall be certified by the pump manufacturer and shall be submitted to the engineer for approval prior to shipment.

3.03 FIELD TESTING

A. Field testing shall be in accordance with Section 11000, Equipment General Provisions and Section 11100, Pumps-General.

B. Field Reprime Test

1. Each pump shall be given a reprime test in the field. Each pump shall be tested three times, and the elapsed time required to achieve reprime shall be recorded for each test. The average time of the three tests shall be used. This average time must be less than or equal to the specified times. No external devices or vacuum assist units shall be used during reprime tests.

2. The test shall be conducted as follows:

   a. The clarifier water surface elevation shall be set to the normal operating level as shown in the hydraulic profile on the Contract Drawings.

   b. Fill pump casing full of water.

   c. Drain suction pipe.

   d. Drain liquid level in pump casing to the cutwater tip.

   e. Record time from instant starter energizes until pump comes to full prime and is pumping at full rated capacity against the specified head. Suction and discharge gauges shall be attached to the pump during the test to insure full prime is reached. A standard stop watch shall be used to keep time.

   f. The reprime test shall also be administered as above, but rather than drain the pump casing to the cutwater tip, the suction check valve shall be removed and the pump brought to prime. Once the pump is pumping at its fully rated capacity the pump shall be cut off. The air valve on the discharge piping shall be opened to assist in draining of the suction leg to the aeration tank water surface elevation. The suction leg will drain and a natural siphonage shall occur from the pump casing. The time required for each pump to reprime under this condition shall be recorded. The average time of three tests shall be used.

3. Should the proposed equipment fail to meet the specified performance criteria or fail to reprime within the specified time, the equipment will be rejected. The pump manufacturer shall have seven (7) days to correct any deficiencies prior to a retest. The retest shall be identical to the first test. Should equipment fail to perform as specified during the retest, the Engineer shall direct the equipment be removed from the jobsite and an equipment offering which will perform as specified be provided.

- END OF SECTION -

SECTION 11000

CHEMICAL METERING PUMP SYSTEM

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, equipment, materials, and incidentals required and install, complete and ready for operation a chemical dosing and metering system as shown on the Drawings and as specified herein.

B. Furnish chemical fill station containment pallet(s) as shown on the Drawings and specified herein.

C. The chemical metering pump skid shall be pre-engineered by the metering pump manufacturer, prefabricated, pre-piped as shown on the drawings and as specified herein as manufactured by Grundfos. The pump skids shall be manufactured from polypropylene. The chemical metering skid is required to be fully functional at temperatures up to 104 degrees F.

1. One chemical metering pump skid for sodium hypochlorite to provide a chlorine residual for reclaimed water of 0.5 to 3.0 mg/L.

a. The pump skid specified herein shall include, but is not limited to, the following:

1) Chemical feed pumps with integral flow metering module
2) Strainers
3) Calibration columns
4) Pressure gauges
5) Pressure relief valves
6) Pulsation dampeners
7) Backpressure valves
8) Ball valves and unions
9) Pump control panel with SCADA interface
10) Feed system base, deck
11) Miscellaneous piping and accessories

D. The work includes, but is not limited to, the purchase and installation of new equipment as shown on the Drawings and specified herein.

E. It is the intent of this specification that a single skid supplier coordinates the products and equipment for the chemical metering system.

F. The CONTRACTOR shall also raise the existing chemical skid and provide all new piping, valves, and appurtenances as specified herein to connect it to the new storage tank and new fill piping, valves, and connections.

1.02 SUBMITTALS

A. Copies of all materials required to establish compliance with the Specifications shall be submitted in accordance with the provisions of Section 01300. Submittals shall include at least the following:

1. Data on the characteristics and performance of all pumps, including Manufacturer's certified rating data.

2. Certified shop drawings showing all important details of construction and dimensions.

3. Descriptive literature, bulletins, and/or catalogs of the equipment.

4. The total weight estimate of the equipment.

5. A complete total bill of materials.

6. Supporting documentation of Manufacturer’s certification to NSF/ANSI Standard 61 Drinking Water System Components for water treatment chemicals.

7. A list of the manufacturer's recommended spare parts with the manufacturer's current price for each item.

9. Complete wiring diagrams and schematics of each control panel, controllers, control device and operator's station.

10. Complete wiring diagrams and schematics of all power and control systems showing wiring requirements between all system components, motors, sensors, control panels, etc., including connections to work of other sections.

11. Fabrication drawings of pump wall supports, splash guard hangers and splash guards. Drawings shall show pump orientation per the Drawings to show the relationship between the pumps, guards and supports. If CONTRACTOR proposes alternative pump layouts, they shall be shown and clearly stated that a deviation is being requested with this submittal.

12. Data on noise.

13. The recommended grades of lubricants, along with references to alternative equal products by other manufacturers.

14. Certification by the supplier that the equipment and materials to be provided are suitable for the service intended.

15. A complete description of chemical resistance of the component materials that will come in contact with chemicals, as specified herein.
16. A quality assurance checklist from the supplier identifying that the chemical metering skid system design and installation are sufficient for satisfactory operation of the metering system.

17. In the event that it is impossible to conform with certain details of the Specifications due to different manufacturing techniques, describe completely all non-conforming aspects.

18. Product data on the containment pallets.

B. Operating and Maintenance Data and Training:

1. Operating and maintenance instructions shall be furnished to the ENGINEER as provided in Section 01730. The instructions shall be prepared specifically for this installation and shall

include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

2. A factory representative who has a complete knowledge of the proper operation and maintenance shall be provided for a minimum of 1 day solely to instruct representatives of the OWNER and ENGINEER on proper operation and maintenance of the equipment. One day is defined as 8 hours of instruction, excluding travel and lodging expenses. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no additional cost to the OWNER.

3. The technical representative shall have at least four years of experience in chemical system training and instruction. Training sessions shall be scheduled not less than two weeks in advance. Written training materials consisting of the final O&M manuals shall be provided to each of the OWNER’s personnel in attendance and shall remain with the trainees.

1.03 REFERENCE STANDARDS

A. National Electrical Manufacturers Association (NEMA)

B. American Society for Testing and Materials (ASTM)

C. American National Standards Institute (ANSI)

D. Anti-Friction Bearing Manufacturers Association (AFBMA)

E. American Welding Society (AWS)

F. Occupational Safety and Health Administration (OSHA)

G. Underwriters Laboratories (UL)

H. Where reference is made to one of the above standards, the revision in effect at the time of contract award shall apply.

1.04 QUALITY ASSURANCE

A. Tubing, valves and pipe shall be manufactured from materials certified to NSF/ANSI Standard 61 for chemical storage and submit form from NSF supporting chemical certification.

B. All solvent welds shall be performed by a fabricator who has attended a Solvent Welding Seminar per ASTM D2855 and passed the ASME B31.3 Bonder Qualification Test.

C. The pumps and skids covered by these Specifications are intended to be standard pumping equipment, as modified by these Specifications, of proven ability, as manufactured by a single manufacturer, having long experience in the production of such pumps. The pumps and skids furnished shall be designed, constructed, and installed in accordance with the best practices and methods, and shall operate satisfactorily when installed as specified herein and shown on the drawings.

C. Should equipment which differs from these Specifications be offered and approved by ENGINEER and OWNER as equal to that specified, such equipment shall be acceptable only on the basis

that any revisions in the design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc. required to accommodate such a substitution shall be made at no additional cost to the OWNER and be as approved by the OWNER and ENGINEER.

1.05 SYSTEM DESCRIPTION

A. General

1. Mechanically actuated diaphragm pumps will be used to meter liquid sodium hypochlorite at 12.5 percent concentration from the sodium hypochlorite storage tank to one primary injection point on the upstream side of the pumps. The sodium hypochlorite metering pump skid will be mounted adjacent to the tank in an uncooled, ventilated enclosed building.

2. The variable speed pumps will be controlled by the pump control panel and plant SCADA system based on the respective flow rates of the pumps and residual chlorine concentrations.

3. The sodium hypochlorite metering system shall be suitable materials of construction to operate with sodium hypochlorite products at a concentration of 12.5 to 15 percent.

B. Refer to the process and instrumentation diagrams in the Drawings and to Division 16 for specific control requirements of the chemical pump systems.

1.06 TOOLS AND SPARE PARTS

A. All special tools required for normal operation and maintenance shall be furnished with the equipment.

B. Manufacturer’s preventive maintenance kit shall include the following spare parts at a minimum:

1. One diaphragm assembly (Per Pump on System)
2. Two check valve assemblies (Per Pump on System)
3. Two sets of valve gaskets, one set of seals, and O-rings (Per Pump on System)

C. All tools and spare parts shall be packed and identified in accordance with manufacturer’s recommendations in a sealed toolbox or other plastic/metal container. No cardboard boxes will be allowed.

D. With the O&M manual submittal, provide a list of all spare and replacement parts.

1.07 POWER SUPPLY

A. The entire skid mounted chemical metering system shall be designed for operation on a single 120 VAC, 20 Amp, single phase power supply. Metering system control panel shall distribute 120 VAC through protective devices and integral power supplies, as required.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 11000 for additional details and requirements related to storage, handling, and delivery.

B. All pumps, controllers, motors, panels, and appurtenances shall be shipped from the Manufacturer in protective cartons or containers.

C. All flanges, pipe connections, and electrical connections shall be suitably protected to prevent damage during delivery, storage, and installation.

D. The Manufacturer shall provide written instructions on storage and handling of the equipment to the CONTRACTOR.

E. Pump skids shall be delivered as a complete factory piped/ fabricated skid mounted system, protected from the elements via shrink wrap or other suitable means. Manufacturer's written storage instructions shall be followed by the CONTRACTOR.

1.09 WARRANTY

A. The equipment shall be warranted by the CONTRACTOR and MANUFACTURER for a minimum period of one (1) year from date of substantial completion, to be free from defects in workmanship, design or material. If the equipment should fail during the warranty period due to a defective part(s), it shall be replaced in the machine and the unit(s) restored to service at no additional cost to the OWNER.

B. The MANUFACTURER's warranty period shall start concurrently with the CONTRACTOR's warranty period. No exception to this provision shall be allowed.

PART 2 – PRODUCTS

2.01 GENERAL

A. The Specifications are intended to give a general description of what is required, but do not cover all details which may vary in accordance with the exact requirements of the equipment as offered. They are, however, intended to cover the furnishing, delivery, installation and field testing of all materials, equipment and apparatus as required. Any additional auxiliary equipment necessary for the proper operation of the proposed installation not mentioned in these Specifications or shown on the drawings shall be furnished and installed.

B. All equipment shall be designed and proportioned to have liberal strength, stability, and stiffness and to be specifically adapted for the intended service.

C. The equipment, including pump skids, shall be rigidly and accurately anchored into position by CONTRACTOR in accordance with manufacturer's installation recommendations. All necessary foundation bolts, plates, nuts, and washers shall be furnished and installed by CONTRACTOR in accordance with manufacturer's recommendations. Anchor bolts shall be titanium for the sodium hypochlorite metering pumps. Each pump shall be rigidly mounted to a polypropylene channel base of sufficient stiffness to support pump, motor, and reducer. Skids shall be constructed so that the pumps are a minimum of 1.5-inches above the skid slab in the event of a chemical leak. The actual pump skid shall be mounted by the CONTRACTOR on a concrete pad. The final dimensions of the pump pad shall be coordinated to fit the skid during the shop drawing phase.

D. Provide forklift cutouts for all metering pump skids weighing over 100 lbs.

E. Stainless steel nameplates giving the name of the manufacturer, model number and serial number, capacity, and other pertinent data shall be attached to each item of equipment.

F. Pump skid and piping shall be designed to accommodate 2 pumps (one duty / one standby) and space to tie in a future third pump.

1. Pump nameplates shall include capacity, head, speed, and any other pertinent information.

2. Motor nameplates shall include horsepower, speed, voltage, amperes, service factor and any other pertinent data.

F. Nameplates giving the name and number of each pump or item of equipment shall be rigidly fastened to all control panels furnished under this section. All push buttons, selector switches, lights, etc. shall be properly labeled such that the function of each component is clearly identified.

G. The chemical feed pumps shall be model DDA 7.5-16 mechanical diaphragm metering pumps as manufactured by Grundfos.

H. All PVC connections shall be solvent welded socket connections or flanged connections, except where a transition is required to a component that is not available with socket connections (e.g., transitions to tubing fittings)

I. Vented ball valves shall be used on the sodium hypochlorite system skids.

2.02 CHEMICAL METERING PUMPS - GENERAL

A. All pumps shall be variable speed chemical feed microprocessor-controlled, mechanically actuated diaphragm metering pumps, motor driven, and shall be of suitable materials for pumping the respective chemical solutions. Each pump shall be capable of receiving a 4-20 mA external signal for flow pacing and allow manual control at the pump. Single ball type check valves shall be provided on the suction and discharge, including a replaceable ball guide. The pumps shall be dry-lift self-priming and capable of indefinite operation without process fluid.

1. Chemical metering pumps shall be Mechanically Actuated Diaphragm, positive displacement, motor driven, metering pump manufactured by GRUNDFOS with no exceptions.

2. Solenoid-driven pumps, hydraulically actuated diaphragm pumps and those with a lost motion spring return are not acceptable.

3. Chemical metering pump shall be driven by a microprocessor controlled PMSM (Permanent Magnet Synchronous Motor) providing a minimum of [800:1] turndown ratio. The PMSM to be mechanically connected to a flat, PTFE diaphragm via a piston and gear assembly. The drive assembly shall be a maintenance free design.

4. The pump shall operate at 100% stroke length throughout the pump’s complete capacity range. No adjustment to the stroke length to regulate flow is acceptable.

5. The liquid end & valve design shall provide for ease of maintenance. Ball check valves shall be cartridge type design.

6. The pump shall be able to calculate the measured flow through the pump head to monitor the dosing process without the need for additional equipment.

7. The pump shall be able to compensate automatically for discharge pressure fluctuations, maintaining a constant flow rate.

8. The pump design shall include provisions for optional field adjustment positioning of the control interface / display, for right side or left side or front mounting.

9. Pump enclosure rating shall be to IP65 and NEMA 4X standards.

10. The mechanically actuated disc diaphragm shall be constructed of a steel core, vulcanized into nylon-reinforced EPDM, with PTFE-faced fluid contact surface. The diaphragm shall be of a convex design fitting into a concave liquid end to minimize dead volume and promote flow of solids in suspension.

11. The pump design shall include an integral removable click stop mounting plate, to allow for flat base mounting.

12. All pumps shall be designed to deliver the capacity tabulated below at the minimum discharge pressure specified.

Sodium Hypochlorite Metering Pumps (Disinfection – 12.5% solution strength)

Number of Units	2 (1 duty/1 standby)
Capacity (maximum)	2 gal/hr
Capacity (minimum)	0.000667 gal/hr
Maximum Pressure	150 psi
GRUNDFOS Model Used for Design:	DDA 7.5-16 FCM-PVC/V/C-F-31U7U7BG

B. Drives and Capacity Control (Motorized Pumps)

1. Stroke frequency control for motorized pumps shall be done with an integral stepper motor and integral microprocessor controller to achieve a nearly continuous dosage.

2. An integral variable speed PMSM shall be used to ensure the pump discharge phase extends throughout the full period between suction intervals.

3. Variable frequency drives shall not be accepted.

4. The motor shall be integral to the pump and supplied with power cord and plug.

5. The drive mechanism shall not require regular field service or external lubrication.

C. Pump Interface

1. User interface/display shall be backlit LCD with selectable on-site positioning for either side or front mounting.

2. The interface shall provide a selection of metered output to be displayed in gallons per hour (gph) or liters per hour (l/h). Pumps displaying percent (%) of output only will not be accepted.

3. The interface should include a turn and push knob (click wheel) for easy navigation.

4. The interface menu shall include 28 language selections and provide easy navigation of all configuration and operational functions.

5. The interface shall include a lock function to protect against unauthorized changes.

6. A built-in counter shall be included to provide a running total of, accumulated strokes, cumulative hours of operation and dosing flow.

7. A priming button shall be provided on the interface. The priming button shall initiate a time selectable prime cycle operating at full capacity without need of attenuating the pumps output set point.

8. A system of white, red, yellow and green LCD screen color changes shall indicate pump status and alarm conditions.

D. Operation

1. Repeatable metering accuracy shall be ±1.5% of set point plus 0.1% full scale at constant hydraulic conditions throughout the entire output range.

2. The pump shall be able to compensate automatically for discharge pressure fluctuations while maintaining a constant flow rate.

3. The pump shall be equipped with a slow mode function for use with high-viscosity liquids. The slow mode function shall reduce the suction speed to either 50% or 25% of maximum capacity to ensure optimal priming and pumping reliability.

4. The pump shall be able to calculate the measure the flow and display the flow on the LCD screen and transfer the value via a proportional analog signal 4-20mA.

5. The pump shall be equipped with a calibration function which when initiated operates the pump for a set number of strokes and displays the anticipated pumped volume. The calibration process allows adjustment of the pump to set the calibration relative to the drawdown volume.

6. The pump shall be equipped with an analog scalable 4-20mA signal input.

7. The pump shall be equipped with provisions for selectable mode NO/NC external pump enable/disable interface.

8. The pump shall be equipped with input connections for Grundfos optional dual level control and alarm outputs for low-level and empty tank warnings.

9. The pump shall be equipped with a programmable proportional 4-20mA signal output.

10. The pump shall be equipped with two potential free selective programmable outputs contacts.

E. Control

1. The pump shall come equipped with 5 menu selectable control modes; Manual, analog, pulse, timer or batch. The pump shall also be Profibus, Profinet, Modbus TCP and Modbus RTU compatible with optional external interface module.

   Manual Control

   a. Output of pump is displayed in gal or liters per hour. Pump output adjustment is performed with the turn and push knob (click wheel) on the interface.

   b. Pumping rate changes are to be achieved through precise speed control with fixed 100% full stroke length.

   c. Pump should include a start/stop button.

   Automatic Control

   a. Analog: Pump shall include direct interface provisions for analog control. Both direct and reverse acting 4-20mA input configurations are to be acceptable inputs. The menu configuration shall permit pump maximum output multipoint scaling. The pump shall include a local alarm for loss of 4-20 mA input signal.

   b. Pulse: The pump shall include direct interface provisions for pulse output devices. In pulse control mode, the pump feed rate is altered by adjusting the volume of product per incoming pulse and by the frequency of pulses generated by the external device.

   c. Batch: In batch mode the pump shall respond to deliver a menu configurable quantity of liquid after receiving a remotely provided contact input.

   d. Cycle timer: The configuration menu of the cycle timer shall permit the user to prescribe batch volume, timed sequence start point and the time between each successive timed delivery cycle.

   e. Week timer: The pump shall be equipped with a real-time clock and a seven-day internal week timer. The configuration menu shall permit the user to prescribe up to 16 procedures with batch volume, dosing time, start time and weekdays.

2.03 SKID-MOUNTED CHEMICAL METERING SYSTEM

A. The skid mounting of the metering pumps shall conform to the following requirements:

1. The chemical feed system shall be completely assembled, mounted, calibrated, tested, and delivered to the site on a single skid. Components to be mounted on the skid are as indicated on the drawings and shall include the metering pumps, calibration column, piping, valves, piping accessories (pulsation dampeners, strainers, back pressure valves, pressure relief valves, etc.), and wiring integral to the skid. The chemical metering pump manufacturer shall be responsible for providing all equipment, valves and piping within the skid boundary. The metering pump skid shall be manufactured by Grundfos. No alternates will be approved.

2. The skids shall be constructed of fusion welded polypropylene sheets with adequate supports for all equipment and piping and a ½-inch drip lip.

3. The skids shall be designed in a primary/backup arrangement utilizing a common suction header and a common discharge header.

4. All components of the skid-mounted system (pumps, piping, and controls) shall be tested as described in specification.

5. Skid dimensions are anticipated to be 55-in wide by 23-in deep by 55-in high. Final dimensions shall be determined during the submittal phase and shall be coordinated with the proposed layout by the CONTRACTOR. Any changes from the design drawings will be the responsibility of the CONTRACTOR.

B. Skid-mounted accessories shall include the following, refer to the P&IDs for actual quantities per skid:

1. Wye Strainer:

a. For each diaphragm type metering pump, as shown on the Drawings, a suction line wye strainer shall be provided. Wye strainers shall have 1/32-inch perforations. Strainers shall be one size larger than the suction piping in which they are installed, and the piping shall be bushed up accordingly. Strainer material shall be a PVC body, solvent weld ends, PVC mesh, and FKM (Viton ®) O-ring.

2. Calibration Chamber:

a. Provide clear plastic calibration chamber with vent for use in calibrating the metering pumps.

b. The chamber shall be sized to give adequate capacity for a minimum 30 second draw down test.

c. The scale shall give direct readings in milliliters (mL) and gallons per hour (gph) without the need for calculations.

d. The calibration chamber shall be piped and valved so that each pump shall be able to utilize the calibration chamber without interfering with the operation of the other pumps.

e. The top of the chamber shall have a threaded fitting to allow for piping to a common vent.

3. Pulsation Dampeners:

a. Shall be of the single diaphragm design, capable of arresting water hammer in the pump discharge lines created by the metering pumps.

b. Materials of construction of diaphragm and body shall be corrosion resistant to the chemical fluid pumped.

c. Provide one dampener on the discharge side of each metering pump.

d. Each pulsation dampener shall include an integral pressure gauge.

e. Pulsation dampeners shall be sized appropriately for each pump to remove a minimum of 95 percent of the pulsations. The manufacturer shall provide calculations to verify sizing if requested by the ENGINEER.

f. Shall be hydro-pneumatic type and of vertical design. A pulsation dampener shall consist of two chambers, an upper pressure chamber and a lower process fluid chamber. Two chambers shall be separated by a flexible, elastomeric bladder, a PTFE bellow or a diaphragm.

g. Shall be designed at a minimum safety margin of 4:1 burst pressure to maximum working pressure. Pulsation dampener shall be capable of handling pump's maximum stroke volume. The pressure chamber shall be charged with compressed air to pump manufacturer's recommended charging pressure.

4. Pressure Gauges and Diaphragm Isolators:

a. For each chemical metering skid, provide a pressure gauge and diaphragm type chemical isolation suitable for each chemical service. The gauge guard body shall be constructed of the same material as the applicable chemical piping system. The diaphragms shall be Teflon. No threaded connections shall be allowed. Range of pressure gauge to be suitable with each chemical service but at least a minimum operating pressure of 20 psi.

b. Pressure gauge shall have a 300 series stainless steel case and shall be approximately 2-½-inch nominal diameter with a type 316 stainless steel Bourdon tube and a 300 series stainless steel movement. The gauge dial shall be a white background with black markings and sealed to prevent entrance of moist air. The gauges shall be liquid filled with glycerin and shall be provided with a filler/breather cap. The socket shall be Type 316 stainless steel with bottom connection.

c. Each pressure gauge assembly shall be equipped with an isolation valve and diaphragm seal to protect the gauge from contact with fluid in the pipeline. The isolation valve shall be a ball valve. The valve and diaphragm seal housing shall be constructed of the same

material as the applicable chemical piping system and shall have either socket weld, socket fuse or flanged process connection. The diaphragm shall be Teflon. Mineral oil fill between the diaphragm seal and the gauge shall be furnished with the unit.

5. Backpressure and Pressure Relief Valves:

   a. Adjustable diaphragm backpressure sustaining type valve installed on pump discharge header and set at location recommended by manufacturer. Materials to be suitable for rated chemical service.

   b. Adjustable diaphragm pressure relief valve and line sight glass installed on at location shown on the drawings. The backpressure valve shall be provided loose and installed in the field by the contractor. PRV required for each pump mounted on feed system. Materials to be suitable for respective chemical service. Initial settings shall be as follows:

      1) PRV setting: 48 psig
      2) BPV setting: 38 psig

6. Piping, Valves and Appurtenances:

   a. Skid piping, valves and appurtenances shall be Schedule 80 PVC. PVC glue/cement shall be as recommended by the pipe manufacturer for the service outlined in this Section.

   b. Piping shall be supported at every fitting and as appropriate to properly support the pipe. Piping connections to the pump shall be flanged or socket welded with pipe unions.

   c. True-union ball valves shall be provided for isolation of major equipment. Seals shall be compatible with the chemical being pumped.

   d. Provide any other valves such as unions, check valves, ball valves, anti-siphon valves as shown on the drawings.

   e. The sodium hypochlorite piping and pump liquid end shall be PVC with FKM (Viton®) seals. Ball valves for the sodium hypochlorite skids shall be vented.

7. Flow and Pressure Annunciations:

   a. Vendor shall provide system instrumentation as required for annunciation of hypochlorite system flow rate and system discharge pressure.

   b. Annunciation will be transmitted to hypochlorite remote I/O control panel DIO-1 and transmitted to main site PLC panel SCP-1 via fiber optic communications.

   c. A CIU500 module shall be provided as an integral unit for communication with local DIO-1 control panel via ProfiNet.

   d. Calculated values are also acceptable to an accuracy of +/- 2%.

2.04 CHEMICAL METERING SYSTEM CONTROL PANEL

A. Dual Pump Control Panel for Sodium Hypochlorite Pump Skid

1. The chemical metering skid control panel shall be configured with the following:

    a. NEMA 4X fiberglass enclosure, 3-point latch, piano hinge, lockable
    b. Weatherproof duplex receptacle
    c. Control power supplies
    d. ProfiNet media converter
    e. Overcurrent protective devices
    f. Two analog inputs (4-20ma) speed command
    g. Two digital inputs (on/off) run command
    h. Two digital outputs (on/off) run status
    i. Two digital outputs (on/off) alarm status
    j. Two digital outputs (on/off) in-remote status
    k. Two analog outputs (4-20ma) speed indication

2. The panel shall be UL 508 rated and shall be fabricated by the chemical skid manufacturer and tested with the chemical feed skid prior to shipment to the site.

3. Primary control for the metering system shall be accomplished via ProfiNet communications protocol with backup hardwired signals as described above. Remote operation accomplished by receiving a dry contact maintained enable signal and analog 4-20mA signal for 0 to 100 percent speed command. Remote status contacts for remote selected, running, alarm, and analog 4-20mA speed feedback proportional to pump speed. The pump feedback signal shall take into account the stroke length and decrease the max output of 20 mA proportionally to the setting.

4. Alarm relay is triggered from, at a minimum, any one of the following:

    a. Pump power failure, blown internal fuse, loss of analog signal, diaphragm failure, low flow, and internal motor monitor failure.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The chemical feed and metering systems shall be installed in accordance with manufacturer's instructions and recommendations in locations shown on the drawings. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the recommendations of the manufacturer. Anchor bolts shall be set in accordance with the shop drawings.

B. Piping shall be rigidly supported in accordance with Division 15.

3.02 INSPECTION AND TESTING

A. CONTRACTOR is responsible for assuring services, labor, and equipment of the manufacturer as specified herein. The equipment manufacturer shall furnish the services of a competent and experienced representative who has complete knowledge of proper operation and maintenance

of the equipment to inspect the installed equipment, supervise the initial test run, and to provide instructions to the plant personnel. Two visits shall be provided by chemical metering skid manufacturer. The first visit shall be to conduct inspection of installation and shall be a minimum of one day. The second visit shall be a minimum of two days and shall complete start-up, operate, and supervise the preliminary test (no chemicals) and the full functional test and to instruct plant personnel in the operation and maintenance of the equipment. The final copies of operation and maintenance manuals specified in Section 01730 must have been delivered to the ENGINEER prior to scheduling the second visit for the instruction period with the OWNER.

B. Testing

1. Upon completion of installation, the MANUFACTURER, in the presence of the ENGINEER, shall perform a preliminary test (no chemicals) over the full range of each system to ensure the functioning of all component parts to the satisfaction of the ENGINEER. The test shall be over the full range of capacity. The manufacturer shall furnish all labor and equipment. Air and power shall be supplied by the CONTRACTOR. Approval of the preliminary test by the ENGINEER shall not constitute final acceptance of the equipment furnished.

2. Full functional testing shall be performed in the presence of the ENGINEER and a qualified manufacturer's representative on the system. The manufacturer shall furnish all labor materials and equipment required for such tests and shall correct any deficiencies noted by repairing or replacing the defective component and retesting as required until the equipment meets the Specifications and the satisfaction of the ENGINEER. A performance check shall be made on each metering pump with the chemical it is intended to pump. Pumps shall be tested at 10%, 20%, 50%, 75%, and 100% of scale, as required. The total error based on the field determined instrument errors, shall not exceed plus or minus two percent of the actual flow for the pumps.

C. Operator Training

1. The second visit shall be during startup and to instruct plant personnel in the operation and maintenance of the system(s). If, during running of the tests, one or more points appear to be out by more than the specified amount, the manufacturer's field engineer shall make such adjustments or alterations as are necessary to bring equipment up to specification performance. Following such adjustment, the tests shall be repeated for all specified points to ensure compliance. Thirty days will be allowed for any changes necessary to meet the specifications. Otherwise the OWNER reserves the right to have the rejected equipment removed from the site and replaced by satisfactory equipment that operates in accordance with the Specifications. Chemicals for the full operating test will be furnished by the CONTRACTOR.

END OF SECTION

SECTION 13206

PRESTRESSED CONCRETE TANK (TYPE II)

PART 1 -- GENERAL

1.01 THE REQUIREMENTS

A. Provide all labor, material, and equipment required to design, construct, disinfect and test the AWWA D110 Type II prestressed concrete tank with all accessories required for a complete installation, as shown on the Drawings and as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 - Concrete Formwork

B. Section 03200 – Concrete Reinforcement

C. Section 03290 - Joints in Concrete

D. Section 03300 - Cast-In-Place Concrete

E. Section 03350 - Concrete Finishes

F. Section 03360 - Shotcrete

G. Section 03370 - Concrete Curing

H. Section 13212 -Water Storage Tank Disinfection

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the Specifications, all work hereunder shall conform to the applicable requirements of the following documents to the extent that the requirements therein are not in conflict with the provisions of this Section.

1.	ACI 301	—	Specifications for Structural Concrete for Buildings
2.	ACI 304	—	Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete
3.	ACI 305R	—	Hot Weather Concreting
4.	ACI 306	—	Cold Weather Concreting
5.	ACI 318	—	Building Code Requirements for Reinforced Concrete

6. ACI 347 — Recommended Practice for Concrete Formwork

7. ACI 350 R — Code Requirements for Environmental Concrete Structures and Commentary

8. ACI 423 — Prestressed Concrete

9. AWWA D110 — Wire-Wound Circular Prestressed Concrete Water Tanks

1.04 INFORMATION FURNISHED BY JEA

A. Applicable information to be furnished by Purchaser for one prestressed concrete tank keyed to the respective paragraphs as outlined in the Foreword of AWWA Specification D110 is included in the following Tank Schedule A.

Tank Schedule A
Summary of Information to be Furnished by Purchaser
for a Type II Core Wall Tank per AWWA Specification D110

AWWA ITEM

1. Tank shall be of Type II construction with composite shotcrete-steel diaphragm walls designed in accordance with AWWA D110, ACI 350 and the Florida Building Code. Tank shall be designed by the manufacturer for loadings from all sources, including dead, live, internal fluid, soil, groundwater, and wind in accordance with all applicable state and local codes. These loads shall be stated in the design calculations to be submitted in accordance with Article 1.05 of this Section.

2. One (1) tank with a capacity of one million, five hundred thousand (1.5 million) gallons.

   Nominal inside diameter = 105’-0”

   Nominal side water depth = 24’-2”

   Design High Water Level = EL 54.17

   Bottom Elevation at Perimeter = EL 31.00.

3. Subdrainage and overflow collection systems shall be as indicated in the Contract Documents and as further detailed in Items 12, 13, and 19 of this Schedule.

4. All design loads and calculations shall be included in the design calculation report required by Section 1.05.d.

   Dead load shall be the estimated weight of all permanent construction and fittings. The unit weight of concrete shall be 150 lbs. per cubic foot. The unit weight of steel shall be 490 lbs. per cubic foot.

Live loads shall be the estimated weight of all the liquid when the tank is filled to the maximum water surface elevation designated herein. The unit weight of water shall be 62.4 lbs. per cubic foot.

Wind loads shall be computed in accordance with ASCE 7 and the Florida Building Code Section 1609 – Wind Loads, using a 138 mph design wind velocity, exposure category C, and AWWA D110.

5. The tank is to be located on the property of JEA at the location indicated on the Drawings.

6. Contractor is responsible for providing permanent 480 volt electric power for the facility and shall provide his own temporary power. Compressed air is not available at the site. The Contractor shall be responsible for providing compressed air as required for construction.

7. a) Concrete Dome Roof: Concrete dome roof shall be cast-in-place concrete of spherical shape with a rise between 1:8 and 1:14 per the manufacturer's design, subject to this Specification. Dome shall be clear span, supported by the tank wall with no interior columns or supports with a circumferentially prestressed concrete ring beam designed to withstand all induced loads. Dome thickness shall be governed by buckling resistance, by minimum thickness for practical construction or by corrosion protection for reinforcement provided that the thickness of the dome shall not be less than three inches for monolithic concrete.

   b) *(NOT APPLICABLE)* Aluminum Dome Roof

8. The tank shall be constructed as a composite shotcrete-steel core wall with a continuous steel diaphragm embedded in the core wall and wire wound prestressing and shall be designed in accordance with AWWA D110, ACI 350 and the Florida Building Code. Where these specifications are in conflict, the more stringent requirements shall apply except where stated otherwise herein.

9. A subsurface investigation report provided by JEA is included as an Appendix to these Specifications.

10. Accessory equipment as detailed in Section 2.11 of this specification shall be provided in accordance with AWWA D110 and the Contract Documents. Locations shall be as indicated in the Contract Documents.

11. Piping shall conform to Division 15 - Mechanical. Piping includes, but is not limited to, inlet, outlet, and overflow piping. Earth cover over pipes shall be as indicated in the Contract Documents. Pipe material shall be as detailed in Contract Documents.

    Pipe Connections: The tank shall be furnished with the following pipe connections:

a) 16" inlet connection
b) 16” outlet connection
c) 16" overflow connection – alterations to the overflow diameter shall be based on the design of the tank manufacturer, based upon flow rate, and shall not be at the expense of JEA. Tank manufacturer shall also provide means of supporting concrete encasement around overflow pipe as shown on Contract Documents.
d) 16” drain connection
e) 4” tank level sensing line connection
f) 1” altitude control valve level sensing line

All pipe connections shall be made in a manner that will provide absolutely watertight connections and shall be in accordance with standard practices of the industry and applicable AWWA and NSF specifications.

12. Design fill rate and maximum fill, overflow and withdrawal rates shall be as follows:

Design Fill Rate: 2 mgd

Max Fill Rate: 3.5 mgd

Max Overflow Rate: 3.5 mgd

Max Withdrawal Rate: 6 mgd

13. The overflow pipe arrangement, elevation and freeboard shall be as shown on the Contract Drawings. Concrete encasement supported off walls of Prestressed Concrete Tank shall also be provided as shown on Contract Documents.

14. Exterior wall coatings and architectural treatment shall be as detailed in the Contract Documents.

15. The maximum allowable stresses and reinforcement requirements shall be in accordance with Section 4.6 of AWWA D-110 and Sections 2.06, 2.07 and 3.04 herein.

16. The maximum allowable coefficient of friction requirements shall be in accordance with Section 4.7 of AWWA D-110.

17. Foundations: A subsurface investigation report provided by JEA is included as an Appendix to these Specifications. Foundations shall be designed and furnished by the Contractor as follows:

    a) The foundation mat for the Prestressed Concrete Tank shall be designed by the Prestressed Concrete Tank manufacturer in accordance with Article 3.02 herein and based on the data contained in the sub-surface investigation report provided by JEA. The foundation construction drawings shall be prepared by the Contractor and submitted for review and final approval by the Engineer. Contractor shall be responsible for supplementary geotechnical information as necessary, and shall at a minimum determine bearing elevation, bearing capacity and estimated settlement. Contractor shall submit details and calculations on foundation design.

    b) The design of the concrete foundation, the specifications for the cement and aggregate, and the mixing of the aggregate shall be in accordance with the latest revision of Standard 318 of the American Concrete Institute and Section 03300 of these Specifications. Concrete for the tank base mat and pipe encasement shall have a minimum compressive strength of 4,500 pounds per square inch at 28 days and meet requirements of Section 03300 for Class A1 concrete. Reinforcement shall comply with the latest revision of ASTM A615, Grade 60, and Section 03200 of these Specifications.

19. The required elevation of the overflow pipe and overflow ports shall be as shown on the Contract Drawings.

20. Finished grade shall vary from approximately elevation 30’ to elevation 32’,

1.05 SUBMITTALS

A. Shop Drawings

1. The Contractor shall submit the following in accordance with the requirements of Section 01300 – Submittals:

    a. Complete record of experience of proposed prestressed concrete AWWA D110 Type II tank manufacturer, including names of Owners and dates of construction for no less than five installations designed and

constructed in the name of the manufacturer, of comparable size or larger now in service.

b. Shop Drawings of the tanks and foundations including erection, installation, and adjustment instructions. Included with the Shop Drawings shall be all material certifications, mill test reports, etc., which are required by this and other applicable sections of the Specifications.

c. Certification signed and sealed by a Professional Engineer registered in the State of Florida that the tank design conforms to the requirements of the Specifications, Codes, and Standards referenced herein.

d. Design calculations for the tank walls shall be signed and sealed by a Professional Engineer registered in the State of Florida, with design loads listed at the beginning of the calculations. Submittal of calculations and subsequent review by the Engineer shall not relieve the Contractor from full responsibility for the accuracy and completeness of his design.

e. Copies of Shotcrete Nozzlemen certificates.

f. Operation and Maintenance Manuals.

g. A Safe Work Plan addressing all stages of Ground Storage Tank construction emphasizing high hazard work tasks. The Safe Work Plan shall include, but is not limited to: lifting and rigging, wrapping the tank with pre-stressed wire, and performing work inside the enclosed tank. The Safe Work Plan shall include the development of job hazard analysis (JHA's) for different work tasks that identifies work sequencing, hazards and mitigation of hazards, and documented training of personnel performing Work. The Safe Work Plan shall also address the manufacturer's on-site representative who will be responsible for daily implementation of the Safe Work Plan at the work site. Installation of protective barriers shall be required.

   The Safe Work Plan shall be approved by JEA and the Engineer prior to any work being performed on the Ground Storage Tank. Individual JHA's shall be approved by JEA and the Engineer prior to commencing associated tasks.

1.06 QUALITY ASSURANCE

A. Contractor shall be solely responsible for the adequacy of design and safety of the completed structure, and shall provide the services of the prestressed concrete tank manufacturer for the design and construction of the structure to meet the requirements stated herein. The entire tank, including all portions of the bottom slab, walls, and roof shall be constructed by the prestressed concrete tank manufacturer. This stipulation applies even when design of bottom slab is included on Contract Drawings.

B. The prestressed concrete tank manufacturer shall be a specialist in the design and construction of prestressed concrete tanks with at least ten years experience which shall include no less than five installations of comparable size or larger now in service.

C. The prestressed concrete tank manufacturer shall have on its staff a full-time Professional Engineer registered in the State of Florida who will be in responsible engineering charge of the work and who has been the Design Engineer of Record for a minimum of five (5) similar structures of equal or greater capacity within the last 10 years, in successful service for at least five (5) years. All design calculations shall be sealed and signed by such Professional Engineer.

1.07 WARRANTY

A. Contractor shall guarantee the design, workmanship, and materials for a period of five years from date of acceptance of the work. In case leakage or other defects appear within the five-year period, he shall promptly make required repairs at his own expense upon written notice by JEA that such defects have been found. Leakage through the side walls shall be defined as the appearance of free liquid showing stream flow on the exterior surface, the source of which is from the inside of the tank.

PART 2 -- PRODUCTS

2.01 GENERAL

A. Prestressed concrete tank(s) shall be of shotcrete –steel diaphragm corewall and wire-wound construction.

B. The AWWA D110 Type II tank(s) shall be as manufactured by Crom Corporation, Gainesville, Florida; Precon Corporation, Newberry, Florida; or equal.

C. Experience in the design and construction of AWWA D110 Type I, Type III, or Type IV tanks is not an acceptable substitute for the specified Type II tank.

2.02 CONCRETE

A. Concrete materials including cement, aggregate, water, admixtures, and mix design shall conform to Section 03300 - Cast-In-Place Concrete. Concrete for the tank wall and dome construction shall have a minimum compressive strength of 4,500 psi at 28 days. Concrete for the tank floor, footings, pipe encasement, and other work associated with construction of the tank shall have a minimum compressive strength of 4500 psi at 28 days. All cast-in-place concrete used for construction of the Prestressed Concrete Tank shall meet the requirements of Class A1 concrete in accordance with Specification Section 03300.

B. Concrete for tank wall and dome construction shall be air entrained.

C. Concrete or shotcrete in contact with prestressing steel shall have a maximum water soluble chloride ion concentration of 0.06 percent by weight of cement.

D. Curing materials shall conform to Section 03370 - Concrete Curing.

2.03 FORMWORK

A. Formwork for concrete work shall conform to Section 03100 - Concrete Formwork.

2.04 REINFORCING STEEL (OTHER THAN PRESTRESSING WIRE)

A. Reinforcing bars, welded wire fabric, bar supports, bolsters, chairs, spacers, and tie wire shall conform to Section 03200 - Reinforcing Steel.

2.05 STEEL DIAPHRAGM

A. Galvanized steel diaphragm used in construction of the core wall shall be 26 gauge with 0.017 min. thickness conforming to the requirements of ASTM A653/A653M. Weight of zinc coating shall not be less than G 90 of Table 1 of ASTM A653/A653M.

B. Steel sheet shall be ribbed to provide a mechanical bond to the concrete.

2.06 PRESTRESSING WIRE

A. Circumferential prestressing wire shall conform to ASTM A821 Type B with:

1. Diameter shall be equal to or larger than 0.162 inches (8 gauge), up to a maximum of 0.250 inches

2. fs wall = 115,000 psi

3. fsi = 145,000 psi or no greater than 0.70 fsu

4. fsu shall be equal to or greater than 231,000 psi

B. Splices and anchor clamps for prestressing wire shall be ferrous material compatible with the wire and shall develop the full strength of the wire. Wire splice and anchorage accessories shall not nick or otherwise damage the prestressing.

C. Contractor shall furnish certified statement from approved independent testing laboratory for wire used.

2.07 SHOTCRETE

A. Shotcrete shall conform to Section 03360 - Shotcrete, and shall have a compressive strength as required by the design, but no less than that stated in Article 3.01, "Design Criteria" of this Section.

B. Shotcrete:

a. fc shall be equal to or less than 2,000 psi

b. f'c shall be equal to or greater than 4,000 psi

c. fci shall be equal to or less than 0.55 f'ci at winding

2.08 WATERSTOP AND BEARING PADS

A. Waterstop between foundation and core wall shall be PVC, conforming to Section 03290 – Joints in Concrete. Splices shall be made in accordance with the manufacturer's recommendations subject to the approval of the Engineer.

B. Bearing pads shall be PVC or other material which does not degrade in the presence of chloramines.

2.09 COATINGS

A. A cementitious based damp-proofing coat shall be used on the exterior of precast dome roofs.

B. Acrylic coats shall be used on cast-in-place dome roofs, exterior walls, and as a final coat on all exterior surfaces.

C. Tank wall and dome colors shall be coordinated with JEA. The manufacturer shall provide JEA with color samples and coordinate the final color selection with JEA prior to application.

2.10 MISCELLANEOUS TANK ACCESSORIES

A. The following accessories shall be furnished by the Contractor as indicated on the Drawings:

1. Fiberglass interior ladder, complete with a fall prevention system. Fiberglass ladder shall be as specified in Section 06610 - Glass Fiber and Resin Fabrications. Fall prevention system shall be as specified in Section 05515 - Ladders.

2. Aluminum exterior ladder, complete as specified in Section 05515 - Ladders.

3. Aluminum handrail shall be as specified in Section 05520 - Handrails and Railings.

4. Roof hatches and covers shall be as specified in Section 05531 - Gratings, Floor Plates and Access Hatches.

5. Roof ventilators shall be provided as shown on the Drawings or as required by manufacturer of prestressed concrete tank.

6. Piping shall conform to Division 15 - Mechanical. Piping includes, but is not limited to, inlet, outlet, drain and overflow piping.

7. Precast concrete overflow outlets shall be provided as indicated on the Drawings. The overflow shall be provided as indicated on the Drawings. The overflow outlets shall be located on the dome near the edge and shall begin functioning when the tank water level is 3 inches above the design high water level. The combined size of all overflows shall be three times the area of the inlet pipe. The overflow outlet openings shall be covered with removable fiberglass screen and shall function as additional ventilators.

8. Exterior level indicator, as shown on Drawings.

9. Manway entry systems, as shown on Drawings.

10. Anti-Vortex outlet, as shown on Drawings.

PART 3 -- EXECUTION

3.01 GENERAL

A. Dimensions and structural details shown on the Drawings and specified herein are minimum requirements. The Contractor shall provide whatever additional thicknesses, reinforcing, etc necessary to meet code and structural requirements.

3.02 TANK FLOOR AND FOUNDATION

A. The concrete tank floor and foundation shall be constructed of Class A1 reinforced cast-in-place concrete containing not less than 0.8 percent reinforcing steel and conforming to all applicable sections of the Contract Documents for concrete and reinforcement as listed herein.

B. The floor slab shall be designed as a concrete mat foundation not less than 8” thick and shall be placed monolithically. The floor slab shall be thickened as required beneath baffle walls, at sumps, and in other locations specified by the tank manufacturer. Wall footings, if necessary, shall be floor grade and shall be placed monolithically with the floor slab.

C. The minimum concrete cover over steel reinforcement shall be 2 inches. Where cast directly against grade, the cover shall be increased to 3 inches

D. The Contractor shall repair all cracks in the tank floor slab at his own expense using a method approved by the Engineer.

3.03 CORE WALL

A. The core wall shall consist of shotcrete placed over a steel diaphragm and vertical reinforcing.

B. The diaphragm shall be continuous throughout the core wall providing a positive waterstop.

1. The diaphragm shall be erected plumb and securely anchored and aligned to serve as a shooting form for the shotcrete mortar. The diaphragm shall be so formed and erected that a strong mechanical key between shotcrete and shell will be created.

2. The diaphragm shall be lapped, interlocked, and completely sealed with an approved epoxy bonding material. Only vertical diaphragm joints shall be used. Lap and interlock all vertical joints using a mechanical crimper. All vertical joints shall be sealed water tight by epoxy injection. This epoxy injection shall be carried out from bottom of the wall to top of wall, using a pressure pumping procedure, after the steel diaphragm has been fully encased, inside and outside, with shotcrete. The diaphragm, crimper, and the epoxy bonding material must have demonstrated suitability through successful use in at least five comparable installations. The final determination of suitability shall be determined solely by the Engineer.

3. No holes, including nailholes, shall be made in the diaphragm for any purpose, including the purpose of erection, before, during, or subsequent to erection, except for those required for inserting pipe sleeves, reinforcing bolts, or other special appurtenances.

C. Vertical reinforcing to compensate for shrinkage, temperature, and vertical bending moments in the core wall shall be as follows:

1. The inside face shall consist of the continuous steel diaphragm and reinforcing steel bars as required by design computations.

2. The outside face shall be as required by design computations, but not less than #4 bars at 12 inches center to center.

D. A shotcrete coat conforming to Section 03360 - Shotcrete, shall cover and protect the steel diaphragm with a minimum of one inch cover.

E. Core wall thickness at the top of the tank shall be not less than 3 1/2-inches. Base-of-wall thickness shall be determined by design calculations to resist the initial compressive stresses of the prestressing wire, backfill, and other applicable loads. The wall may taper uniformly on the outside face from top to bottom as required by design thicknesses. Horizontal sections of the wall shall form true circles without flats, excessive bumps, or hollows. Maximum dimension tolerances for core wall construction (including diaphragm as applicable) shall be as follows:

Thickness ± 1/4 inch

Height 1/4 inch in 100 ft. not to exceed a total of 1/2 inch

Out-of-plumb 1/4 inch in 10 ft. of height

Out-of round ± 1 inch per 100 ft. diameter

F. Unless specifically authorized in writing by the Engineer, concrete shall not be placed without special protection during cold weather when the ambient temperature is below 35 degrees Fahrenheit or when the concrete is likely to be subjected to freezing temperatures before initial set has occurred and the concrete strength has reached 500 psi.

G. The Contractor shall furnish, install and coordinate all work including, but not limited to, tank construction, telemetry work, electrical work, and mechanical work.

H. Prior to the placement of the mat foundation concrete, all piping that penetrates the floor shall be set.

3.04 HORIZONTAL PRESTRESSING

A. Circumferential prestressing of the tank walls shall be accomplished by applying continuously and uniformly a prestressing steel wire to the core wall in a helix of such pitch as to provide an initial predetermined force and unit compressive stress in the core wall per lineal foot of height equivalent to that derivable from the Drawings. Splicing of the wire shall be permitted only when terminating an application of one complete coil of wire or in the event a defective section of wire must be removed during application. A machine shall be used for applying the wire, capable of continuously inducing a uniform initial force in the wire as it is laid on the tank wall. Force in the wire shall be induced by methods not dependent on cold working or re-drawing the wire. Only the aggregate force of all stressed wires per foot shall be considered rather than the force per individual wire, and such aggregate force shall not be less than required by the Drawings or specified herein. No circumferential movement of the wire along the tank wall will be permitted during or after stressing of the wire. The steel wire bands on the core wall and dome ring shall be so placed that the prestress "working force" per foot of wall height shall exceed the hydraulic ring tension forces by not less than 5 percent. The "work force" shall be defined as the force determined by multiplying the area of steel wire by the unit wire stress after a substantial allowance for prestress losses due to shrinkage and plastic flow in the shotcrete, relaxation in the steel, creep, etc has been made from the initial unit wire stresses. Such initial unit wire stress readings shall be made the same day the wire is placed, or if made later and after some stress losses have already occurred due to creep of wire, plastic flow, and shrinkage of core wall, allowances shall be made for such losses. The clear space between adjacent wires is to be no less than one wire diameter.

B. At all openings through the sidewalls, the wires shall be placed equally above and below the opening. The displaced wires will be added to those for a foot or two above and below the opening, leaving an entire strip around the tank which is unbanded. Such unbanded strip shall be no more than 30-inches high. A stress plate shall be required at all above grade locations where prestress wires are displaced 24 inches or greater. The stress plate shall be designed to transfer stress across the opening.

C. No prestressing wire shall be installed until the shotcrete mortar core wall has been shown by test to have attained 75 percent of the 28-day design compressive strength specified herein. No prestressing wire shall be applied when weather conditions are unfavorable.

D. Where more than one layer of wire is required, underlayers shall be covered with shotcrete of sufficient thickness to provide approximately 1/8-inch cover over the wire.

E. Finish covercoat shotcrete shall be applied as soon as practical after the last application of wire coat, see Article 3.07.

F. Attention is directed to the fact that prestressing wire is susceptible to failure through corrosion. Extreme care shall be used to protect the wire against leakage of water both from within and without the tank.

3.05 STRESS MEASUREMENT

A. The Contractor shall supply, at his own expense, special equipment at the job site capable of measuring the stress in the wire after it is in placed on the wall. This stress-measuring equipment shall consist of an electronic direct-reading stressometer accurate to within 1 percent, complete with calibrated dynamometers and a test stand to calibrate the stressometer from time to time if necessary.

B. At least one stress reading per vertical foot or one stress reading for every roll of wire, whichever is greater, shall be taken immediately after the wire has been applied on the wall. All readings shall be recorded and shall refer to the applicable height and layer of wire for which the stress is being taken. If applied stresses fall below the design stress in the steel, additional wire will be provided to bring the force on the corewall up to the required design force. If the stress in the steel is more than 7% over the required design stress, the wrapping operation should be discontinued, and satisfactory adjustment made to the stressing equipment before proceeding.

3.06 TESTING

A. Leakage Testing

1. The prestressed concrete tank shall be tested for leakage. For tanks containing potable water, leak testing may be concurrent with tank disinfection and shall be as defined herein. For tanks containing non-potable water, leakage testing shall be performed in accordance with Section 01470 Watertightness Testing of Concrete Structures.

2. Water for the initial leakage testing, cleaning and, rinsing shall be paid for and provided by JEA. Water for all subsequent leakage testing should it be required, shall be paid for by the Contractor and provided by JEA. The Contractor shall reimburse JEA for all water used at the current rates for water usage. The costs for all chemicals and equipment (pumps, testing kits, etc.) associated with leakage testing, cleaning, or rinsing, of the tank shall be the responsibility of the Contractor. JEA has limited facilities for potable water use

and reserves the right to limit the volume of water used per day and the times of the day when the Contractor is permitted to use water for the project. Disposal of water for leak testing, cleaning and, rinsing, shall be the responsibility of the Contractor, performed under the City's General Permit, and shall be performed in accordance with all federal, state and local requirements in such a manner as to cause no adverse environmental effects such as fish kills or erosion. A water disposal plan shall be submitted to the Engineer prior to tank cleaning and filling.

3. The wire-wound prestressed concrete tank shall be tested for watertightness in accordance with AWWA D110 Section 5.13 upon completion of the tank.

4. The following test shall be applied to determine water tightness:

   a. Fill the tank with potable water (at JEA's option) to the maximum liquid level indicated.

   b. At least 95 percent of the maximum wetted surface area shall be wetted for at least 72 hours to allow for moisture absorption by the concrete or pneumatic mortar.

   c. The drop in liquid level shall be measured over the next 24 hours. The liquid-volume loss shall not exceed one twentieth of one percent of the tank capacity. Evaporative effects shall be taken into consideration in determining leakage. If leakage exceeds the maximum allowable, the tightness test shall be extended to a total of five days. If at the end of five days, average daily leakage does not exceed the maximum allowable, the test shall be considered satisfactory. If the average daily leakage exceeds the maximum allowable, the Contractor shall repair the tank and retest it at no additional cost to JEA. The method of repair shall be submitted to the Engineer for approval.

   d. Damp spots on the exterior wall surface shall not be permitted. Damp spots are defined as spots where moisture can be picked up on a dry hand. The source of water movement through the wall shall be located and permanently sealed in an acceptable manner. No leakage that includes visible flow through the wall-floor joint shall be permitted.

B. Tank disinfection shall conform to Section 13212 - Water Storage Tank Disinfection.

C. Bacteriological Contamination

1. Two water samples shall be collected from the tank for bacteriological analysis of at least 24 hours apart, and delivered to JEA for testing purposes. Chlorine residual measurements shall be taken and recorded at the time each bacteriological sample is collected.

2. The results of both of these samples must indicate that no coliform bacteria is present in the tank to have a satisfactory bacteriological quality. If

contamination is indicated, then the disinfection procedure shall be repeated at no additional cost to JEA.

3. Following satisfactory bacteriological testing, the tank may be placed in service.

3.07 EXTERIOR COVERCOAT

A. After circumferential prestressing wires have been placed by a wire winding machine, the wires shall be covered with shotcrete conforming to Section 03360 - Shotcrete, or equivalent, that will provide a minimum thickness over the wire of 1 inch. The shotcrete shall be applied such that shotcrete does not build up or cover the front face of the wire until the spaces behind and between the prestressing elements are filled.

B. The exterior overcoat shall have a smooth finish meeting the following tolerances:

Vertical alignment in any 10 feet of length	1/8 in.
Horizontal curvature in 10 feet	1/4 in.

3.08 TANK ACCESSORIES

A. Tank accessories shall be furnished by the Contractor as shown on the Drawings and specified in other sections of the Specifications.

3.09 PAINTING

A. After erection and testing is complete, the tank exterior shall be painted if applicable in conformance with Section 09900 - Painting.

3.10 START-UP SERVICES

A. The Contractor shall furnish the services of the manufacturer's technical representative to inspect and correct or supervise correction of any defects or malfunctions and furnish start-up services. The Contractor shall provided qualified technical representative(s) to inspect the completed installation. Costs to check the installation shall be included in the purchase price of the equipment. The manufacturer's technical representative shall be available for system start-up, performance tests, and operating instructions for not less than a 2-day period.

3.11 FINAL INSPECTION

A. On or near the one-year anniversary date of initial tank use the manufacturer's representative shall make a visual inspection of the tank exterior and appurtenances and the immediate area surrounding the tank. A written summary of this inspection shall be filed with the tank owner and the tank manufacturer.

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SECTION 13209

DOUBLE WALL CHEMICAL STORAGE TANKS

PART 1-GENERAL

1.01 Requirements

1. The CONTRACTOR shall provide SAFE-Tank® double wall high density cross-linked polyethylene tanks and accessories per section 2.05, complete and in place, in accordance with the Contract Documents.

2. Unit Responsibility: The CONTRACTOR shall be responsible for furnishing the SAFE-Tank® double wall tank(s) and its accessories for chemical storage as indicated.

1.02 REFERENCES, CODES AND STANDARDS

A. American Society of Testing Materials (ASTM).

1. D638	Tensile Properties of Plastics
2. D883	Standard Definitions of Terms Relating to Plastics
4. D1505	Density of Plastics by the Density-Gradient Technique
5. D1525	Test Method for Vicat Softening Temperature of Plastics
6. D1693	ESCR Specification Thickness 0.125" F50-10% Igepal
7. F412	Standard Terminology Relating to Plastic Piping Systems

B. ANSI Standards: B-16.5, Pipe Flanges and Flanged Fittings

C. Building Code: International Building Code, IBC 2009

D. ARM: Low Temperature Impact Resistance (Falling Dart Test Procedure)

E. NSF/ANSI Standard 61, AWWA – Drinking Water System Components

F. ASTM D-1998, Standard Specification for Polyethylene Upright Storage Tanks

1.03 SUBMITTALS

A. Shop Drawings: Shop drawings shall be approved by the engineer or contractor prior to the manufacturing of the SAFE-Tank® double wall tank(s). Submit the following as a single complete initial submittal.
Sufficient data shall be included to show that the product conforms to Specification requirements. Provide the following additional information:

1. SAFE-Tank® double wall tank and Fitting Material

a. Resin Manufacturer Data Sheet

b. Fitting Material

c. Gasket style and material

d. Bolt material

2. Dimensioned Tank Drawings

a. Location and orientation of openings, fittings, accessories, restraints and supports.

b. Details of manways, flexible connections, and vents.

3. Calculations shall be stamped and signed by a registered, third party engineer in the state of the installation.

a. Tank restraint system. Show seismic and wind criteria.

B. Manufacturer's warranty

C. Manufacturer's unloading procedure (see Poly Processing Company Installation Manual)

D. Manufacturer's installation instructions (see Poly Processing Company Installation Manual)

E. Supporting information on Quality Management System.

F. Supporting documentation of Manufacturer's certification to NSF/ANSI Standard 61 – Drinking Water System Components for water treatment chemicals.

G. Manufacturer's Qualifications: Submit to engineer a list of 5 installations in the same service as proof of manufacturer's qualifications.

H. Electrical heat tracing and foam insulation data sheets as required.

I. Factory Test Report

1. Wall thickness verification.

2. Fitting placement verification.

3. Visual inspection

4. Impact test

5. Gel test

6. Hydrostatic test

1.04 QUALITY ASSURANCE

A. The Contractor shall supply SAFE-Tank® double wall tanks of the high density cross-linked polyethylene. Tanks furnished under this Section shall be supplied by Poly Processing Company or approved equal who has been regularly engaged in the design and manufacture of chemical storage tanks for over 10 years.

B. Tanks shall be manufactured from virgin materials.

C. Tanks shall be manufactured from materials certified to NSF/ANSI Standard 61 for chemical storage, and submit form from NSF supporting chemical certification.

1.05 WARRANTY

A. The warranty shall be provided upon request for the specific service application. For most chemical applications, Poly Processing Company offers a limited 5 year full replacement warranty. For Sulfuric Acid, Hydrochloric Acid, and Sodium Hypochlorite the warranty varies. See Poly Processing Company's chemical specific positions and warranty statement.

PART 2 – PRODUCTS

2.01 GENERAL

A. Tanks shall be rotationally-molded, high density cross-linked polyethylene, double wall, Safe-tank®, flat bottom tanks -. The assembly consists of one cylindrical, closed top inner primary tank and one cylindrical, open top containment outer tank. Each tank is a rotationally molded one-piece seamless constructed tank. The SAFE-Tank® tanks are designed for above-ground, vertical installation and are designed to store approved chemicals at atmospheric pressures. The assembly shall be designed to prevent rainwater and debris from entering the containment tank. Tanks shall be adequately vented as prescribed in Poly Processing Company's Technical Bulletin, Venting-Design for ACFM (air cubic feet per minute). Where indicated, tanks shall be provided with ancillary mechanical fittings and accessories. Tanks shall be marked to identify the manufacturer, date of manufacture and serial numbers must be permanently embossed into the tank.

2.02 MANUFACTURER

A. Tanks shall be manufactured by Poly Processing Company.

2.03 POLYETHYLENE STORAGE TANKS

A. Service: Chemical storage tanks shall be suited for the following operating conditions:

B. High Density Cross-linked Polyethylene resin used in the tank manufacture shall be Poly CL™ or equal and shall contain ultraviolet stabilizer as recommended by resin manufacturer. Where black tanks are indicated, the resin shall have a carbon black compounded into it. The tank material shall be rotationally molded and be a resin that is commercially available at the time of tank manufacture.

C For sodium hypochlorite, sulfuric acid, and other oxidizing chemicals, tank resin shall include an antioxidant polyethylene system (OR-1000) with four times the antioxidant properties of a standard polyethylene bonded to the interior surface during the manufacturing process.

D. Wall thickness for a given hoop stress is to be calculated in accordance with ASTM D 1998. In NO case shall the tank thickness be less than design requirements per ASTM D 1998.

1. The wall thickness of any cylindrical portion at any fluid level shall be determined by the following equation:

T = P x OD/2SD or 0.433 x SG x H x OD/2SD

Where:
- T = wall thickness, in
- P = pressure, psi
- SG = specific gravity, gm/cc
- H = fluid head, ft
- OD = outside diameter, ft
- SD = hydrostatic design stress

a. The minimum wall thickness shall be sufficient to support its own weight in an upright position without external support but shall not be less than 0.187" thick.

2. On closed top tanks the top head shall be integrally molded with the cylindrical wall. Its minimum thickness shall be equal to the thickness of the top of the straight sidewall. In most cases, flat areas shall be provided for attachment of large fittings on the dome of the tank.

3. The bottom head shall be integrally molded with the cylindrical wall. Knuckle radius shall be:

Tank Diameter, ft	**Min Knuckle Radius, in**
less than or equal to 6	1
greater than 6	1-1/2

4. Tanks with 3000 gal capacity or larger shall have at least 3 lifting lugs. Lugs shall be designed for lifting the tank when empty.

a. Unless otherwise indicated by Contract drawings, for indoor pneumatic fill, manways shall be 24-in diameter or greater and equipped with an emergency pressure relief device or SAFE- Surge™ Manway with pressure relief at 6" water column to prevent over-pressurization. The SAFE-Surge manway shall be chemically compatible with the chemical being stored. Gaskets shall be closed cell, cross-linked polyethylene foam, Viton, or EPDM materials.

b. Unless otherwise indicated by Contract drawings, for outdoor pneumatic fill, manways shall be 24-in diameter or greater and equipped with Poly Processing Company's F.S.2650® combined manway and vent to prevent over pressurization of tank. Manway must be capable of relieving a volume flow rate of up to 2650 ACFM. Gaskets shall be closed cell, cross- linked polyethylene foam, Viton, or EPDM materials.

c. Unless otherwise indicated, tanks less than 2000 gallons in non-pneumatic applications shall have a manway cover 17-in or smaller of Polyethylene material with a coarse thread. Gaskets shall be closed cell, cross-linked polyethylene foam, viton or EPDM materials.

NOTE: Tanks must be vented to allow for performance at atmospheric pressure, in accordance with the following matrix:

Venting Requirements For Polyethylene Tanks

Mechanical Pump Fill	**Pneumatic Fill**								
IF ≤ 1000 gallons	**IF** - Vent length ≤ 3 feet			**IF -** Vent length > 3' and ≤ 30'			**IF** - Scrubber Application		
Vent size should equal size of largest fill or discharge fitting	**AND - Vent** screen mesh size ≥ 1/4" or no screen used			**AND -** 3 or less 90° elbows with no other restrictions or reduction in pipe size			**Vent pipe size throughout scrubber system CANNOT be reduced!** Centerline of dispersion pipe not to be submersed > 6 inches		
IF > 1000 gallons	**Emergency Pressure Relief Cover Required**			**Emergency Pressure Relief Cover Required**			Perforated dispersion pipe must be same diameter or larger, as vent. Sum of perforations ≥ cross sectional area of pipe		
Vent size should exceed the largest fill or discharge fitting by 1 inch	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size
	2"	2"	4"	2"	2"	6"	2"	2"	6"
	3"	2"	6"	3"	2"	6"	3"	2"	8"
	3"	3"	6"	3"	3"	8"	3"	3"	10"

(2) 2 inch vents **DO NOT EQUAL** 4 inch venting capacity rev. Nov 2006
For detailed venting guidelines, please visit our Technical Resources at www.polyprocessing.com

E. Tank colors shall be natural (un-pigmented), black (compounded), or as specified by the ENGINEER with written agreement by the tank manufacturer.

2.04 TANK ACCESSORIES

A. Restraint System:

1. Metal components to be stainless steel or painted clips, edge softeners, and tension ring with stainless steel cables and clamps.

2. Tank restraint system shall be supplied and the design of same certified by a Structural Engineer registered in the State of tank installation. Design shall conform to the most recent edition of the IBC code for seismic and wind load. Anchor bolts as required by the calculations shall be supplied by the tank manufacturer.

C. Heat Tracing

1. Heat tracing system for temperature maintenance shall be SilcoPad® tank heating systems designed to maintain a desired product temperature, not

to exceed 100 degrees F. Each system shall include tank heating pads and a temperature controller. The quantity and type of SilcoPad® is determined by the size of the tank, the desired temperature maintenance and environmental conditions. Systems shall be available in 30, 60 or 100 degrees F. Tanks are supplied with the heating panels and a controller installed by Poly Processing Company. Power supply to be the only field installation required.

a. Pads to operate on 120 vac single phase with a maximum power density of 0.5 watts/sq.inch.

b. Silicone pad heaters must fully comply with Article 427-23 (b) of the National Electric Code.

c. Temperature controller to be supplied with two electronic thermostats switching the heating system via one solid state relay. Primary thermostat to control desired product temperature and secondary thermostat to provide over temperature protection at 150 degrees F.

2.05 TANKS:

A. Tank Schedule per the following specifications

Note 1: Approximate overall height is measured along the straight cylindrical portion of the tank and includes the dome top.

B. Fittings

1. Tank fittings shall be according to the fitting schedule in 2.05B above. Threaded fittings shall use American Standard Pipe Threads. If tanks are insulated, fittings shall be installed at the factory prior to application of the insulation.

2. Bolted flange fittings shall be constructed of one 150 lb. flange with ANSI bolt pattern, one flange gasket and stud bolts with gaskets. Stud bolts to have chemical resistant polyethylene injection molded heads and gaskets to provide a sealing surface between the bolt head and the interior tank wall. Stud bolt heads are to be color coded for visual ease of identifying the bolt material by onsite operators. Green- 316 Stainless Steel, Black- Titanium, Red- Alloy C-276, Blue- Monel. All materials shall be compatible with chemical service and as indicated in the fitting schedule above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

3. For sodium hypochlorite and sulfuric acid storage, Bolted One-Piece Sure Seal (B.O.S.S.), double flange fittings constructed of virgin polyethylene shall be supplied. Bolts will be welded to a common backing ring and encapsulated with polyethylene preventing fluid contact with the metal material. Flange will have one full face gasket to provide a sealing surface against inside tank wall. All materials shall be compatible with chemical service and as indicated in the fitting schedule

above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

4. Down Pipes and Fill Pipes: Down pipes and fill pipes shall be supported at 6-ft max intervals. Down pipes and fill pipes shall be PVC or material compatible with the chemical stored.

5. U-Vents: Each tank must be vented for the material and flow and withdrawal rates expected. Vents should comply with OSHA 1910.106(F)(iii)(2)(IV)(9). U-vents shall be sized by the tank manufacturer and be furnished complete with insect screen if required (Insect screen lessens the vent capacity by 1/3) in accordance with the venting schedule listed above.

6. On dual wall tank(s) greater than 1000 gallons, bottom fitting(s) must be designed to maintain 110% secondary containment integrity. Bottom containment fitting must include PTFE expansion joint designed to accommodate movement of primary tank in design accordance with ASTM-D 1998 tolerances. All secondary containment fittings and parts shall be resistant to chemical fume corrosion. Fitting shall include the option to connect a secondary containment pipe over primary pipe.

7. All fittings on the 1/3 lower sidewall of tanks with capacities $\geq$ 1000 gallons shall have 100% virgin PTFE Flexijoint® expansion joint. Expansion joint to have 3 convolutions, stainless steel limit cables, FRP composite flanges and meet the following minimum performance specifications. Galvanized parts will not be accepted.

   Expansion joints to meet the following minimum performance requirements:

   Axial Compression ≥ 0.67”
   Axial Extension ≥ 0.67”
   Lateral Deflection ≥ 0.51”
   Angular Deflection ≥ 14º
   Torsional Rotation ≥ 4º

2.06 LEVEL INDICATION

A. Float Indication: The level indicator shall be assembled to the tank and shall consist of PVC float, indicator, polypropylene rope, perforated interior pipe, PVC roller guides, clear UV resistant PVC sight tube EnviroKing® by C.F. Harvel, and necessary pipe supports. The level indicator shall act inversely to the tank contents and shall not allow entrance of tank contents into the sight tube at any time. Indicator shall be neon orange color for visual ease for onsite operators.

B. Ultrasonic Level Indicator: The ultrasonic level indicator shall be a Flowline ultrasonic level transmitter, level controller with one 4-20 mA or 0-10 VDC continuous level input and NEMA 4X box to be supplied by tank manufacturer.

2.07 FACTORY TESTING

A. Material Testing

1. Perform gel and low temperature impact tests in accordance with ASTM D 1998 on condition samples cut from each polyethylene chemical storage tank.

2. Degree of Crosslinking. Use Method C of ASTM D 1998- Section11.4 to determine the ortho-xylene insoluble fraction of cross-linked polyethylene gel test. Samples shall test at no less than 60 percent.

B. Tank Testing

1. Dimensions: Take exterior dimensions with the tank empty, in the vertical position. Outside diameter tolerance, including out-of-roundness, shall be per ASTM D 1998. Fitting placement tolerance shall be +/- 1/2-in vertical and +/- 1 degree radial.

2. Visual: Inspect for foreign inclusions, air bubbles, pimples, crazing, cracking, and delamination.

3. Hydrostatic test: Following fabrication, the bottom tanks, including inlet and outlet fittings, shall be hydraulically tested with water by filling to the top sidewall for a minimum of 1 hour and inspected for leaks. Following successful testing, the tank shall be emptied and cleaned prior to shipment.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. The tank shall be shipped upright or lying down on their sides with blocks and slings to keep them from moving. AVOID sharp objects on trailers.

B. All fittings shall be installed and, if necessary, removed for shipping and shipped separately unless otherwise noted by the contractor.

C. Upon arrival at the destination, inspect the tank(s) and accessories for damage in transit. If damage has occurred, Poly Processing Company shall be notified immediately.

3.02 INSTALLATION

A. Install the tanks in strict accordance with Poly Processing Company's Tank Installation Manual and shop drawings.

B. Installation will be inspected by manufacturer to verify system flexible connections, venting and fittings are properly installed. In addition to on-sight inspection tank system(s) to be reviewed using tank manual check list as supplied by manufacture as listed below.

C. Manufacturer to provide 1 hour training session to prepare operators to service and maintain the tank system. Included in training session will be (#) training manuals.

D. Manufacturer's trained technician to do an onsite inspection of installation. Inspection will verify chemical application, plumbing connections, venting, and applicable ancillary equipment such as ladders, restraints, etc. A verification of proper installation certificate will be supplied when equipment passes installation checklist.

E. Tank manuals will consist of installation check lists, tank drawing(s) as built, fitting drawings referencing nozzle schedule on tank drawing, materials of construction, and recommended maintenance program.

3.03 FIELD TESTING

A. Poly Processing Company recommends that all tanks be hydro-tested for 24 hours prior to commissioning.

END OF SECTION

SECTION 13212

WATER STORAGE TANK DISINFECTION

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The work under this Section includes providing for a complete and comprehensive flushing, testing, and disinfection program for a water storage tank, as specified herein.

B. Before being placed into service and before Certification of Substantial Completion can be issued by the Engineer, the tank and all new reclaimed water systems shall be disinfected in accordance to the requirements of these Specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 - Submittals

B. Section 13206 – Prestressed Concrete Tank

C. Section 15000 - Basic Mechanical Requirements

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Shall be as specified in Section 01090, Reference Standards.

B. AWWA D100 - Welded Steel Tanks for Water Storage

C. AWWA C652 - Disinfection of Water Storage Facilities

D. Florida Administrative Code, Title 15A, Subchapter 18C.

PART 3 -- EXECUTION

3.01 WATER SUPPLY

A. JEA will provide reasonable quantities of water necessary for flushing, testing, and disinfection of all facilities associated with this Project. All pipelines and the tank shall be filled slowly either through an existing valve or through taps. Special care shall be exercised in loading lines and filling the tank to prevent damage. The Contractor shall coordinate with JEA the operation of all existing valves. **All valve operations shall be done by JEA's personnel only**.

3.02 SCHEDULING

A. The Contractor shall provide the Engineer with a detailed flushing, testing, and disinfection plan for approval. **The Engineer reserves the right to adjust, modify, and/or alter the proposed plan to serve the best interests of JEA at no additional cost to JEA.**

B. The Contractor shall give JEA through the Engineer, at least 1 week advance notice of his intent to begin flushing, testing and disinfecting any portion of the system.

C. All flushing, testing and disinfection shall be witnessed by the Engineer and a representative of JEA. The Contractor shall coordinate all work with the Engineer at a time mutually agreeable to JEA and shall give at least 24 hours advance notice prior to performing any work.

3.03 FLUSHING

A. The Contractor shall flush all facilities described herein in accordance with these Specifications. The times for flushing shall be coordinated through the Engineer, with JEA, for their ability to provide adequate water. The Contractor shall have no claim for monetary compensation from JEA for the inability of JEA to provide adequate water at the proposed time of flushing. Compensation to the Contractor is limited to an extension of time to the Contract only.

B. The Contractor shall prevent excessive water from flowing onto private property. Care shall be exercised to prevent the water from entering trenches or wetting backfill material. All materials shall be furnished by the Contractor.

3.04 TESTING

A. The Contractor shall test the tank in accordance with the Specifications.

3.05 DISINFECTION

A. The tank shall be disinfected in accordance with the procedures described in AWWA C652, Disinfection of Water Storage Facilities. Disinfection shall also be in accordance with the requirements of the Florida Department of Environment, Health and Natural Resources, Division of Environmental Health (DEHNR) (15ANCAC 18C.1003) and JEA.

B. Disinfection shall be accomplished after the tank has been flushed, if applicable, and passed the hydrostatic test. The tank shall be disinfected by any one or a combination of all three of the methods of chlorination identified in Section 4 of AWWA C652. The Contractor shall submit the proposed method to the Engineer prior to performing the work. Disinfection shall be repeated as often as necessary, and as directed by the Engineer and/or DEHNR and/or JEA until the minimum residual chlorine content has been reached. The Contractor shall obtain certificates of satisfactory bacteriological tests and furnish them to JEA before the request is made for acceptance of the work. The Contractor shall furnish and install, at his own expense, all means and apparatus

necessary for performing the disinfection. The chlorine solution shall be thoroughly flushed out prior to placing the tank in service. The Contractor is cautioned that the spent chlorine solution must be disposed of in such a way as not to be detrimental to animal, plant, or fish life. The Contractor shall pay all civil penalties, fines, costs, assessments, etc., associated with any discharge of spent chlorine solution associated with the Contractor's work. Chlorine residual tests will be made after flushing to assure that the chlorine residual is not in excess of 1 ppm.

C. The Contractor shall have no claim for monetary compensation from JEA for the inability of JEA to provide adequate water at the proposed time of disinfection. Compensation to the Contractor is limited to an extension of time to the Contract only.

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SECTION 15000

BASIC MECHANICAL REQUIREMENTS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install to the required line and grade, all piping together with all fittings and appurtenances, required for a complete installation. All piping located outside the face of structures or building foundations and all piping embedded in concrete within a structure or foundation shall be considered exterior piping.

B. The CONTRACTOR shall furnish and install fittings, couplings, connections, sleeves, adapters, harness rods and closure pieces as required to connect pipelines of dissimilar materials and/or sizes herein included under this Section and other concurrent Contracts for a complete installation.

C. The CONTRACTOR shall furnish all labor, materials, equipment, tools, and services required for the furnishing, installation and testing of all piping as shown on the Drawings, specified in this Section and required for the Work. Piping shall be furnished and installed of the material, sizes, classes, and at the locations shown on the Drawings and/or designated in this Section. Piping shall include all fittings, adapter pieces, couplings, closure pieces, harnessing rods, hardware, bolts, gaskets, wall sleeves, wall pipes, hangers, supports, and other associated appurtenances for required connections to equipment, valves, or structures for a complete installation.

D. Piping assemblies under 4-inch size shall be generally supported on walls and ceilings, unless otherwise shown on the Drawings or ordered by the Engineer, being kept clear of openings and positioned above "headroom" space. Where practical, such piping shall be run in neat clusters, plumb and level along walls, and parallel to overhead beams.

E. The CONTRACTOR shall provide taps on piping where required or shown on the Drawings. Where pipe or fitting wall thicknesses are insufficient to provide the required number of threads, a boss or pipe saddle shall be installed.

F. The work shall include, but not be limited to, the following:

1. Connections to existing pipelines.

2. Test excavations necessary to locate or verify existing pipe and appurtenances.

3. Installation of all new pipe and materials required for a complete installation.

4. Cleaning, testing and disinfecting as required.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 1, General Requirements

B. Division 2, Sitework

C. Division 5, Metals

D. Division 9, Finishes

E. Division 11, Equipment

F. Division 16, Electrical

1.03 MATERIAL CERTIFICATION AND SHOP DRAWINGS

A. The CONTRACTOR shall furnish to JEA (through the Engineer) a Material Certification stating that the pipe materials and specials furnished under this Section conform to all applicable provisions of the corresponding Specifications. Specifically, the Certification shall state compliance with the applicable standards (ASTM, AWWA, etc.) for fabrication and testing.

B. Shop Drawings for major piping (2-inches in diameter and greater) shall be prepared and submitted in accordance with Section 01300 – Submittals. In addition to the requirements of Section 01300 – Submittals, the CONTRACTOR shall submit laying schedules and detailed Drawings in plan and profile for all piping as specified and shown on the Drawings.

C. Shop Drawings shall include, but not be limited to, complete piping layout, pipe material, sizes, class, locations, necessary dimensions, elevations, supports, hanger details, pipe joints, and the details of fittings including methods of joint restraint. No fabrication or installation shall begin until Shop Drawings are approved by the Engineer.

PART 2 -- PRODUCTS

2.01 GENERAL

A. All specials and every length of pipe shall be marked with the manufacturer's name or trademark, size, class, and the date of manufacture. Special care in handling shall be exercised during delivery, distribution, and storage of pipe to avoid damage and unnecessary stresses. Damaged pipe will be rejected and shall be replaced at the CONTRACTOR's expense. Pipe and specials stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.

B. Testing of pipe before installation shall be as described in the corresponding ASTM or AWWA Specifications and in the applicable standard specifications listed in the following sections. Testing after the pipe is installed shall be as specified in Section 3.09.

C. Joints in piping shall be of the type as specified in the appropriate Piping System Schedule in Section 15390, Schedules.

D. ALL BURIED EXTERIOR PIPING SHALL HAVE RESTRAINED JOINTS FOR THRUST PROTECTION UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS. ALL EXPOSED EXTERIOR PIPING SHALL HAVE FLANGED JOINTS, UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS.

E. The CONTRACTOR shall verify existing above ground and buried piping tie-in connections before fabricating new piping assemblies. The CONTRACTOR shall verify size, type, and location of all existing buried piping and appurtenances by excavating test pits as required of all buried connections and crossings which may affect the CONTRACTOR's work prior to ordering pipe and fittings to determine sufficient information for ordering materials. The CONTRACTOR shall take whatever measurements that are required to complete the work as shown or specified.

F. Before setting wall sleeves, pipes, castings and pipes to be cast in place, the CONTRACTOR shall check the Drawings and equipment manufacturer's drawings which may have a direct bearing on the pipe locations.

G. Piping shall be attached to pumps, valves, equipment, etc., in accordance with the respective manufacturers' recommendations. This includes the use of flexible connectors as required.

H. All changes in directions or elevations shall be made with fittings, unless otherwise shown.

2.02 WALL PIPES

A. Where wall sleeves or wall pipes occur in walls that are continuously wet on one or both sides, they shall have water stop flanges at the center of the casting or as shown on the Drawings. Ends of wall pipes shall be flange, mechanical joint, plain end, or bell as shown on the Drawings, or as required for connection to the piping. Wall pipes shall be of the same material as the piping that they are connected to. If welded waterstop flanges are employed, welds shall be 360 degree continuous on both sides of flange. Unless otherwise shown on the Drawings, waterstop flanges shall conform to the minimum dimensions shown below:

Pipe Size	Waterstop Flange Diameter	Waterstop Flange Thickness
4" - 12"	OD + 3.10"	0.50"

14" - 24"	OD + 4.15"	0.75"
30" - 36"	OD + 4.50"	1.00"
42" - 48"	OD + 5.00"	1.25"
54"	OD + 5.90"	1.50"

2.03 SLEEVES

A. Unless shown otherwise, all piping passing through walls and floors shall be installed in sleeves or wall castings accurately located before concrete is poured, or placed in position during construction of masonry walls. Sleeves passing through floors shall extend from the bottom of the floor to a point 3 inches above the finished floor, unless shown otherwise. Water stop flanges are required on all sleeves located in floors or walls which are continually wet or under hydrostatic pressure on one or both sides of the floor or wall.

B. Sleeves shall be cast iron, black steel pipe, or fabricated steel in accordance with details shown on the Drawings. If not shown on the Drawings, the CONTRACTOR shall submit to the Engineer the details of sleeves he proposes to install; and no fabrication or installation thereof shall take place until the Engineer's approval is obtained. Steel sleeves shall be fabricated of structural steel plate in accordance with the standards and procedures of AISC and AWS. Steel sleeve surfaces shall receive a commercial sandblast cleaning and then be shop painted in accordance with Section 09900 – Painting.

2.04 SOLID SLEEVE COUPLINGS

A. Solid sleeve couplings shall be used to connect buried service piping where shown on the Drawings. Solid sleeves shall be ductile iron, long body and shall conform to the requirements of ANSI A21.10 (AWWA C110). Unless otherwise shown or specified, solid sleeve couplings shall be Style A11760 as manufactured by American Cast Iron Pipe Co., or equal.

2.05 SLEEVE TYPE COUPLINGS

A. Sleeve type, flexible couplings shall be furnished and installed where shown on the Drawings or otherwise required to resist internal operating pressures.

B. Materials shall be of high strength steel and couplings shall be rated for the same pressures as the connecting piping.

C. Gaskets shall be rubber. Bolts and nuts shall be alloy steel, corrosion-resistant and prime coated.

D. Couplings shall be shop primed with a premium quality primer compatible with the painting system specified in Section 09900 - Painting. Field painting of wetted area shall be done prior to installation.

E. Harnessing

1. Harness couplings to adjacent flanges as shown, specified or otherwise required to restrain all pressure piping.

2. Dimensions, sizes, spacing and materials for lugs, tie rods, washers, and nuts shall conform to the standards for the pipe size, and design pressure specified.

3. No less than two (2) bolts shall be furnished for each coupling.

4. Tie bolts, nuts and washers shall be ASTM A 193, Grade B7 steel or better and as a minimum shall be hot dip galvanized.

5. Harness rods shall have lengths less than 10 feet between adjacent flanged joints on fittings and as a minimum shall be hot dip galvanized.

F. Couplings shall be as manufactured by Dresser Industries, Style 38, or equal as required and shown on the Drawings. All couplings shall be provided without interior pipe stop.

2.07 RESTRAINED DISMANTLING JOINTS

A. Restrained dismantling joints shall be furnished as required and as shown on the Drawings.

B. All restrained dismantling joints, 12 inches in diameter and smaller, except as shown on the Drawings or directed by the Engineer, shall be locking type flanged adapters.

C. Pressure and service shall be the same as connected piping.

D. Materials shall be cast iron for pipes up to 12 inch diameter and high strength steel for pipes larger than 12 inch diameter.

E. Restrained dismantling joints shall be shop primed with a premium quality primer compatible with the paint system specified in Section 09900 – Painting. Field painting of wetted area shall be done prior to installation.

F. Bolts and nuts shall be alloy steel, corrosion-resistant and prime coated.

G. Where identified on the Drawings, restrained dismantling joints shall be restrained by tying the restrained dismantling joint to the nearest pipe joint flange using threaded rods and rod tabs. The threaded rods, rod tabs, nuts, bolts and washers shall be as shown on the Drawings and as a minimum shall be hot dip galvanized.

H. Flanged adapters shall be as manufactured by Dresser Industries, Style 127 or 128, Smith Blair Corporation, or equal.

2.09 TAPPING SLEEVES AND TAPPING SADDLES

A. Tapping sleeves shall be similar to Mueller Outlet Seal, American Uniseal or Kennedy Square Seal. All sleeves shall have a minimum working pressure of 150 psi. All sleeves larger than twelve (12) inches shall be ductile iron. All taps shall be machine drilled; no burned taps will be allowed.

B. Tapping saddles may be used on mains sixteen (16) inches and larger where the required tap size does not exceed one-half the size of the main (i.e. 8-inch tapping saddle for use on a 16-inch main). Tapping saddles shall be manufactured of ductile iron providing a factor of safety of at least 2.5 at a working pressure of 250 psi. Saddles shall be equipped with a standard AWWA C-110-77 flange connection on the branch. Sealing gaskets shall be "O" ring type, high quality molded rubber having an approximate seventy durometer hardness, placed into a groove on the curved surface of the tapping saddles. Straps shall be of alloy steel. The tapping saddle shall be the American tapping saddle, U.S. Pipe tapping saddle, or equal. All taps shall be machine cut, no burned taps will be allowed.

2.10 UNIONS

A. For ductile iron, carbon steel, and grey cast iron pipes assembled with threaded joints and malleable iron fittings, unions shall conform to ANSI B16.39.

B. For copper piping, unions shall have ground joints and conform to ANSI B16.18.

C. For PVC and CPVC piping, unions shall be socket weld type with Viton O-ring.

2.11 THERMOPLASTIC TUBING AND FITTINGS

A. Thermoplastic tubing shall be manufactured from polyallomor tubing. Tubing shall be protected from ultraviolet radiation degradation with a black coating or integral color conforming to ASTM D-1248, Type 1, Class C, Category 3. Fittings and connectors used with thermoplastic tubing shall be the flareless tube type constructed of brass conforming to SAE CA377, SAE CA360 or equal. Brass sleeves shall be used.

B. Assembly of the thermoplastic tubing shall consist of pushing the tubing into the fitting and hand tightening the nut with final tightening with a wrench. Care shall be taken not to overtighten the nut. Plastic tube racks and bend holders shall be provided for holding the tubing in position. Needle valves used with thermoplastic tubing shall be the globe type constructed with a brass body, stem and seat and Buna-N "O"-ring seals. Installation shall be in accordance with the manufacturer's recommendations. Thermoplastic tubing, shall be the Impolene (polyallomor) system and needle valves, fittings and connectors shall be the Poly-Flo with 261 UB Universal Nut and Sleeve

system as manufactured by Imperial Eastman, or equal.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. All piping shall be installed by skilled workmen and in accordance with the best standard practice for piping installation as shown on the Drawings, specified or recommended by the pipe manufacturer. Proper tools and appliances for the safe and convenient handling and installing of the pipe and fittings shall be used. Great care shall be taken to prevent any pipe coating from being damaged on the inside or outside of the pipe and fittings. All pieces shall be carefully examined for defects, and no piece shall be installed which is known to be cracked, damaged, or otherwise defective. If any defective pieces should be discovered after having been installed, it shall be removed and replaced with a sound one in a satisfactory manner by the CONTRACTOR and at his own expense. Pipe and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they are accepted in the complete work. All piping connections to equipment shall be provided with unions or coupling flanges located so that piping may be readily dismantled from the equipment. At certain applications, Dresser, Victaulic, or equal, couplings may also be used. All piping shall be installed in such a manner that it will be free to expand and contract without injury to itself or to structures and equipment to which it is connected. All piping shall be erected to accurate lines and grades with no abrupt changes in line or grade and shall be supported and braced against movement, temporary, or permanent. All exposed piping shall be installed with vertical and horizontal angles properly related to adjoining surfaces or pipes to give the appearance of good workmanship. Unless otherwise shown or approved, provided a minimum headroom clearance under all piping of 7 feet 6 inches.

B. Unless otherwise shown or specified, all waste and vent piping shall pitch uniformly at a 1/4-inch per foot grade and accessible cleanouts shall be furnished and installed as shown and as required by local building codes. Installed length of waste and vent piping shall be determined from field measurements in lieu of the Drawings.

C. All excavation shall be made in such a manner and to such widths as will provide ample room for properly installing the pipe and permit thorough compaction of backfill around the pipe. The minimum trench widths shall be in strict accordance with the "Trench Width Excavation Limits" as shown on the Drawings. All excavation and trenching shall be done in strict accordance with these specifications and all applicable parts of the OSHA Regulations, 29CFR 1926, Subpart P.

D. ALL EXCAVATION REQUIRED BY THIS CONTRACT SHALL BE UNCLASSIFIED. NO ADDITIONAL PAYMENT WILL BE MADE FOR ROCK EXCAVATION REQUIRED FOR THE INSTALLATION OF PIPE OR STRUCTURES SHOWN ON THE DRAWINGS.

E. Enlargements of the trench shall be made as needed to give ample space for operations at pipe joints. The width of the trench shall be limited to the maximum

dimensions shown on the Drawings, except where a wider trench is needed for the installation of and work within sheeting and bracing. Except where otherwise specified, excavation slopes shall be flat enough to avoid slides which will cause disturbance of the subgrade, damage to adjacent areas, or endanger the lives or safety of persons in the vicinity.

F. Hand excavation shall be employed wherever, in the opinion of the Engineer, it is necessary for the protection of existing utilities, poles, trees, pavements, or obstructions.

G. No greater length of trench in any location shall be left open, in advance of pipe laying, than shall be authorized or directed by the Engineer and, in general, such length shall be limited to approximately one hundred (100) feet. The CONTRACTOR shall excavate the trenches to the full depth, width and grade indicated on the Drawings including the relevant requirements for bedding. The trench bottoms shall then be examined by the Engineer as to the condition and bearing value before any pipe is laid or bedding is placed.

H. No pressure testing shall be performed until the pipe has been properly backfilled in place. All pipe passing through walls and/or floors shall be provided with wall pipes or sleeves in accordance with the specifications and the details shown on the Drawings. All wall pipes shall be of ductile iron and shall have a water stop located in the center of the wall. Each wall pipe shall be of the same class, thickness, and interior coating as the piping to which it is joined. All buried wall pipes shall have a coal tar outside coating on exposed surfaces.

I. JOINT DEFLECTION SHALL NOT EXCEED 75 PERCENT OF THE MANUFACTURERS RECOMMENDED DEFLECTION. Excavation and backfilling shall conform to the requirements of Section 02200 - Earthwork, and as specified herein. Maximum trench widths shall conform to the Trench Width Excavation Limits shown on the Drawings. All exposed, submerged, and buried piping shall be adequately supported and braced by means of hangers, concrete piers, pipe supports, or otherwise as may be required by the location.

J. Following proper preparation of the trench subgrade, pipe and fittings shall be carefully lowered into the trench so as to prevent dirt and other foreign substances from gaining entrance into the pipe and fittings. Proper facilities shall be provided for lowering sections of pipe into trenches. UNDER NO CIRCUMSTANCES SHALL ANY OF THE MATERIALS BE DROPPED OR DUMPED INTO THE TRENCH.

K. Water shall be kept out of the trench until jointing and backfilling are completed. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no water, earth, or other substance will enter the pipes, fitting, or valves. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored as required.

L. All piping shall be installed in such a manner that it will be free to expand and/or contract without injury to itself or to structures and equipment to which it is connected.

All piping shall be erected to accurate lines and grades with no abrupt changes in line or grade and shall be supported and braced against movement, temporary, or permanent. All exposed piping shall be installed with vertical and horizontal angles properly related to adjoining surfaces or pipes to give the appearance of good workmanship. Pipes crossing within a vertical distance of less than or equal to one (1) foot shall be encased and supported with concrete at the point of crossing to prevent damage to the adjacent pipes as shown on the Drawings.

M. The full length of each section of pipe shall rest solidly upon the bed of the trench, with recesses excavated to accommodate bells, couplings, joints, and fittings. Before joints are made, each pipe shall be well bedded on a solid foundation; and no pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid by the CONTRACTOR at his own expense. Pipe shall not be laid in water or when trench conditions are unsuitable for work.

N. Proper and suitable tools and appliances for the safe convenient handling and laying of pipe shall be used and shall in general agree with manufacturer's recommendations.

O. AT THE CLOSE OF EACH WORK DAY THE END OF THE PIPELINE SHALL BE TIGHTLY SEALED WITH A CAP OR PLUG SO THAT NO WATER, DIRT, OR OTHER FOREIGN SUBSTANCE MAY ENTER THE PIPELINE, AND THIS PLUG SHALL BE KEPT IN PLACE UNTIL PIPE LAYING IS RESUMED.

P. During the laying of pipe, each pipe manufacturer shall provide his own supervisor to instruct the CONTRACTOR's pipe laying personnel in the correct procedure to be followed.

Q. Ordinarily only full lengths of pipe (as furnished by the pipe manufacturer) shall be used exceptions: closure pieces at manholes and areas where joint deflection is required.

R. For gravity sewer installations, the CONTRACTOR shall use a laser device to maintain the trench and pipe alignment. The laser device shall be re-checked for correct elevation and pipe alignment prior to pipe installation if the device is left in the pipe overnight. Corrected invert elevations at each manhole and any adjustments will be coordinated and approved by the Engineer.

S. ALL PIPING SHALL HAVE TYPE "A" BEDDING AS SHOWN ON THE DRAWINGS, UNLESS OTHERWISE SPECIFIED HEREIN OR INDICATED ON THE DRAWINGS.

T. AT THE CLOSE OF WORK EACH DAY PIPELINE TRENCHES SHALL BE COMPLETELY BACKFILLED. IN PAVED AREAS THE SURFACE MAY BE TEMPORARILY RESTORED WITH BASE IN LIEU OF REPAVING DAILY. IF TEMPORARY BASE ROCK IS INSTALLED, IT SHALL BE INSTALLED TO AN ELEVATION NO MORE THAN 1-INCH BELOW THE EXISTING PAVEMENT. THE TEMPORARY BASE ROCK SHALL BE THE REQUIREMENT FOR ROAD BASE MATERIAL SPECIFIED IN SECTION 02510, ASHPALTIC CONCRETE PAVEMENT. ALL EXCESS BASE ROCK INSTALLED FOR TEMPORARY ACCESS SHALL BE

REMOVED PRIOR TO PAVING. UNDER NO CONDITIONS SHALL ANY PIPELINE TRENCH BE LEFT OPEN DURING NON-WORKING HOURS.

3.02 REINFORCED CONCRETE PIPE, CONCRETE CULVERT, AND DRAIN PIPE

A. The laying of reinforced concrete pipe shall conform to the applicable sections of the Concrete Pipe Handbook as published by the American Concrete Pipe Association.

3.03 DUCTILE IRON PIPE

A. Ductile iron pipe (DIP) shall be installed in accordance with the requirements of the Ductile Iron Pipe Handbook published by the Ductile Iron Pipe Research Association, and AWWA C600.

B. Where it is necessary to cut ductile iron pipe in the field, such cuts shall be made carefully in a neat workmanlike manner using approved methods to produce a clean square cut. The outside of the cut end shall be conditioned for use by filing or grinding a small taper, at an angle of approximately 30 degrees.

C. UNLESS OTHERWISE APPROVED BY THE ENGINEER, FIELD WELDING OF DUCTILE IRON WILL NOT BE PERMITTED.

3.04 PVC/CPVC AND HDPE PIPE

A. Polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC) and High Density Polyethylene (HDPE) pipe shall be laid and joints assembled according to the respective manufacturer's recommendation. PVC pipe installation shall comply with applicable sections of the Uni-Bell PVC Pipe Association Recommended Standard Specifications.

B. Plastic piping shall not be installed when the temperature is less then 60°F except as otherwise recommended by the manufacturer and approved by the Engineer.

3.05 CARBON AND STAINLESS STEEL PIPE

A. Installation of steel pipe shall be by skilled workmen and shall conform to the applicable sections of AWWA Manual M-11. Joints for steel piping shall be either screwed, welded, or flanged as shown on the Drawings or as specified.

B. Welding in the field shall be performed only when requested on the shop drawings and permitted by the Engineer for carbon steel pipe. No welding of stainless steel pipe shall be allowed in the field. All field welds shall be radiographically inspected.

C. Installation of the steel casing pipe shall be by skilled workmen and in accordance with the best standard practice for steel pipe installation. Joints for steel casing pipe shall be butt welded.

1. The boring equipment to be used for installing the jacked casing shall be of such size and capacity to allow the boring to proceed in a safe and expeditious

manner. The installation of the casing and boring of the hole shall be done simultaneously to avoid cave-ins or settlement and for safety of traffic above.

2. The CONTRACTOR shall check the vertical and horizontal alignment of the casing by survey instrument at least once during each four feet of advance, or as directed by the Engineer. Pits shall be well sheeted and braced as necessary for safe and adequate access for workmen, inspectors and materials and shall be of a size suitable to equipment and material handling requirements.

3. Under no conditions shall jetting or wet boring of encasement under pavement be allowed.

4. After installation of the carrier pipe, each end of the casing pipe shall be made watertight with a brick masonry bulkhead. In addition, a Class B concrete cradle shall be provided from each end of the bulkhead to the first pipe joint outside of the bulkhead.

3.06 COPPER PIPE

A. Installation of copper pipe shall be by skilled workman in accordance with the manufacturer's recommendations. Use teflon tape at all fittings unless otherwise required for intended service. Install unions at the connections to each piece of equipment to allow removal of equipment without dismantling connecting piping.

B. Wall sleeves shall be provided for all piping passing through exterior walls and shall be of the same material as the piping to which it is joined. All wall sleeves shall be provided with an acceptable waterstop.

C. The CONTRACTOR shall provide hot and cold water mains with branches and risers complete from point indicated on the Drawings running to all fixtures and other outlets indicated. Mains and branches shall be run generally as shown on the Drawings. The CONTRACTOR shall provide all interior water piping, branches, and risers as shown on the Drawing and shall make connections to all plumbing fixtures, hose bibs, wall hydrants, and other points requiring water under this and other Divisions of the Specifications.

D. All water mains and branches shall be pitched at least one (1) inch in twenty-five (25) feet toward fixtures. The piping installation shall be arranged so that the entire system can be drained through fixture supply connections.

E. Unions shall be installed at the connections to each piece of equipment to allow for removal of equipment without dismantling connecting piping.

F. Joints 1-1/4 inches and larger shall be made with silver solder. For joints less than 1-1/4 inches and all valves (regardless of size) use 95/5 solder. Soldered joints shall be prepared with a non-corrosive paste flux in accordance with manufacturer's instructions. All joints shall be thoroughly cleaned with emery cloth and reamed out before assembly. Acid core solder will not be permitted.

3.07 JOINTS IN PIPING

A. Restrained joints shall be provided on all pipe joints as specified herein and shown on the Drawings. Restrained joints shall be made up similar to that for push-on joints.

B. Push-on joints include a single rubber gasket which fits into the bell end of the pipe. The gasket shall be wiped clean, flexed and then placed in the socket. Any bulges in the gasket which might interfere with the entry of the plain end of the pipe shall be removed. A thin film of lubricant shall be applied to the gasket surface which will come into contact with the spigot end of the pipe. The lubricant shall be furnished by the pipe manufacturer. The plain end of the pipe, which is tapered for ease of assembly, shall be wiped clean and a thick film of lubricant applied to the outside. The pipe shall be aligned and carefully entered into the socket until it just makes contact with the gasket. The joint assembly shall be completed by entering the pipe past the gasket until it makes contact with the bottom of the socket. The pipe shall be pulled "home" with an approved jack assembly as recommended by the pipe manufacturer. If assembly is not accomplished by reasonable force, the plain end shall be removed and the condition corrected.

C. Flanged joints shall be brought to exact alignment and all gaskets and bolts or studs inserted in their proper places. Bolts or studs shall be uniformly tightened around the joints. Where stud bolts are used, the bolts shall be uniformly centered in the connections and equal pressure applied to each nut on the stud. Pipes in all lines subject to temperature changes shall be cut short and cold sprung into place to compensate for expansion when hot.

D. Mechanical joints shall be made up with gaskets, glands and bolts. When a joint is to be made up, the bell or socket and plain end shall be cleaned and washed with a solution of mild soap in water; the gland and gasket shall be slid onto the plain end and the end then entered into the socket until it is fully "home" on the centering ring. The gasket shall then be painted with soapy water and slid into position, followed by the gland. All bolts shall be inserted and made up hand tight and then tightened alternately to bring the gland into position evenly. Excessive tightening of the bolts shall be avoided. All nuts shall be pulled up using a torque wrench which will not permit unequal stresses in the bolts. Torque shall not exceed the recommendations of the manufacturer of the pipe and bolts for the various sizes. Care shall be taken to assure that the pipe remains fully "home" while the joint is being made. Joints shall conform to the applicable AWWA Specifications.

E. Threaded and/or screwed joints shall have long tapered full depth threads to be made with the appropriate paste or jointing compound, depending on the type of fluid to be processed through the pipe. All pipe up to, and including 1-1/2-inches, shall be reamed to remove burr and stood on end and well pounded to remove scale and dirt. Wrenches on valves and fittings shall be applied directly over the joint being tightened. Not more than three pipe threads shall be exposed at each connection. Pipe, in all lines subject to temperature changes shall be cut short and cold sprung into place to

compensate for expansion when hot. Joints in all piping used for chlorine gas lines shall be made up with a glycerine and litharge cement. Joints in plastic piping (PVC/CPVC) shall be laid and joints made with compounds recommended by the manufacturer. Installation shall conform to the requirements of ASTM D2774 and ASTM D2855. Unions required adjacent to valves and equipment.

F. Soldered joints shall have the burrs removed and both the outside of pipe and the inside of fittings shall be thoroughly cleaned by proper tools recommended for that purpose. Flux shall be applied to both pipe and inside of fittings and the pipe placed into fittings and rotated to insure equal distribution of flux. Joints shall be heated and solder applied until it shows uniformly around the end of joints between fitting and pipe. All joints shall be allowed to self-cool to prevent the chilling of solder. Combination flux and solder paste manufactured by a reputable manufacturer is acceptable. Unions required adjacent to valves and equipment.

G. Welded joints shall be made by competent operators in a first class workmanlike manner, in complete accordance with ANSI B31.1 and AWWA C206. Welding electrodes shall conform to ASTM A233, and welding rod shall conform to ASTM A251. Only skilled welders capable of meeting the qualification tests for the type of welding which they are performing shall be employed. Tests, if so required, shall be made at the expense of the CONTRACTOR, if so ordered by the Engineer. Unions shall be required adjacent to valves and equipment.

H. Copper joints shall be thoroughly cleaned and the end of pipes uniformly flared by a suitable tool to the bevels of the fittings used. Wrenches shall be applied to the bodies of fittings where the joint is being made and in no case to a joint previously made. Dimensions of tubing and copper piping shall be in complete accordance with the fittings used. No flare joints shall be made on piping not suited for flare joints. Installations for propane gas shall be in accordance with NFPA 54 and/or 58.

I. Solvent or adhesive welded joints in plastic piping shall be accomplished in strict accordance with the pipe manufacturer's recommendations, including necessary field cuttings, sanding of pipe ends, joint support during setting period, etc. Care shall be taken that no droppings or deposits of adhesive or material remain inside the assembled piping. Solvent or adhesive material shall be compatible with the pipe itself, being a product approved by the pipe manufacturer. Unions are required adjacent to valves and equipment. Sleeve-type

expansion joints shall be supplied in exposed piping to permit 1-inch minimum of expansion per 100 feet of pipe length.

J. Dielectric unions shall be installed wherever dissimilar metals are connected except for bronze or brass valves in ferrous piping. Unions shall be provided downstream of each valve with screwed connections. The CONTRACTOR shall provide screwed or flanged unions at each piece of equipment, where shown, and where necessary to install or dismantle piping.

K. Eccentric reducers shall be installed where air or water pockets would otherwise occur in mains because of a reduction in pipe size.

L. Joints in polypropylene and polyvinylidelene fluoride pipe shall be butt fusion weld. All butt welding shall follow the requirements of ASTM D-2657 and the manufacturer's recommendations.

3.08 FLUSHING AND TESTING

A. All piping shall be properly flushed and tested unless specifically exempted elsewhere in the Specifications or otherwise approved by the Engineer. Air and gas pipelines shall be flushed and tested with compressed air. Gravity sewer piping shall be flushed and tested as specified in Section 02604 - Utility Structures. All other liquid conveying pipelines shall be flushed and tested with water. The CONTRACTOR shall furnish and install all means and apparatus necessary for getting the air or water into the pipeline for flushing and testing including pumps, compressors, gauges, and meters, any necessary plugs and caps, and any required blow-off piping and fittings, etc., complete with any necessary reaction blocking to prevent pipe movement during the flushing and testing. All pipelines shall be flushed and tested in such lengths or sections as agreed upon among JEA, Engineer, and CONTRACTOR. Test pressures shall be as specified in Section 15390 – Schedules, and shall be measured at the lowest point of the pipe segment being tested. The CONTRACTOR shall give JEA and Engineer reasonable notice of the time when he intends to test portions of the pipelines. The Engineer reserves the right, within reason, to request flushing and testing of any section or portion of a pipeline.

B. The CONTRACTOR shall provide water for all flushing and testing of liquid conveying pipelines. Raw water or non-potable water may be used for flushing and testing liquid pipelines not connected to the potable water system. Only potable water shall be used for flushing and testing the potable water system.

C. Air and gas piping shall be completely and thoroughly cleaned of all foreign matter, scale, and dirt prior to start-up of the air or gas system.

D. At the conclusion of the installation work, the CONTRACTOR shall thoroughly clean all new liquid conveying pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, etc., which may have entered the pipe during the construction period. If after this cleaning any obstructions remain, they shall be corrected by the CONTRACTOR, at his own expense, to the satisfaction of the Engineer. Liquid conveying pipelines shall be flushed at the rate of at least 2.5 feet per second for a duration suitable to the Engineer or shall be flushed by other methods approved by the Engineer.

E. Compressed/service air and gas piping shall be flushed by removing end caps from the distribution lines and operating one (1) compressor, in accordance with the manufacturer's instructions.

F. After flushing, all air piping shall be pressure and leak tested prior to coating and wrapping of welded joints. Immediately upon successful completion of the pressure and leak test, welded joints shall be thoroughly cleaned of all foreign matter, scale, rust, and discoloration and coated in accordance with the Specifications.

G. All process air piping shall be leak tested by applying a soap solution to each joint. Leak tests shall be conducted with one (1) blower in service at normal operating pressure.

H. During testing the piping shall show no leakage. Any leaks or defective piping disclosed by the leakage test shall be repaired or replaced by the CONTRACTOR, at his own expense, and the test repeated until all such piping shows tight.

I. All buried process air piping shall be pressurized to 25 psig and tested for leaks by applying a soap solution to each joint. The air supply shall be stopped and the pipe pressure monitored. System pressure shall not fall by more than 0.5% of the 25 psig test pressure over a one-hour test period. Should the system fail to hold the required pressure for one hour, the cause shall be determined and corrected and the test repeated until a successful test of the entire system is obtained.

J. Field leakage tests shall be performed for all submerged process air piping. The procedure shall consist of operating the system under clear nonpotable water for visual identification of all leaks. All field leakage tests shall be witnessed by the Engineer. All submerged piping shall be installed free of any leaks.

K. After flushing, all liquid conveying pipelines shall be hydrostatically tested at the test pressure specified in the appropriate Piping System Schedule in Section 15390 – Schedules. The procedure used for the hydrostatic test shall be in accordance with the requirements of AWWA C600. Each pipeline shall be filled with water for a period of no less than 24 hours and then subjected to the specified test pressure for 2 hours. During this test, exposed piping shall show no leakage. Allowable leakage in buried piping shall be in accordance with AWWA C600.

L. Any leaks or defective pipe disclosed by the hydrostatic test shall be repaired or replaced by the CONTRACTOR, at his own expense, and the test repeated until all such piping shows tight.

M. After flushing, all gas piping shall be leak tested in accordance with all local codes and regulations and in conformance with the recommendations or requirements of any National Institute or Association for the specific service application.

3.09 DISINFECTION

A. All pipe and fitting connected to and forming a part of a potable water supply shall be disinfected in accordance with the procedures described in AWWA C 651.

B. Disinfection shall be accomplished after the pipe has been flushed, if applicable, and

passed the hydrostatic test. Such piping shall be filled with 50 parts per million (PPM) of chlorine and held in contact for not less than 24 hours. Final tests after 24 hours contact time shall show a minimum residual chlorine content of 10 ppm in all parts of the system. Disinfection shall be repeated as often as necessary, and as directed by the Engineer and/or JEA until the minimum residual chlorine content of 10 ppm has been reached. The CONTRACTOR shall obtain certificates of satisfactory bacteriological tests and furnish them to JEA before the request is made for acceptance of the work. The CONTRACTOR shall furnish and install, at his own expense, all means and apparatus necessary for performing the disinfection. The chlorine solution shall be thoroughly flushed out prior to placing the new sections of pipe in service. The CONTRACTOR is cautioned that the spent chlorine solution must be disposed of in such a way as not to be detrimental to animal, plant, or fish life. Chlorine residual tests will be made after flushing to assure that residual is not in excess of 1 ppm at any point in system.

3.10 PAINTING AND COLOR CODING SYSTEM

A. All exposed piping specified shall be color coded in accordance with JEA's standard color designation system for pipe recognition and in accordance with Section 15030 – Piping and Equipment Identification Systems. In the absence of a standard color designation system, the Engineer will establish a standard color designation for each piping service category from color charts submitted by the CONTRACTOR in compliance with Section 09900 – Painting.

B. All piping specified in this Section shall be painted in accordance with Section 09900 – Painting, except as follows:

1. Copper pipe

2. Stainless steel pipe, flanges and supports or hangers shall be painted.

- END OF SECTION –

SECTION 15006

DUCTILE IRON PIPE

PART 1 -- GENERAL

1.01 WORK INCLUDED

A. The CONTRACTOR shall furnish and install ductile iron pipe and all appurtenant Work, complete in place, all in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 - Submittals

B. Section 09900 - Painting

C. Section 15000 - Basic Mechanical Requirements

1.03 REFERENCED SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards:

ANSI/AWWA C110/A2 for and/or C153/A21.531.10	Ductile-Iron and Gray-Iron Fittings 4-in. Through 64-in. Water and Other Liquids
ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
ANSI/AWWA C151/A21.51	Ductile-iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
ANSI/AWWA C600	Installation of Ductile-Iron Water Mains and Appurtenances

1.04 SUBMITTALS

A. Shop Drawings: The CONTRACTOR shall submit Shop Drawings of pipe and fittings in accordance with the requirements set forth in the Sections entitled “Piping” and “Submittals”.

1.05 SCHEDULE OF PIPING MATERIALS

A. A schedule of piping materials is included in the Section entitled “Schedules”.

PART 2 -- PRODUCTS

2.01 GENERAL

A. Pipe shall be centrifugally cast in metal molds or sand lined molds in accordance with ANSI A21.51 (AWWA C151) of grade 60-42-10 ductile iron. The above standard covers ductile iron pipe with nominal pipe sizes from three inches up to and including sixty-four inches in diameter. Working pressure shall be as specified herein, unless higher pressure is indicated on the Piping Schedule in Section 15390 - Schedules.

B. Wall Thickness

1. Buried push-on, mechanical, and restrained joint pipe shall have a wall thickness class in accordance with ANSI A21.51 equal to or greater than classes indicated below, unless indicated to be otherwise in the Piping Schedule

Buried Pipe

Size	Class
4” - 20”	350
24” - 64”	250

2. All flanged, grooved pipe shall have a wall thickness class in accordance ANSI A21.15 (AWWA C115) and be rated at 250 psi working pressure. The nominal thickness of pipe 6-inch and larger shall not be less than those shown in Table 15.1 of ANSI C115. The nominal thickness of 4-inch pipe shall be ANSI C151 Class 54.

C. Joints

1. Ductile iron pipe above grade shall be flanged. All ductile iron pipe below grade shall have thrust restrained joints.

2. Mechanical and push-on type joints shall be in accordance with ANSI A21.11 (AWWA C111).

3. Flanges for flanged pipe shall be in accordance with ANSI A21.15 (AWWA C115), shall be ductile iron, shall be rated at 250 psi maximum working pressure, and shall be similar to flange Class 125 per ANSI B16.1. Where shown on the drawings, pipe and fittings shall be furnished with flanges similar to flange Class 250 per ANSI B16.1. Fittings shall be provided with flanges having a bolt circle and bolt pattern the same as the adjacent pipe and/or mechanical devices. Joint materials shall be ANSI sized and approved and shall consist of hot dip galvanized carbon steel bolts and nuts and full faced 1/8" thick neoprene gaskets.

4. No raised face flanges shall be used. The raised faces shall be milled flat.

5. Flange gaskets shall be full face neoprene rubber.

D. Restrained Push-on Joints (Single Gasket)

1. Restrained joints in pipe and fittings shall be of the single gasket push-on type, and shall conform to all applicable provisions of ANSI/AWWA Standard C111/A21.11, except that gaskets for pipe and fittings shall be neoprene, and the following requirements:

   a. Thickness of the pipe barrel remaining at grooves cut, if required in the design of restrained end joints, shall not be less than the nominal wall thickness of equal sized non restrained pipe as specified in Item 2.01B.

   b. Restrained joints using field welding, set screws, or gaskets with expanding metal inserts will not be acceptable.

   c. The restraining components, when not cast integrally with the pipe and fittings, shall be ductile iron or a high strength non-corrosive alloy steel.

   d. Tee head bolts and hexagonal nuts for all restrained joints in pipe and fittings shall be of high strength cast iron with composition, dimensions and threading as specified in ANSI/AWWA Standard C111/A21.11, except that the length of the bolts shall meet the requirements for the restrained joint design.

   e. The proper number of gaskets, bolts, nuts and all necessary joint material, plus one extra gasket for every 10 joints or fraction thereof, shall be furnished with each order. The gaskets and joint accessories shall be shipped in suitable protection containers.

   f. Each thrust-restraint joint and the pipe and fitting of which it is a part, shall be designed to withstand the axial thrust from an internal pipeline pressure of at least 150 psi at bulkhead conditions without reduction because of its position in the pipeline nor for support from external thrust blocks.

   g. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly. During deflection, all components in the restrained system shall be in contact to provide an equal force on all contact areas.

   h. When restrained spigot ends are ordered the corresponding bell ends of the pipe to be restrained.

2. Restrained push-on joints for ductile iron pipe and fittings shall be TR-FLEX (4-inch through 36-inch) and HP-Lok (42-inch through 64-inch) and as manufactured by U.S. Pipe and Foundry, Flex-Ring (4-inch to 54-inch) and Lok-Ring (54-inch to 64-inch) by the American Ductile Iron Pipe Co., or equal. The restraining components, when not cast integrally with the pipe and fittings, shall be ductile iron or a high strength noncorrosive alloy steel. For cut grooved retainers, the thickness of barrel left after grooving shall not be less than the nominal wall thickness of equal sized nonrestrained pipe as specified herein above for the centrifugally cast ductile iron pipe.

3. Restrained Mechanical Joint: Mechanical joints shall be restrained with Megalug Series 1100 as manufactured by Ebaa Iron, Inc., or equal. Restrained mechanical joint pipe shall only be used in special cases when restrained push-on joints are not available and when requested by the CONTRACTOR and acceptable to the Engineer. Tee head bolts and hexagonal nuts for all restrained joints in pipe and fittings shall be of high strength cast iron with composition, dimensions and threading as specified in ANSI/AWWA Standard C111/A21.1 1, except that the length of the bolts shall meet the requirements for the restrained joint design.

E. Fittings

1. Shall be manufactured in accordance with ANSI A21.10 (AWWA C110) and/or ANSI A21.53 (AWWA C153) latest revisions for nominal pipe sizes four inches to sixty-four inches, and shall be either flanged, mechanical joint or restrained joint. Any other fittings, not included in ANSI A21.10 (AWWA C110) shall conform in design and performance to the requirements of this Standard.

2. Shall have a rated pressure equal to or greater than the specified working pressure for nominal pipe sizes of three inches to sixty-four inches (350 psi fittings available through and including twenty-four inches, only).

3. Blind, filler, companion and reducing flanges shall conform to ANSI B16.1.

F. Pipe Coating General: All ductile iron pipe and fittings shall be supplied with the same coating material throughout the project. Coating shall be provided in the interior and exterior of the pipe as described hereinafter.

1. The standard asphaltic coating shall be applied prior to shipment to the exterior wall of buried pipe and fittings in accordance with ANSI A21.51 (AWWA C151).

2. A coating of rust inhibitive primer, compatible with the coating system specified in Section 09900 – Painting, shall be applied prior to shipment to all exposed and interior piping.

3. Cement-Mortar Lining: All ductile iron pipe and fittings used for reclaimed water shall be cement-lined and seal-coated in accordance with ANSI/AWWA Standard C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

4. Polyethylene Encasement: All ductile iron pipe, fittings and valves installed underground shall be encased with polyethylene film consisting of three layers of co-extruded linear low density polyethylene (LLDOE), fused into a single thickness of not less than eight mils. The polyethylene encasement shall meet all the requirements of ANSI/AWWA C105/A21.5.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. The CONTRACTOR shall perform all earthwork including excavation, backfill, bedding, compaction, sheeting, shoring and bracing, dewatering and grading in accordance with Division 2 - Sitework.

B. Unless otherwise directed, ductile iron pipe shall be laid with the bell ends facing upstream in the normal direction of flow and in the direction of laying.

C. Thrust restrained and mechanical joints shall be made in accordance with the manufacturer's standards except as otherwise specified herein. Joints between mechanical joint pipe and/or fittings shall be made in accordance with ANSI/AWWA Standard C600, except that deflection at joints shall not exceed one-half of the manufacturer's recommended allowable deflection, or one-half of the allowable deflection specified in ANSI/AWWA C600, whichever is the lesser amount.

D. Before laying thrust restrained and mechanical joint pipe and fittings, all lumps, blisters and excess bituminous coating shall be removed from the bell and spigot ends. The outside of each spigot and the inside of each bell shall be wire brushed, and wiped clean and dry. The entire gasket groove area shall be free of bumps or any foreign matter which might displace the gasket. The cleaned spigot and gasket shall not be allowed to touch the trench walls or trench bottom at any time. Vegetable soap lubricant shall be applied in accordance with the pipe manufacturer's recommendations, to aid in making the joint. The workmen shall exercise caution to prevent damage to the gasket or the adherence of grease or particles of sand or dirt. Deflections shall only be made after the joint has been assembled.

E. Prior to making up flanged joints in ductile iron pipe and fittings, the back of each flange under the bolt heads and the face of each flange shall have all lumps, blisters and excess bituminous coating removed and shall be wire brushed and wiped clean and dry. Flange faces shall be kept clean and dry when making up the joint, and the workmen shall exercise caution to prevent damage to the gasket or the adherence of grease or particles of sand or dirt. Bolts and nuts shall be tightened by opposites in order to keep flange faces square with each other, and to insure that bolt stresses are evenly distributed.

F. Bolts and nuts in thrust restrained, mechanical and flanged joints shall be tightened in accordance with the recommendations of the pipe manufacturer for a leak-free joint. The mechanics shall exercise caution to prevent overstress. Torque wrenches shall be used until, in the opinion of the Engineer, the mechanics have become accustomed to the proper amount of pressure to apply on standard wrenches.

G. Cutting of the ductile iron pipe for inserting valves, fittings, etc., shall be done by the CONTRACTOR in a neat and workmanlike manner without damage to the pipe, the lining, or the coating. Pipe 16 inches and larger in diameter shall be cut with a mechanical pipe saw. After cutting the pipe, the plain end shall be beveled with a heavy file or grinder to remove all sharp edges.

H. Areas of loose or damaged lining associated with field cutting shall be repaired or replaced as recommended by the pipe manufacturer and required by the Engineer.

Repair methods shall be as recommended by the manufacturer and shall be submitted to the Engineer for review.

I. Any work within the pipe shall be performed with care to prevent damage to the lining. No cable, lifting arms or other devices shall be inserted into the pipe. All lifting, pulling or pushing mechanisms shall be applied to the exterior of the pipe barrel.

J. Homing the pipe shall be accomplished by the use of a hydraulic or mechanical pulling device, unless otherwise accepted by the Engineer. No pipe shall be driven or struck in order to seat it home.

K. Cleaning: Cleaning methods shall be acceptable to the Engineer, and must be sufficient to remove silt, rocks, or other debris which may have entered the pipeline during its installation and shall also follow the requirements of Section 15000, "Basic Mechanical Requirements".

- END OF SECTION -

SECTION 15008

PVC/CPVC PIPE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Reference Section 15000, Basic Mechanical Requirements.

PART 2 -- PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS (3-INCH AND LESS)

A. PVC pipe and fittings shall be manufactured in accordance with ASTM D 1784, D 1785 and F 441, "normal impact" pipe, Schedule 40 or 80 as specified in Section 15390 - Schedules.

B. Fittings used with this pipe shall be socket type or flanged type as specified herein, in Section 15390 - Schedules, or indicated on the Drawings. Plastic piping shall be installed in full accordance with the manufacturer's recommendations for the specific installation. No field bending or distortion of the pipe will be permitted.

C. PVC pipe shall be Type 1 Grade 1 conforming to ASTM D 1784 and D 1785. Fittings shall conform to the following standard specifications:

Socket Type (Schedule 40); ASTM D 2466

Socket Type (Schedule 80); ASTM D 2467

D. Provide flanged fittings of the same material as the specified pipe and material conforming to ANSI B16.5 at all valves and equipment with Teflon filled or natural rubber gaskets. Bolts shall be type 316 stainless steel for flanged joints. Flanges are not required at true (double) union valves.

E. Solvent cement for socket type joints shall conform to ASTM D 2564 for PVC pipe and fittings.

2.02 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS (4-INCH AND LARGER)

A. C900-Class 200 shall be in sizes between 4 inches and 12 inches and shall meet the requirements of AWWA C900 "Poly Vinyl Chloride (PVC) Pressure Pipe" and shall conform to all the requirements of ASTM D1784 and ASTM D2241. The pipe shall be a minimum of DR 14 and shall be capable of withstanding the overburden pressures determined by the depth of burial in the field.

1. Pipe material shall be made from clean, virgin, NSF approved Class 12454-A PVC compound conforming to resin specification ASTM D1784. Standard laying

lengths shall be 20-feet (±1 inch). Random lengths of not more than 15% of the total footage of each size may be shipped in lieu of the standard lengths. Reruns of reclaimed material shall not be accepted.

2. The pipe shall have bell and spigot ends with push-on, O-ring rubber gasket, compression type joints conforming to the requirements of ASTM 2672. Elastomeric gaskets shall conform to the requirements of ASTM D1869 and ASTM F477.

3. Minimum pipe stiffness (F/dY) at 5% deflection shall be 914 psi for all sizes when tested in accordance with D2241.

4. The pipe shall be designed to pass a quick burst test pressure of 985 psi applied in 60 to 70 seconds when tested in accordance with ASTM D1599, as referenced in ASTM D2241.

5. Fittings for C900-Class 200, DR 14 shall be ductile iron, bolted mechanical joint.

2.03 POLYVINYL CHLORIDE (PVC) GRAVITY PIPE AND FITTINGS

A. Pipe and fittings shall conform to ASTM D3034 for nominal pipe sizes 15-inches and smaller. Wall thicknesses shall be as specified for a Standard Dimension Ratio (SDR) of 35. Pipe and fittings for nominal pipe sizes 18-inches and larger shall conform to ASTM F679. Wall thicknesses shall be as specified for PS46.

B. Pipe bells shall have an elastomeric gasket conforming to ASTM F477. Pipe joints shall meet the requirements of ASTM D3212 under both pressure and 22 in. Hg vacuum.

C. Pipe shall be supplied in standard laying lengths of 14 ft. or 20 ft.

D. All fittings and accessories shall have bell and/or spigot configurations compatible with that of the pipe.

2.04 CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE AND FITTINGS

A. CPVC shall be manufactured in accordance with ASTM D 1785, D 1784 and F 441, "normal impact" pipe, Schedule 40 or 80 as specified.

B. Fittings used with this pipe shall be socket type or flanged type as specified herein or indicated on the Drawings. Plastic piping shall be installed in full accordance with the manufacturer's recommendations for the specific installation. No field bending or distortion of the pipe will be permitted.

C. CPVC pipe shall be Type 4, Grade 1, Schedule 80, conforming to ASTM D 1784 and ASTM F 441. CPVC fittings shall be socket type conforming to ASTM F 439.

D. Solvent cement for socket type joints shall conform to ASTM F 493 for CPVC pipe and fittings.

(Continued on Next Page)

PART 3 -- EXECUTION

3.01 INSTALLATION

A. All pipe and fittings shall be installed in accordance with Section 02222, Excavation and Backfill for Utilities.

- END OF SECTION -

SECTION 15020

PIPE SUPPORTS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Reference Section 05050, Metal Fastening.

B. Reference Section 15000, Basic Mechanical Requirements.

PART 2 -- PRODUCTS

2.01 HANGERS AND SUPPORTS

A. All piping shall be adequately supported and braced by means of adequate hangers, concrete piers, pipe supports, brackets, or otherwise as may be required by the location. Generally, concrete supports shall be used where pipe centerline is less than 3 feet above floor, and hangers above 6 feet unless specified or shown otherwise. Supports shall be not more than 10 feet on center for steel and cast iron, 5 feet on center for plastic unless otherwise shown on the Drawings or required by the specific manufacturer. All necessary inserts or appurtenances shall be furnished and installed in the concrete or structures for adequately securing hangers and supports to the structure.

B. Hangers and supports shall conform to the following requirements:

1. All hangers and supports shall be capable of adjustment after installation. Types of hangers and supports shall be kept to a minimum.

2. Hanger rods shall be straight and vertical. Chain, wire, strap, or perforated bar hangers shall not be used. Hangers shall not be suspended from other piping.

3. Vertical piping shall be supported at each floor and between floors by stays or braces to prevent rattling and vibration.

4. Supports and hangers for plastic piping shall include wide saddles or bands as recommended by the manufacturer and approved by the Engineer to distribute load and thus avoid localized deformation of the pipe.

5. Hanger and supports shall prevent contact between dissimilar metals by use of copper plated, rubber, vinyl coated or stainless steel hangers.

6. Copper piping shall be supported by plastic coated or copper plated hangers and supports.

7. Plastic piping shall be supported by plastic coated hangers and supports.

8. Hangers and supports shall provide for thermal expansion throughout the full

operating temperature range.

9. Expansion type anchors used for pipe hangers and supports shall be Type 304 stainless steel.

C. All metallic hangers and supports shall be standard make by Anvil International, Inc., "Witch" by Carpenter & Paterson, Ltd., B-Line Systems, Inc., or equal; and data on the types and sizes to be used shall be furnished to the Engineer for approval. Metallic support system brackets, rods, support clips, clevis hangers, hardware, etc. Materials of construction shall be as identified in Table 15020-1.

Table 15020-1
Metal Hanger and Support Materials of Construction

	Required Material [1]
Facility, Structure or Area[2]	**316L Stainless Steel**
Booster Pump Station	X
General Site/Yard Piping[3]	X

[1] Refer to Specification Section 05010 – Metal Materials for grade requirements of steel for pipe supports.

[2] The limits of each facility/structure identified above shall extend to 5 feet beyond the perimeter walls or pads of each facility/structure.

[3] General Site/Yard Piping shall account for all areas of the project site up to the limits of facilities/structures identified above.

D. Non-metallic support system shall be a heavy duty channel framing system. Channel frames shall be manufactured by the pultrusion process using corrosion grade polyester or vinylester resins. All fiberglass construction shall include suitable ultraviolet inhibitors for UV exposure and shall have a flame spread rating of 25 or less per ASTM E84. Piping accessories, pipe clamps, clevis hangers, support posts, support racks, fasteners, etc., shall be constructed of vinylester or polyurethane resin. Non-metallic support systems shall be standard make Aickinstrut by Aickinstrut, Inc., Unistrut Fiberglass by Unistrut, Inc., Enduro Fiberglass Systems, or equal. The CONTRACTOR shall submit data on the types and sizes of approval. Unless otherwise shown or specified the CONTRACTOR shall provide support spacings in the conformance with the pipe and support system manufacturer's requirements.

PART 3 – EXECUTION

(NOT USED)

- END OF SECTION –

SECTION 15030

PIPING AND EQUIPMENT IDENTIFICATION SYSTEMS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install all components of the system for identification of piping and equipment as specified hereinafter. The system shall include the application of color coding to all new and altered plant piping. The CONTRACTOR shall paint the equipment and piping of all Contracts in the colors herein specified, and in accordance with the requirements of Section 09900, Painting.

B. In addition to the legends specified herein the Engineer may order the CONTRACTOR to furnish and install additional identification legends and arrows at no additional cost to JEA. Such additional signs may be requested near completion of the work and shall be limited to no more than five (5) signs for each type specified herein. The legends and color combinations for additional signs shall conform to the requirements specified herein.

C. The CONTRACTOR shall submit a schedule of the colors and designations proposed in accordance with Section 01300, Submittals, and this Section. A minimum of four (4) color charts with cross-references to the colors listed herein shall be included with the Submittal.

D. Reference Section 15000, Basic Mechanical Requirements.

PART 2 -- PRODUCTS

2.01 PIPING BAND

A. All new and altered piping shall receive identification bands. Such bands shall be 6-inches wide, neatly made by masking, and spaced at intervals of 30-inches on centers regardless of the diameter of the pipe being painted. The CONTRACTOR may use approved precut and prefinished metal bands on piping, in lieu of the masked and painted bands, where approved by the Engineer.

2.02 PIPING IDENTIFICATION LEGEND

A. The CONTRACTOR shall apply identification legends to all types and sections of piping as shown on the Drawings or as designated by the Engineer. Such legends shall be in the form of plain block lettering giving the name of the pipe content in full or abbreviated form, and showing the direction of flow by arrows. All lettering and arrows shall be of the plastic snap-on type, Seton nameplate "setmarks", or equal, or they shall be formed by stenciling in an approved manner using white or black as directed and shall have an overall height in inches in accordance with the following table:

Diameter of Pipe or Pipe Covering	Height of Lettering
3/4 to 1-1/4 inches	1/2-inches
1-1/2 to 2-inches	3/4-inches
2-1/2 to 6-inches	1-1/4-inches
8 to 10-inches	2-1/2-inches
Over 10-inches	3-1/2-inches

B. Identification lettering shall be located midway between color coding bands where possible. Identification lettering and arrows shall be placed as directed by the Engineer, but shall generally be located each fifteen (15) feet in pipe length, and shall be properly inclined to the pipe axis to facilitate easy reading. In the event lettering and arrow identifications are required for piping less than 3/4-inch in diameter, the CONTRACTOR shall furnish and attach approved color coded tags where instructed.

C. The colors referenced in the legend are as manufactured by KOP-COAT. They are used for convenience only.

D. Piping and Equipment Identification

Service	Legend	Base
Reclaimed Water	Reclaimed Water	Pantone Purple
Sodium Hypochlorite Solution	Sodium Hypochlorite	Yellow
Diesel Fuel	Diesel Fuel	Red
Potable Water	Potable Water	Blue

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 15061

SODIUM HYPOCHLORITE DUAL CONTAINMENT PIPING

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install dual containment piping, fittings, leak detection and all appurtenant work, complete and in place, all in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Submittals

B. Piping, General

C. Division 16 – Electrical

D. Division 17 - Instrumentation

1.03 SUBMITTALS

A. Shop Drawings: The Contractor shall submit from the manufacturer shop drawings of the containment piping system in accordance with the requirements of the Sections entitled “Submittals” and “Materials and Equipment”.

B. Certifications: The Contractor shall furnish a certified affidavit of compliance with all applicable regulatory requirements for the containment systems and other products furnished under this section of the specifications.

1.04 ACCEPTABLE MANUFACTURERS

A. The containment piping shall be factory fabricated by a manufacturer that has at least five years experience and provide product reliability.

B. Manufacturers shall be IPEX, Asahi/America or Engineer approved equal.

C. Leak detection systems shall be as manufactured by IPEX, Asahi/America, or Engineer approved equal.

1.05 MANUFACTURER’S SERVICE REPRESENTATIVE

A. Inspection, Startup and Field Adjustment: The service representative of the Manufacturer shall be present at the site for two (2) work days, to furnish the services required by the Section entitled “Equipment General Provisions”.

B. Training of Owner’s Personnel: The training representative of the Manufacturer shall be present at the site one work day to furnish the services required by section entitled “Equipment General Provisions”.

C. For the purposes of this paragraph, a work day is defined as an eight hour period at the site, excluding travel time.

D. The times specified shall not be construed as to relieve the manufacturer of any additional visits to provide sufficient service to place the system in satisfactory operation. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor.

E. The Engineer may require that the inspection, startup, and field adjustment services above be furnished in three (3) separate trips.

F. The manufacturer's representative shall sign in and out at the office of the Engineer Residence Project Representative on each day the manufacturer's representative is at the project site.

PART 2 - PRODUCTS

2.01 CARRIER PIPE

A. Carrier pipe materials shall be Sch 80 CPVC as specified in Section 15008.

B. The Contractor shall terminate secondary containment a minimum of 6-inches above ground where the pipe rises, in accordance with Supplier recommendations, unless otherwise shown differently on the drawings.

2.02 CONTAINMENT PIPE

A. Secondary containment piping systems shall be provided for the following chemicals:

1. Sodium Hypochlorite

B. The secondary containment pipe shall contain all material discharged from a service pipe for a period of time equal to or longer than the maximum anticipated time sufficient to allow recovery of the discharged material.

C. All secondary containment piping shall be such that it will contain 110 percent of the volume of the service pipe. Containment shall be drainable and air testable. All straight sections, fittings, and other accessories shall be factory manufactured and prefabricated for the placement of leak detection cable in the secondary containment and sized as follows:

Carrier Pipe Size (inch)	Containment Pipe Size (inch)
0.5, 0.75 & 1	3
1.5	4
2	4
3	6
4	6

2.03 SUB-ASSEMBLIES

A. Gland seals and anchors shall be designed and factory-prefabricated to prevent the ingress of moisture into the system. All subassemblies shall be designed to allow for complete draining and drying of the double pipe.

2.04 FITTINGS

A. All fittings shall be factory manufactured. Unless otherwise indicated, secondary contained fittings shall be constructed using injection molded fittings. Anchors shall be of sufficient thickness to withstand the maximum possible end loads that can be generated by the carrier pipe during the life of the system. Bends must be anchored on both ends. Tees and laterals must be anchored on both the run and the branch connections.

2.05 PIPE SUPPORTS

A. Supports shall be designed by the manufacturer. The manufacturer shall design and fabricate the system so that the pipe is supported inside the containment pipe. All pipe supports shall be circular and solvent welded to the carrier pipe except on sulfuric acid system.

2.06 JOINTS

A. Adhesive bonded joints in containment piping shall be painted with piping ID colors required in the Section entitled “Piping and Equipment Identification Systems”.

PART 3 - EXECUTION

3.01 GENERAL

A. The secondary containment piping system shall be installed according to the manufacturer’s printed instructions and recommendations.

3.02 TESTING

A. The testing plan and schedule shall be submitted in writing for approval by the Engineer and Owner a minimum of 2 weeks before testing is to start.

B. All test equipment, temporary valves, bulkheads, or other air control equipment and materials shall be determined and furnished by the Contractor subject to the Engineer’s review. No materials shall be used which would be injurious to the containment pipe or its future function.

C. Unless otherwise provided herein, air for testing shall be furnished by the Contractor.

D. All testing operations shall be performed in the presence of the Engineer.

E. Prior to pressure testing, the containment system shall be flushed or blown out as appropriate. The Contractor shall test the containment system either in sections or as a unit. The test shall be made closing valves when available, or by placing temporary bullheads in the pipe and filling the line with air. The Contractor shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test procedure without damage to, or movement of, the adjacent pipe.

F. The containment system shall be filled at a rate which will not cause any damage to the line or adjacent structures.

G. The secondary containment piping shall be air tested at 5 psi, and the service piping shall be hydrostatically tested to the pressures noted in the pipe schedule and

measured at the lowest point of the containment system section being tested. The test pressure shall be held for not less than 4 hours.

H. The containment system shall not show a loss of pressure of more than 5 percent. In case the containment system fails to pass the described leakage test, the Contractor shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall again test the containment system.

I. Secondary containment pipe joints completed at the factory shall be air tested and shall have no leakage.

- END OF SECTION -

SECTION 15095

VALVES, GENERAL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install, complete with all assemblies and accessories, all valves shown on the Drawings and specified herein including all fittings, appurtenances and transition pieces required for a complete and operable installation.

B. All valves shall be constructed of first quality materials which have strength, wearing, and corrosion resistance characteristics entirely suitable for the types of service for which the individual valves are designated. Except where noted otherwise, valves designated for water service shall conform to pertinent sections of the latest revision of AWWA C500 Specifications. Cast iron valve bodies and parts shall meet the requirements of the latest revision of ASTM Designation A-126, "Standard Specifications for Gray Iron Castings for Valves, Flanges, and Pipe Fittings, Class B."

C. All valve body castings shall be clean, sound, and without defects of any kind. No plugging, welding, or repairing of defects will be allowed.

D. Valves shall have flanged ends for exposed service and mechanical joint ends for buried service, unless otherwise shown on the Drawings or specified herein. Flanged ends shall be flat-faced, 125 lb. American Standard unless otherwise shown or specified in accordance with ANSI B16.1. All bolt heads and nuts shall be hexagonal of American Standard size. The CONTRACTOR shall be responsible for coordinating connecting piping. Valves with screwed ends shall be made tight with Teflon tape. Unions are required at all screwed joint valves.

1.02 SUBMITTALS

A. The CONTRACTOR shall furnish to JEA, through the Engineer, a Performance Affidavit where required in individual valve specifications, utilizing the format specified in Section 11000, Equipment General Provisions. Performance tests shall be conducted in accordance with the latest revision of AWWA C500 and affidavits shall conform to the requirements of the Specifications

B. Shop Drawings conforming to the requirements of Section 01300, Submittals, are required for all valves, and accessories. Submittals shall include all layout dimensions, size and materials of construction for all components, information on support and anchoring where necessary, pneumatic and hydraulic characteristics and complete descriptive information to demonstrate full compliance with the Documents. Shop Drawings for electrically operated/controlled valves shall include all details, notes, and diagrams which clearly identify required coordination with the electrical power supply and remote status and alarm indicating devices. Electrical control schematic diagrams shall be submitted with the Shop Drawings for all electrical controls. Diagrams shall be

drawn using a ladder-type format in accordance with JIC standards. Shop Drawings for pneumatically operated/controlled valves shall include all details, notes, and diagrams which clearly identify required coordination with the compressed air (service air) system and electrical controls.

C. Operation and maintenance manuals and installation instructions shall be submitted for all valves and accessories in accordance with the Specifications. The manufacturer(s) shall delete all information which does not apply to the equipment being furnished.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. The CONTRACTOR shall provide the services of a qualified representative of the manufacturer(s) of the equipment named below to check out and certify the installation(s), to supervise the initial operation, and to instruct JEA's operating personnel in proper operation and maintenance procedures in accordance with the following schedule:

Service	Number of Trips	Number of Days/Trip
Installation and Testing	1	1
Startup and Training	1	1

B. Any additional time required to achieve successful installation and operation shall be at the expense of the CONTRACTOR. The manufacturer's representative shall sign in and out at the office of the Engineer's Resident Project Representative on each day he is at the project.

C. A written report covering the representative's findings and installation approval shall be mailed directly to the Engineer covering all inspection and outlining in detail any deficiencies notes.

D. The times specified are exclusive of travel time to and from the facility and shall not be construed as to relieve the manufacturer of any additional visits to provide sufficient service to place the equipment in satisfactory operation.

PART 2 -- PRODUCTS

2.01 FLOW INDICATORS

A. Flow indicators shall be the Akron ball-type as manufactured by Brooks Instrument Co., Fischer and Porter, or equal, and shall have bronze bodies, glass dome, and plastic ball.

2.02 CORPORATION STOPS

A. Corporation stops shall be of bronze with tapered male iron pipe threads on inlets and outlets. Terminal outlets shall have screwed bronze hex head dust plugs or caps. Unions shall be used on all corporation stop outlets with connecting piping. Corporation stops shall have a minimum working pressure rating of 250 psi and shall be

as manufactured by Mueller Co., Hays Mfg. Div. of Zurn Industries, or equal.

2.03 FLOOR BOXES

A. Floor boxes shall be provided for all nut operated or floor accessed valves. Floor boxes shall be of the adjustable, sliding type, cast iron, suitable to withstand heavy traffic, as manufactured by James B. Clow & Sons, Kennedy Valve Mfg. Co., or equal. The covers shall be marked with appropriate designations of piping contents (i.e.: water, sewer) and bases shall be the round type. All nut operated valves in this Section shall be clearly identified by stainless steel or laminated plastic identification tags. The tags shall be permanently affixed to the inside of the floor boxes, under grating, etc. and shall bear the embossed letters which clearly identify each valve by its appropriate designation.

B. Two (2) valve operating wrenches shall be supplied in 4 foot lengths with tee handles for each size nut supplied. Valve wrenches shall be Model No. F-2520 as manufactured by James B. Clow & Sons, Kennedy Valve Mfg. Co., Figure No. 122, or equal.

2.04 VALVE BOXES

A. The CONTRACTOR shall furnish and install valve boxes as shown on the Drawings and specified herein.

B. All valve boxes shall be placed so as not to transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The ground in the trench upon which the valve boxes rest shall be thoroughly compacted to prevent settlement. The boxes shall be fitted together securely and set so that the cover is flush with the finished grade of the adjacent surface. A concrete pad as detailed on the Drawings shall be provided around the valve box, sloped outwards.

C. All valve boxes shall be 2-piece cast iron, sliding type, 5-1/4" shaft, with heavy duty traffic weight collar and the lid marked with the appropriate carrier product (i.e.: WATER). Boxes shall be as manufactured by James B. Clow & Sons, Kennedy Valve Mfg. Co., Charlotte Pipe and Foundry Company, or equal.

2.05 STRAINERS

A. Y-Strainers shall be Y-pattern cast iron body, flanged or screwed ends with stainless steel or Monel, 20 mesh strainers. Strainers shall be 200 psi, cold-water service strainers, as manufactured by WATTS, Crane Co., Zurn, or equal.

B. Manually cleaned strainers shall be the duplex basket tapered plug type.

1. Strainers 3-inches in diameter and larger shall have flanged ends conforming to ANSI B16.1-125/150 pound standard.

2. Strainers less than 3-inches in diameter shall have screwed end connectors, unless otherwise shown on the Drawings.

3. Strainers shall be constructed with an ASTM A48, Class 30 cast iron body, ductile iron trim, removable 0.045 inch staggered hole perforation, 304 stainless steel filter baskets and gauges on the inlet and outlet.

4. All strainers shall be suitable for 125 psi service.

5. Switching flow from one basket to the other shall be accomplished by moving the handle through a 180° arc. The switching operation shall not stop flow through the strainer and shall provide for on-line removal of either basket with the other basket functional. The plug shall be automatically positioned with integral stops and shall be easily lifted and reseated under pressure.

6. The strainer shall be designed to minimize the possibility of material bypassing the plug while being rotated and to prevent debris from building up under the plug. The strainer covers shall be designed for quick opening with swing away yoke.

7. Each basket compartment shall have a side drain outlet.

8. All strainers shall be provided with support legs.

9. Duplex basket strainers shall be similar to the Model 53BTX as manufactured by Hayward, or equal.

2.06 QUICK DISCONNECT COUPLINGS

A. Quick disconnect type coupling for compressed/service air shall be provided where indicated on the Drawings. Coupling shall provide for instantaneous shutoff in socket end when lines are disconnected. Couplings shall be constructed of 316 stainless steel with a BUNA-N O-ring and integral safety lock. Couplings shall comply with Military Specification 4109 (interchangeable with standard plug of the same size).

2.07 BACKFLOW PREVENTERS

A. Backflow preventer shall be the size shown on the Drawings and shall be of the double check valve principle. Backflow preventer installation shall include isolation valves and four test cocks, furnished as an assembly. For backflow preventers less than 2-1/2", the installation assembly also shall include a strainer. Isolation valves for backflow preventers shall be ball valves, except for size 2-1/2" and larger which shall be resilient seat gate valves. Test cocks shall be located as recommended by the manufacturer to facilitate functional testing of the assembly. The backflow preventer shall be a WATTS 709, Wilkins Model 975XL, or equal.

B. Reduced Pressure Backflow Preventer shall be of the size shown on the Drawings, and shall be of the reduced pressure principle type in accordance with AWWA Standards C510 and C511, with two (2) independent operating spring loaded check valves and one (1) spring loaded, diaphragm actuated, differential pressure relief valve shall be installed between the check valves. Backflow preventer shall be bronze body construction, with EPT rubber discs and Buna-N and nylon diaphragm. Screws and springs shall be of stainless steel. End connections shall be screwed, unless otherwise

specified or shown on the Drawings. Reduced pressure backflow preventer installations shall include isolation valves and four test cocks, furnished as an assembly. For reduced pressure backflow preventers less than 2-1/2" the installation assembly also shall include a strainer. Isolation valves for reduced pressure backflow preventers shall be ball valves, except for sizes 2-1/2" and larger which shall be resilient seat gate valves. Test cocks shall be located as recommended by the manufacturer to facilitate functional testing of the assembly. The reduced pressure backflow preventer shall be as manufactured by Beeco Division, Hersey Products Inc., Aergap Model 6CM, WATTS 909, Wilkins Model 975, or equal.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Except where noted otherwise herein, all valves shall be installing and tested in accordance with the latest revision of AWWA C500. Before installation, all valves shall be lubricated, manually opened and closed to check their operation and the interior of the valves shall be thoroughly cleaned. Valves shall be placed in the positions shown on the Drawings. Joints shall be made as directed under the Piping Specifications. The valves shall be so located that they are easily accessible for operating purposes, and shall bear no stresses due to loads from the adjacent pipe. The CONTRACTOR shall be responsible for coordinating connecting piping.

B. All valves shall be tested at the operating pressures at which the particular line will be used. Any leakage or "sweating" of joints shall be stopped, and all joints shall be tight. All motor operated and cylinder operated valves shall be tested for control operation as directed by the Engineer.

C. Provide valves in quantity, size, and type with all required accessories as shown on the Drawings.

D. Install all valves and appurtenances in accordance with manufacturer's instructions. Install suitable corporation stops at all points shown or required where air binding of pipe lines might occur. Install all valves so that operating handwheels or wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by Engineer. Unless otherwise approved, install all valves plumb and level. Valves shall be installed free from distortion and strain caused by misaligned piping, equipment or other causes.

E. Valve boxes shall be set plumb, and centered with the bodies directly over the valves so that traffic loads are not transmitted to the valve. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.

3.02 SHOP AND FIELD TESTING

A. Shop and field testing of valves shall be as follows:

1. Certified factory testing shall be provided for all components of the valve and operator system. Valves and operators shall be shop tested in accordance with

the requirements in the latest revision of AWWA C500, including performance tests,
leakage test, hydrostatic tests, and proof-of-design tests. The manufacturer through the CONTRACTOR shall submit certified copies of the reports covering the test for acceptance by the Engineer.

2. Shop testing shall be provided for the operators consisting of a complete functional check of each unit. Any deficiencies found in shop testing shall be corrected prior to shipment. The system supplier through the CONTRACTOR shall submit written certification that shop tests for the electrical/pneumatic system and all controls were successfully conducted and that these components provide the functions specified and required for proper operation of the valve operator system.

3. The CONTRACTOR shall conduct field tests to check and adjust system components, and to test and adjust operation of the overall system. Preliminary field tests shall be conducted prior to start-up with final field tests conducted during start-up. The factory service representative shall assist the CONTRACTOR during all field testing and prepare a written report describing test methods, and changes made during the testing, and summarizing test results. The service representative shall certify proper operation of the valve operator system upon successful completion of the final acceptance field testing.

4. Preliminary and final field tests shall be conducted at a time approved by the Engineer. The Engineer shall witness all field testing.

5. All costs in connection with field testing of equipment such as energy, light, lubricants, water, instruments, labor, equipment, temporary facilities for test purposes, etc. shall be borne by the CONTRACTOR. The CONTRACTOR shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when JEA formally takes over the operation thereof.

6. Preliminary field tests shall be conducted prior to start-up and shall include a functional check of the entire valve operator system and all system components. Preliminary field tests shall demonstrate that the valve operator system performs according to specifications and that all equipment, valves, controls, alarms, interlocks, etc., function properly. The preliminary field test report must be approved by the Engineer prior to conducting final field acceptance tests. Based on results of preliminary field tests, the CONTRACTOR shall make any adjustments required to settings, etc., to achieve the required valve closing time and operation specified or otherwise directed by the Engineer.

7. Final field acceptance tests shall be conducted simultaneously with the start-up and field testing of the pumps, air compressors, process air blowers, etc. Field tests shall be conducted for the full range of operating modes and conditions specified and as directed by the Engineer. Each of the valves shall be tested at minimum, maximum, and normal head/flow conditions, and under all specified

conditions of opening and closing. Performance of pneumatic valves and compressed air system under normal operating conditions and during simulated power failures shall be checked.

8. Field testing shall include optimization of opening and closing times of the valves. The CONTRACTOR shall provide the means for accurate measurement of pipeline pressures as directed by the Engineer. Valve opening and closing times shall be adjusted based on process requirements to optimize operation of the valves. Final valve opening and closing times as determined by field tests shall be approved by the Engineer prior to final acceptance of the system.

- END OF SECTION -

SECTION 15100

VALVE OPERATORS

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. Equipment shall be provided in accordance with the requirements of Section 11000 – Equipment General Provisions and Section 15000 – Basic Mechanical Requirements.

B. Valve operators shall be designed to unseat, open or close, and seat the valve under the most adverse operating condition to which the valves will be subjected.

C. Operator mounting arrangements shall be as indicated on the Drawings or as directed by the manufacturer and/or Engineer. There shall be no mounting restrictions on the electric valve actuator.

D. The valve operators shall be the full and undivided responsibility of the valve manufacturer in order to ensure complete coordination of the components and to provide unit responsibility.

1.02 SUBMITTALS

A. The following items shall be submitted with the Shop Drawings in accordance with, or in addition to the submittal requirements specified in Section 01300 - Submittals; and Section 11000 - Equipment General Provisions:

1. Certification that the force required to operate all valves is as specified herein.

1.03 WARRANTY AND GUARANTEE

A. Warranty and Guarantee shall be as specified in Section 11000 - Equipment General Provisions with the exception that the warranty period shall be, as a minimum, for two (2) years from the date of shipment.

PART 2 -- PRODUCTS

2.01 GENERAL

A. Manual operators shall be provided on all valves. Manual operator type shall be as specified herein and as shown on the Drawings.

B. Quarter turn valves 8” and greater in size shall have geared operators. Gate valves 14” and greater in size shall have geared operators.

C. Operators/actuators shall be furnished with conservatively sized extension bonnets, extension stems, or torque tubes, and all required appurtenances required for a complete installation. Operators furnished with extension bonnets shall include stainless steel extension stems, or stainless steel torque tubes.

2.02 MANUAL OPERATORS

A. Unless otherwise specified or shown on the Drawings, manual operator type shall be as follows:

1. Buried valves shall be equipped with nut operators, extended stems, and valve boxes.

2. Exposed valves up to 6-inch shall be lever operated (except gate valves).

3. Exposed valves 8-inches and larger shall be handwheel operated.

4. Exposed gate valves shall be handwheel operated.

5. Valves with centerline of operator located more than 6-feet above the floor or platform from which it is to be operated shall have a chainwheel operator, unless otherwise indicated on the Drawings.

B. Manual operators shall be rigidly attached to the valve body unless otherwise specified or shown on the Drawings.

C. All operators shall turn counter-clockwise to open and shall have the open direction clearly and permanently marked.

D. Valve operators shall be designed so that the force required to operate the handwheel, lever, or chain (including breakaway torque requirements) does not exceed 80 pounds applied at the extremity of handwheel or chainwheel operator. Design pressures for sizing of valve operators shall be the piping test pressure for the piping in which the valve is to be installed as shown in the Piping Schedule in Section 15390 – Schedules.

E. Handwheels for valves operators shall not be less than 12 inches in diameter. The maximum diameter of any handwheel shall not exceed 24 inches.

F. Nut operators shall have standard 2-inch square AWWA operating nuts designed in accordance with AWWA C504-94.

G. Geared manual operators shall be of the worm gear, traveling nut or scotch yolk type except manual operators for butterfly valves 18-inch in diameter or larger which shall be worm gear, unless otherwise indicated in the individual valve specification. Gear operators shall be of the worm gear or bevel gear type. Gear box designs incorporating end of travel stops in the housing shall be equipped with AWWA input stops. Each gearbox shall require a minimum of 10 turns for 90 degree rotation or full valve stem travel and shall be equipped with a mechanical valve position indicator.

H. Manual operators on below grade (and vault installed) valves shall be permanently lubricated and watertight under an external water pressure of 10 psi.

2.03 SPARE PARTS

A. Spare parts shall be provided in accordance with Section 11000, Equipment General Provisions and shall include, as a minimum, the following:

- Five (5) O-Ring Seal Kits

PART 3 -- EXECUTION

3.01 INSTALLATION

A. All valve actuators shall be installed in accordance with the manufacturer's published recommendations and the applicable specification sections for valves, and motor controls.

B. Valve actuators shall be factory coated in accordance with the manufacturer's standard paint system.

3.02 SHOP TESTING

A. Shop testing shall be in accordance with Section 11000 - Equipment General Provisions and with the following additional requirements:

1. Conduct a complete functional check of each unit. Correct any deficiencies found in shop testing prior to shipment.

2. Submit written certification that:

   a. Shop tests for the electrical system and all controls were successfully conducted;

   b. Electrical system and all controls provide the functions specified and required for proper operation of the valve operator system.

3. Each actuator shall be performance tested and individual test certificates shall be supplied free of charge. The test equipment shall simulate each typical valve load and the following parameters should be recorded:

   a. Current at maximum torque setting

   b. Torque at maximum torque setting

   c. Flash Test Voltage

   d. Actuator Output Speed or Operating Time

   e. In addition, the test certificate should record details of specification, such as gear ratios for both manual and automatic drive, closing direction, and wiring diagram code number.

   f. Verification of actuator torque rating with valve.

3.04 FIELD TESTS

A. Field testing shall be in accordance with Section 11000 - Equipment General Provisions and with the following additional requirements:

1. Valve actuators shall be field-tested together with the associated valves.

2. Test all valves at the operating pressures at which the particular line will be used.

3. Test all valves for control operation as directed.

4. Field testing shall include optimization of opening and closing times of the valves. Valve opening and closing times shall be adjusted based on process requirements to optimize operation of the valves. Final valve opening and closing times as determined by field tests shall be approved by the Engineer prior to final acceptance of the system.

B. Preliminary Field Tests

1. General: Preliminary field tests shall be conducted prior to start-up and shall include a functional check of the entire valve operator system and all system components.

2. Scope: Preliminary field tests shall demonstrate that the valve operator system performs according to specifications and that all equipment, valves, controls, alarms, interlocks, etc., function properly.

3. Based on results of preliminary field tests, the CONTRACTOR shall make any adjustments required to settings, etc., to achieve the required valve closing time and operation, as specified or otherwise directed.

C. Final Field Tests

1. Final field tests shall be conducted in accordance with the latest revision of AWWA C500.

2. Final field tests shall be conducted simultaneously with the start-up and field testing of the pumps.

3. Final field tests shall be conducted for the full range of operating modes and conditions specified and as directed by the Engineer. Each of the valves shall be tested at minimum, maximum, and normal head/flow conditions, and under all specified conditions of opening and closing.

4. Certification of Equipment Compliance: After the final field tests are completed and passed, submit affidavit according to Section 11000 - Equipment General Provisions.

- END OF SECTION -

SECTION 15104

BALL VALVES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install ball valves, complete and operable, as shown and specified herein, including epoxy coating, appurtenances, operators, and accessories, all in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15095 - Valves, General

1.03 SUBMITTALS

A. Shop Drawings: Submit shop drawings in accordance with Section 01300, entitled "Submittals." The shop drawings shall include the following:

1. Manufacturer's standard literature.

2. Dimension drawings for all valves to be supplied.

3. Valve manufacture's recommended instructions for joining the valves and piping.

B. Operation and Maintenance Manuals: Submit operation and maintenance manuals in accordance with the section entitled "Submittals".

PART 2 -- PRODUCTS

2.01 PLASTIC BALL VALVES

A. Plastic ball valves shall be used at all PVC pipe installations where required, and be made of polyvinyl chloride (PVC) or chlorinated polyvinyl chloride (CPVC) as recommended by the Supplier for any specific applications. PVC shall be Class 12454-B or better, conforming to resin specification ASTM D1784. CPVC shall be Class 23447-B or better, conforming to resin specification ASTM D1784. All valves shall have manual operators, unless otherwise specified or shown.

B. All plastic ball valves shall have socket true union ends or flanged ends to ANSI B 16.5, class 150, for easy removal. The balls shall have full size ports and PTFE seats and shall be polished free of any imperfections. PTFE seats shall have elastomeric backing cushion of the same material as the valve seals. All body seals, union O-ring seals, and stem seals shall be Viton. The valves shall be suitable for a maximum working non-shock pressure of 230 psi at 73 degrees F for sizes ½" through 2" and 150 psi at 73 degrees F for sizes 2-1/2" through 6". The handle shall incorporate a tool for

adjustment of the seat carrier.

C. Suppliers or Equal

1. ASAHI-America;

2. IPEX;

3. Plast-o-matic.

2.02 STAINLESS STEEL BALL VALVES

A. Ball valves for use with stainless steel piping systems, including instrument isolation, air lines, and moisture drains shall be end entry type with type 316 stainless steel body and trim, Teflon seats and seals and flanged or threaded connections as indicated. Valve body shall be either two or three piece design, no internal ring for the ball shall be acceptable. Valves shall be class 150.

B. Valves shall be supplied with stainless steel manual lever or "T" handle. Valves used as moisture drain valves shall be installed at low points of the line and piped to drain.

C. Suppliers, or Equal

1. Jamesbury Corporation;

2. Jenkins Bros.;

3. Lunkenheimer Flow Control;

4. Wm. Powell Company;

5. Worcester Controls.

PART 3 -- EXECUTION

3.01 GENERAL

A. All valves shall be installed in accordance with provisions of Section 15095 entitled "Valves, General." Care shall be taken that all valves in plastic lines are well supported on each end of the valve.

B. All valves shall be tested to unidirectional or bi-directional shut-off as required by service conditions.

- END OF SECTION -

SECTION 15105

CHECK VALVES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Reference Section 15000, Basic Mechanical Requirements.

B. Valves intended for chemical service shall be constructed of materials suitable for the intended service.

PART 2 -- PRODUCTS

2.01 SWING CHECK VALVES (3-INCH AND LARGER) FOR LIQUID SERVICE

A. Unless otherwise indicated or specified, check valves 3-inches and larger shall be cushion swing check with outside lever and weights. Valves shall have Class 125 flanged ends faced and drilled in accordance with ANSI Standard. Check valves shall have cast iron bodies, with the following components of stainless steel: body ring, disc ring, clapper hinge shaft and assembly, shaft key, clapper spacers, disc stud, disc stud nut and bushing, disc retaining washer and cotter pin. The hinge pin shall extend outside the cast iron body through lubricated stainless steel bushings and outside packed glands on each side of the valve. Each bushing shall be provided with a buttonhead grease fitting. Stainless steel shall be at least 316 stainless steel. Check valves shall be provided with packing around the valve stems of material compatible with the fluid application. Check valves shall be tested at the factory and shall be drip tight under a hydrostatic pressure of 200 psi applied to the downstream side of the disc. A certified test report shall be furnished with each valve.

B. Suppliers, or Equal

1. Clow, 1106LW Series

2. G.A. Industries

2.02 SWING CHECK VALVES (2-1/2-INCH AND SMALLER) FOR LIQUID SERVICE

A. Swing check valves for steam, water, oil, or gas in sizes 2-1/2-inch and smaller shall be suitable for a steam pressure of 150 psi and a cold water pressure of 300 psi. They shall have screwed ends, unless otherwise shown, and screwed caps.

B. The valve body and cap shall be of bronze to ASTM B 61 with threaded ends to ANSI/ASME Bl.20.1.

C. Valves for steam service shall have bronze discs, and for cold water, oil, and gas service replaceable composition discs.

D. The hinge pins shall be of 316 stainless steel.

E. Suppliers

1. Crane Company.
2. Milwaukee Valve Company.
3. Stockham Valves and Fittings.
4. Val-Matic.
5. APCO; Series 800T.

2.03 SWING CHECK VALVES (PVC/CPVC)

A. Swing check valves (PVC/CPVC) shall be constructed of solid Class 12454-B PVC or Class 23447-B CPVC with EPDM or Teflon seats and seals. Valves shall have an external lever and weight. Check valves shall have flanged ends. Valves shall be capable of top entry to facilitate cleaning and repair without removal from the line. Valve shall incorporate a single disc design. Check valves shall be as manufactured by ASAHI/AMERICA, or equal.

2.04 BALL CHECK VALVES (PVC/CPVC)

A. Ball check valves (PVC/CPVC) shall be constructed of Class 12454-B PVC or Class 23447-B CPVC with EPDM seals and seats, as manufactured by Chemtrol Products Division of NIBCO, Inc., or equal. Valves shall have 150 psi minimum non-shock cold water pressure rating and integral union with screwed ends or as specified otherwise.

2.05 CHECK VALVES (PROCESS AIR)

A. Check valves (process air) shall be provided on the discharge of each of the new blower units. Check valves shall be as manufactured by TRW Mission, APCO, or equal, and shall be double-door type with cast iron bodies, ASTM A 126, Class B, and 125-pound standard flanged connections, or insert Type ANSI B16.34. Discs shall be ductile iron, electroless nickel coated, ASTM A 395, and shall be spring-loaded, normally closed, by means of two (2) 316 stainless steel springs which act independently, one on each of two hinged discs. Maximum spring deflection from neutral position for full open valve shall be 140. Valve seating shall be Butyl or Viton A, and shall provide a zero leakage at 5 to 25 psig at a work temperature of 225°F. Maximum pressure loss through check valves shall be:

Air Flow (scfm)	Pressure Loss Through Valve (inches water column)
11,000	1

2.06 LIMIT SWITCH

A. Where applicable, the Swing Check Valves shall be provided with a Limit Switch to remotely indicate the OPEN/CLOSE status.

B. The Limit Switch shall be manufactured by Allen-Bradley Model 802M, or equal. The Limit Switch shall be a Factory Sealed, Corrosion Resistance type switch with a spring return lever. The enclosure shall be rated NEMA-4, UL listed. The electrical rating of the switch shall be SPDT 15 AMPS @120 Volts A.C. The pre-wired switch cable shall include a common wire, normally open wire and normally closed wire.

C. The Check Valve manufacturer shall provide a solid mechanical support to secure the Limit Switch. The Limit Switch support shall also be provided with a mechanical adjustment to properly position the snapping of the Limit Switch.

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SECTION 15108

GATE VALVES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Reference Section 15000, Basic Mechanical Requirements.

PART 2 -- PRODUCTS

2.01 GATE VALVES

A. All gate valves between 2 inches and less than 4 inches shall be iron body, bronze trimmed, wedge disc, and minimum 150 psi non-shock cold water pressure rating. Exposed valves shall be of the outside screw and yoke (OS&Y), ANSI B-16.1, 125 pound flanges and shall be as manufactured by Clow, Mueller, Kennedy or equal.

B. Valves less than 2 inches shall be of bronze body, rising stem, wedge disc and minimum 300 psi non-shock cold water pressure rating. Valves shall have screwed ends or as specified otherwise.

C. Gate valves 4 inches through 16 inches shall be of the non-rising stem design, shall fully comply with the requirements of AWWA C509 for resilient-seated gate valves and shall be the Metroseal 250 as manufactured by U.S. Pipe and Foundry Co., or equivalent as manufactured by Clow, Mueller, kennedy or equal. Gate valves shall be designed for a minimum working pressure of 250 psi and a test pressure of 500 psi. Gate valve body and bonnet shall be cast iron conforming to ASTM A126, Class B with resilient seat gate and O-ring seals. The gate shall be cast iron with a vulcanized rubber coating with no metal to metal contact when in the fully closed position and a smooth unobstructed waterway when in the fully opened position.

D. Gate valves 18 inches and larger shall fully comply with the requirements of AWWA C500 and shall be double disc parallel seat with bypass and inside screw spur geared operator, unless otherwise specified or shown on the Drawings. Valves shall be as manufactured by Clow, Mueller, Kennedy or equal.

E. Barred valves shall be provided with non-rising stems, and with a 2-inch square standard AWWA operating nuts unless otherwise shown on the Drawings or specified herein.

F. All internal ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (10 mils min. dry film thickness) of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 15107

FIRE HYDRANTS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Reference Section 15000, Basic Mechanical Requirements.

PART 2 -- PRODUCTS

2.01 FIRE HYDRANTS

A. All fire hydrants shall be hub end, triple nozzle, approved AWWA type with two (2) 2-1/2-inch hose nozzles and one (1) 4-1/2-inch steamer nozzle with American National Standard hose threads and have a 6-inch bottom mechanical connection.

B. Hydrants shall have a 5-1/4-inch valve opening and shall be built in accordance with AWWA C502. Hydrants shall open left and have a National Standard Pentagon type operating nut (1-1/2-inch point to flat). Hydrants shall have a safety flange and a safety coupling on the valve stem. All hydrants shall be the Mueller Super Centurion A423HP, Clow Medallion, or equivalent as manufactured by M&H.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 15111

BERMAD CONTROL VALVES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Reference Section 15000, Basic Mechanical Requirements.

PART 2 -- PRODUCTS

2.01 BERMAD CONTROL VALVE

A. The BERMAD control valve shall be of the differential single acting type, closing off tightly when the water reaches the maximum predetermined level in the tank to prevent overflow; and opening to permit replenishing of the tank supply when the water level drops approximately 14 feet below the maximum level, as adjusted on the differential control pilot valve.

B. A hand operated valve in the power water line to the top of the piston shall permit adjustment of the speed of valve closing. The tank water level control shall be by means of a diaphragm operated, spring loaded, three way pilot which directs power water to or from the top of the main valve piston. The three way pilot shall be of Type 316 stainless steel construction. The diaphragm surface exposed to the tank head shall be not less than 57 sq. inches. It shall be possible to adjust the spring above the diaphragm for water level control approximately 20% above or below the factory setting.

C. The valve shall be completely piped ready for installation. Piping shall include a stop valve and piping connected to the tank side piping, blow-off valve and piping routed to the drain and a pressure gauge, all installed in accordance with the manufacturer's recommendations.

D. The main valve shall operate on the differential piston principle such that the area on the underside of the piston is no less than the pipe area, and the area on the upper surface of the piston is of a greater area than the underside of the piston.

E. The valve piston shall be guided on its outside diameter by long stroke stationary Vee ports which shall be downstream of the seating surface to minimize the consequences of throttling. Throttling shall be done by the valve Vee ports and not the valve seating surfaces.

F. The valve shall be capable of operating in any position and shall incorporate only one flanged cover at the valve top from which all internal parts shall be accessible. There shall be no stems, stem guides, or spokes within the waterway. There shall be no springs to assist the valve operation.

G. The valve body shall be of cast iron ASTM A-126 with flanges conforming to the latest ANSI Standards. The valve shall be extra heavy construction throughout. The valve interior trim shall be stainless steel as well as the main valve operation.

H. The valve seals shall be easily renewable while no diaphragm shall be permitted within the main valve body.

I. All controls and piping shall be of non-corrosive construction.

J. A visual valve position indicator shall be provided for observing the valve piston position at any time.

K. The valve shall be as manufactured by BERMAD model WW-12”-718-EN-C1-03-Y-C-A5-EB-5AC-NN-N With C1 Cage.

2.01 SOLENOID VALVES

A. Three-way two-position solenoid valves shall be of the two coil type. Both coils shall be normally closed and each shall open independently when energized. The valve shall be of forged brass-body and bonnet with a Buna "N" diaphragm and screwed ends. The solenoid's internal parts shall be of 300 and 400 series stainless steel. The valve shall have a safe body working pressure of 125 psi and shall be as manufactured by ASCO Valves, Automatic Switch Co., or equal, for 120V, 60 Hz, single phase operation. Solenoid enclosure shall be NEMA 4 watertight.

B. Two-way solenoid valves shall be normally closed and shall open when the solenoid is energized, unless otherwise noted. The valve shall be of forged brass-body and bonnet with a BUNA "N" diaphragm and screwed ends. The solenoid's internal parts shall be of 300 and 400 series stainless steel. The valve shall have a safe body working pressure of 125 psi, and shall be as manufactured by ASCO Valves, Automatic Switch Co., or equal, for 120 volt, 60 Hz, single phase operation. Solenoid enclosure shall be NEMA 4 watertight.

C. Four-way two-position solenoid valves shall be of the single coil type and shall be normally closed and shall open when the solenoid is energized (i.e. fail closed). The remainder of the four-way two-position solenoid valves shall be of the two coil type. Both coils shall be normally closed and each shall open independently when energized. The valve shall be of forged brass-body and bonnet with a Buna "N" diaphragm and screwed ends. The solenoid's internal parts shall be of 300 and 400 series stainless steel. The valve shall have a safe body working pressure of 125 psi and shall be as manufactured by ASCO Valves, Automatic Switch Co. or equal, for 120V, 60 Hz, single phase operation. Solenoid enclosure shall be NEMA 4 watertight. The solenoid valve shall be provided with a manual override.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 15114

MISCELLANEOUS VALVES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Reference Section 15000, Basic Mechanical Requirements.

B. Valves intended for chemical service shall be constructed of materials suitable for the intended service.

PART 2 -- PRODUCTS

2.01 AIR RELEASE VALVES (RECLAIMED WATER)

A. Air release valves shall be NSF approved and shall vent accumulating air while the system is in service and under pressure and shall be of the size shown. The valve shall have a cast iron body and cover. The internal mechanism shall be the compound lever type to permit the valve to open under pressure to vent pockets of entrapped air as they accumulate. The compound mechanism shall be activated by a stainless steel concave float to lift the Buna-N needle to shut off the air release orifice. Linkage shall be either delrin or stainless steel. The air release valves shall be designed for a working pressure of 150 psi. The valves shall be supplied with a bronze isolation shut-off gate valve.

B. All internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (10 mils min. dry film thickness) of the manufacturer's premium (NSF approved) epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.

C. Air release valves for potable water shall be APCO Series 200A or equivalent as manufactured by ARI (S-050C), Crispin (PL Series), or Val-Matic (15A – 50HP).

2.02 AIR/VACUUM VALVES

A. The Air/Vacuum valve shall be designed to allow large quantities of air to escape out the orifice during filling sequence and to close water tight when the liquid enters the valve. The Air/Vacuum valve shall also permit large quantities of air to enter thru the orifice when the system is being drained to break the vacuum. The discharge orifice area shall be equal or greater than the inlet area of the valve. The valve shall consist of a body, cover, baffle, float and seat. The cover shall have a male guide ring to fit a counter bore in the body for centering the float into the seat. Valve inlet diameter shall be as identified on the Drawings.

B. The baffle will be an integral part of the body designed to protect the float from direct

contact of the rushing air and water during exhausting cycle. The seat shall be compression molded Buna-N, fastened into a counter bore in the valve cover, with shoulder screws to prevent distortion and permit drop tight shut-off. The seat shall be field replaceable without special tools.

C. The float shall be stainless steel with a one piece center guide stem. The guide stem shall serve to guide the float thru stainless steel top and bottom bushings for positive shut-off into the Buna-N seat. The Air/Vacuum valve shall have a threaded outlet for connection of vent piping as shown on the Drawings.

D. Air/Vacuum valves shall be APCO Series 140/150 or equivalent as manufactured by ARI (Model K-020), Crispin (SA Series), Val-Matic (Model 301A – 308), or equal.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 15115

PVC/CPVC VALVES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Reference Section 15000, Basic Mechanical Requirements.

PART 2 -- PRODUCTS

2.01 MATERIALS OF CONSTRUCTION

A. Valves provided for chemical service shall be constructed of materials suitable for the intended service. PVC valves shall be provided in PVC piping and CPVC valves shall be provided in CPVC piping.

B. Valve bodies shall be constructed of Class 12454-B PVC or Class 23447-B CPVC.

C. Acceptable elastomer materials for each chemical service shall be as follows:

Chemical	Acceptable Elastomers
Drain (DR)	EPDM, Viton, Teflon, Buna N, Hypalon, Neoprene
Sample (SAM)	EPDM, Viton, Teflon, Buna N, Hypalon, Neoprene
Sodium Hypochlorite, 12.5% (SHC)	Viton, Teflon
Water (PSW, RCW, POT)	EPDM, Viton, Teflon, Buna N, Hypalon, Neoprene

2.02 PVC/CPVC BALL VALVES

A. Ball valves shall be full port and shall have 125 psi minimum non-shock cold water pressure rating. Valves shall have integral double unions with socket, screwed, or flanged ends as required and shall have removable handles. Valves shall be manufactured by ASAHI/AMERICA, Chemtrol Products Division of NIBCO, Inc., IPEX Industrial Thermoplastics, or equal. Valves for sodium hypochlorite service shall be vented type.

2.03 PVC/CPVC BALL CHECK VALVES

A. Ball check valves shall have 150 psi minimum non-shock cold water pressure rating and integral double unions with socket, screwed, or flanged ends as required. Valves shall be as manufactured by ASAHI/AMERICA, Chemtrol Products Division of NIBCO, Inc., IPEX Industrial Thermoplastics, or equal.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 15121

PIPING EXPANSION COMPENSATION

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Reference Section 15000, Basic Mechanical Requirements.

PART 2 -- PRODUCTS

2.01 RUBBER EXPANSION JOINTS

A. Rubber expansion joints shall be of the single wide arch design and shall be rated for 225°F (dry) or 210°F (wet). Units shall be provided with 316 stainless steel retaining rings. Exposed expansion joints shall be fully resistant to ultra violet degradation. Submerged expansion joints shall be fully resistant to attack from organisms or chemicals found in the associated process liquid.

B. Expansion joints shall be located as shown on the Drawings and shall be for either wet (W) or dry (D) service. The performance of the expansion joints shall be as indicated in the following table.

Nominal Pipe Diameter (In)	Minimum Required Movement		
	Comp. (In)	Elong. (In)	Lateral (In)
1-1-1/2	5/8	1/4	1/4
2-5	1-3/4	3/4	3/4
6-12	1-3/4	3/4	1
14-20	2	7/8	1-1/8
24-84	2-1/4	1	1-1/8

C. Control rods to prevent over extension shall be provided as indicated on the Contract Drawings or as required by the manufacturer. All expansion joints shall be the product of a single manufacturer.

D. Expansion joints shall be Style 1015 as manufactured by General Rubber Corporation, Red Valve Company, or equal.

- END OF SECTION -

SECTION 15183

REFRIGERANT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to all Sections.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Field refrigerant piping systems for direct expansion HVAC system.

1.03 QUALITY ASSURANCE

A. Comply with ASHRAE Standard 15, Safety Code for Mechanical Refrigeration. The application of this Code is intended to assure the safe design, construction, installation, operation, and inspection of every refrigerating system employing a fluid which normally is vaporized and liquefied in its refrigerating cycle.

B. Comply with ASME B31.5: Refrigerant Piping and Heat Transfer Components.

C. Products shall comply with UL 207 "Refrigerant–Containing Components and Accessories, "Nonelectrical"; or UL 429 "Electrical Operated Valves."

1.04 SUBMITTALS

A. The Contractor shall submit shop drawings on all equipment, accessories and appurtenances and all fabrication work or other mechanical and air conditioning work required, all in accordance with the requirements of Division 1, Submittals.

B. The Contractor shall submit operation and maintenance manual in accordance with the procedures and requirements set forth in the General Conditions and Division 1.

C. Shop Drawings:

1. Complete information for components noted, including valves and refrigerant piping accessories, clearly presented, shall be included to determine compliance with drawings and specifications for components noted below:

    a. Tubing and fittings.

    b. Valves.

    c. Strainers.

    d. Moisture liquid indicators.

e. Filter driers.

f. Flexible metal hose.

g. Liquid suction interchanges.

h. Oil separators (when specified).

i. Gages.

j. Pipe and equipment supports.

k. Refrigerant and oil.

l. Pipe/conduit.

m. Soldering and brazing materials.

n. Underground CPVC conduit and fittings.

D. Certification: Copies of certificates for welding procedure, performance qualification record and list of welders' names and symbols.

E. Design Manual: Furnish two copies of design manual for refrigerant valves and accessories.

PART 2 - PRODUCTS

2.01 PIPING AND FITTINGS

A. Refrigerant Piping: For piping up to 4 inch use Copper refrigerant tube, ASTM B280, cleaned, dehydrated and sealed, marked ACR on hard temper straight lengths. Coils shall be tagged ASTM B280 by the manufacturer. For piping over 4 inch use A53 Black SML steel.

B. Condensate Drain Piping: Drain piping shall be DWV schedule 40 PVC, ASTM D2665. Chemical welded fittings with solvent as recommended by piping manufacturer.

C. Underground Refrigerant Piping Conduit: Install underground refrigerant piping in CPVC schedule 40 conduits with long radius elbows.

D. Fittings, Valves and Accessories:

1. Copper fittings: Wrought copper fittings, ASME B16.22.

a. Brazed Joints, refrigerant tubing: Cadmium free, AWS A5.8/A5.8M. Provide Harris Products Stay Silv 15 Brazing Filler Metal, or equal. No flux required for copper to copper connections. Stay Silv white brazing flux for brass or bronze.

2. Steel fittings: ASTM wrought steel fittings.

a. Refrigerant piping – Welded Joints.

3. Steel Flanges and flanged fittings: ASME B16.24.

4. Refrigeration Valves:

   a. Stop Valves: Brass or bronze alloy, packless, or packed type with gas tight cap, frost proof, back seating.

   b. Pressure Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; UL listed. Forged brass with nonferrous, corrosion resistant internal working parts of high strength, cast iron bodies conforming to ASTM A126, Grade B. Set valves in accordance with ASHRAE Standard 15.

   c. Solenoid Valves: Comply with ARI 760 and UL 429, UL-listed, two-position, direct acting or pilot-operated, moisture and vapor proof type of corrosion resisting materials, designed for intended service, and solder-end connections. Fitted with suitable NEMA 250 enclosure of type required by location.

   d. Thermostatic Expansion Valves: Comply with ARI 750. Brass body with stainless-steel or non-corrosive nonferrous internal parts, diaphragm and spring-loaded (direct-operated) type with sensing bulb and distributor having side connection for hot-gas bypass and external equalizer. Size and operating characteristics as recommended by manufacturer of evaporator and factory set for superheat requirements. Solder-end connections. Testing and rating in accordance with ASHRAE Standard 17.

   e. Check Valves: Brass or bronze alloy with swing or lift type, with tight closing resilient seals for silent operation; designed for low pressure drop, and with solder-end connections. Direction of flow shall be legibly and permanently indicated on the valve body.

5. Strainers: Designed to permit removing screen without removing strainer from piping system, and provided with screens 80 to 100 mesh in liquid lines DN 25 (NPS 1) and smaller, 60 mesh in liquid lines larger than DN 25 (NPS 1), and 40 mesh in suction lines. Provide strainers in liquid line serving each thermostatic expansion valve, and in suction line serving each refrigerant compressor not equipped with integral strainer.

6. Refrigerant Moisture/Liquid Indicators: Double ported type having heavy sight glasses sealed into forged bronze body and incorporating means of indicating refrigerant charge and moisture indication. Provide screwed brass seal caps.

7. Refrigerant Filter Dryers: UL listed, angle or in line type, as shown on drawings. Conform to ARI Standard 730 and ASHRAE Standard 63.1. Heavy gage steel shell protected with corrosion-resistant paint; perforated baffle plates to prevent desiccant bypass. Size as recommended by manufacturer for service and capacity of system with connection not less than the line size in which installed. Filter driers with replaceable filters shall be furnished with one spare element of each type and size.

8. Flexible Metal Hose: Seamless bronze corrugated hose, covered with bronze wire braid, with standard copper tube ends. Provide in suction and discharge

piping of each compressor.

9. Oil Separators: Provide for condensing units, as shown. All welded steel construction with capacity to eliminate a minimum of 95 percent of the oil from the hot gas flowing through it. Provide manufacturer's published ratings for minimum and maximum refrigeration tonnage corresponding to this oil separating efficiency. Separator shall be equipped with a float valve to prevent return of the hot gas to crankcase, and shall have isolating stop valves so it can be opened and services without pumping out any other part of the system. ASME construction or UL listed.

E. Refrigerant Piping Lines: Line sets shall be coated, after field installation and testing, with HERESITE ES-600 air dry phenolic coating system. Coating system shall be applied within 16 hours after line installation. Underground piping installed in CPVC conduit does not require coating.

2.02 GAGES

A. Temperature Gages: Comply with ASME B40.200. Industrial duty type and in required temperature range for service in which installed. Gages shall have Celsius scale in 1-degree (Fahrenheit scale in 2-degree) graduations and with black number on a white face. The pointer shall be adjustable. Rigid stem type temperature gages shall be provided in thermal wells located within 1525 mm (5 feet) of the finished floor. Universal adjustable angle type or remote element type temperature gages shall be provided in thermal wells located 1525 to 2135 mm (5 to 7 feet) above the finished floor. Remote element type temperature gages shall be provided in thermal wells located 2135 mm (7 feet) above the finished floor.

B. Vacuum and Pressure Gages: Comply with ASME B40.100 and provide with throttling type needle valve or a pulsation dampener and shut-off valve. Gage shall be a minimum of 90 mm (3-1/2 inches) in diameter with a range from 0 kPa (0 psig) to approximately 1.5 times the maximum system working pressure. Each gage range shall be selected so that at normal operating pressure, the needle is within the middle-third of the range.

1. Suction: 101 kPa (30 inches Hg) vacuum to 1723 kPa (gage) (250 psig).

2. Discharge: 0 to 3445 kPa (gage) (0 to 500 psig).

2.03 REFRIGERANT AND OIL

A. Provide EPA approved refrigerant and oil for proper system operation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install refrigerant piping and refrigerant containing parts in accordance with ASHRAE Standard 15 and ASME B31.5

1. Install piping as short as possible, with a minimum number of joints, elbow and fittings.

2. Install piping with adequate clearance between pipe and adjacent walls and hangers to allow for service and inspection. Space piping, including insulation, to provide 25 mm (1 inch) minimum clearance between adjacent piping or other surface. Use pipe sleeves through walls, floors, and ceilings, sized to permit installation of pipes with full thickness insulation.

3. Locate and orient valves to permit proper operation and access for maintenance of packing, seat and disc. Generally locate valve stems in overhead piping in horizontal position. Provide a union adjacent to one end of all threaded end valves. Control valves usually require reducers to connect to pipe sizes shown on the drawing.

4. Use copper tubing in protective CPVC conduit when installed below ground.

5. Install hangers and supports per ASME B31.5 and the refrigerant piping manufacturer's recommendations.

B. Joint Construction:

1. Brazed Joints: Comply with AWS "Brazing Handbook" and with filler materials complying with AWS A5.8/A5.8M.

a. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper tubing.

b. Use Type BAg, cadmium-free silver alloy for joining copper with steel.

c. Swab fittings and valves with manufacturer's recommended cleaning fluid to remove oil and other compounds prior to installation.

d. Pass nitrogen gas through the pipe or tubing to prevent oxidation as each joint is brazed. Cap the system with a reusable plug after each brazing operation to retain the nitrogen and prevent entrance of air and moisture.

C. Protect refrigerant system during construction against entrance of foreign matter, dirt and moisture; have open ends of piping and connections to compressors, condensers, evaporators and other equipment tightly capped until assembly.

D. Pipe relief valve discharge to outdoors for systems containing more than 45 kg (100 lbs) of refrigerant.

E. Firestopping: Fill openings around uninsulated piping penetrating floors or fire walls, with firestop material.

3.02 SIGNS AND IDENTIFICATION

A. Each refrigerating system erected on the premises shall be provided with an easily legible permanent sign securely attached and easily accessible, indicating thereon the name and address of the installer, the kind and total number of pounds of refrigerant required in the system for normal operations, and the field test pressure applied.

B. Systems containing more than 50 kg (110 lb) of refrigerant shall be provided with durable signs, in accordance with ANSI A13.1 and ANSI Z535.1, having letters not less than 13 mm (1/2 inch) in height designating:

1. Valves and switches for controlling refrigerant flow, the ventilation and the refrigerant compressor(s).

2. Signs on all exposed high pressure and low pressure piping installed outside the machinery room, with name of the refrigerant and the letters "HP" or "LP."

3.03 FIELD QUALITY CONTROL

A. Prior to initial operation examine and inspect piping system for conformance to plans and specifications and ASME B31.5. Correct equipment, material, or work rejected because of defects or nonconformance with plans and specifications, and ANSI codes for pressure piping.

B. After completion of piping installation and prior to initial operation, conduct test on piping system according to ASME B31.5. Furnish materials and equipment required for tests. Perform tests in the presence of Owner’s representative. If the test fails, correct defects and perform the test again until it is satisfactorily done and all joints are proved tight.

1. Every refrigerant-containing parts of the system that is erected on the premises, except compressors, condensers, evaporators, safety devices, pressure gages, control mechanisms and systems that are factory tested, shall be tested and proved tight after complete installation, and before operation.

2. The high and low side of each system shall be tested and proved tight at not less than the lower of the design pressure or the setting of the pressure relief device protecting the high or low side of the system, respectively, except systems erected on the premises using non-toxic and non-flammable Group A1 refrigerants with copper tubing not exceeding DN 18 (NPS 5/8). This may be tested by means of the refrigerant charged into the system at the saturated vapor pressure of the refrigerant at 20 degrees C (68 degrees F) minimum.

C. Test Medium: A suitable dry gas such as nitrogen or shall be used for pressure testing. The means used to build up test pressure shall have either a pressure limiting device or pressure-reducing device with a pressure-relief device and a gage on the outlet side. The pressure relief device shall be set above the test pressure but low enough to prevent permanent deformation of the system components.

3.04 SYSTEM TEST AND CHARGING

A. System Test and Charging: As recommended by the equipment manufacturer or as follows:

1. Connect a drum of refrigerant to charging connection and introduce enough refrigerant into system to raise the pressure to 70 kPa (10 psi) gage. Close valves and disconnect refrigerant drum. Test system for leaks with halide test torch or other approved method suitable for the test gas used. Repair all leaking joints and retest.

2. Connect a drum of dry nitrogen to charging valve and bring test pressure to design pressure for low side and for high side. Test entire system again for leaks.

3. Evacuate the entire refrigerant system by the triplicate evacuation method with a vacuum pump equipped with an electronic gage reading in mPa (microns). Pull the system down to 665 mPa (500 microns) 665 mPa (2245.6 inches of mercury at 60 degrees F) and hold for four hours then break the vacuum with dry nitrogen (or refrigerant). Repeat the evacuation two more times breaking the third vacuum with the refrigeration to be charged and charge with the proper volume of refrigerant.

- END OF SECTION -

SECTION 15260

PIPE INSULATION

PART 1 - GENERAL

1.01 SCOPE

A. Contractor shall furnish all labor, material, equipment and incidentals to provide insulation with all accessories as shown and specified.

1.02 QUALITY ASSURANCE

A. Design Criteria: Insulation systems including covering, mastics, adhesives, sealers and facings shall have the following fire hazard classifications:

1. Flame spread, 25 maximum.

2. Fuel contributed, 50 maximum.

3. Smoke developed, 50 maximum.

B. Source Quality Control: Perform the following tests and inspections at the factory:

1. Flame spread.

2. Smoke developed.

3. Fuel contributed.

C. Requirements of Regulatory Agencies:

1. Permits: Contractor shall obtain and pay for all required fees, inspections and approvals by authorities having jurisdiction.

2. Building Codes: Comply with applicable requirements of all State and local building codes.

3. Underwriters' Laboratories, Incorporated.

4. National Fire Protection Association.

D. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified:

1. ASTM C 534.

2. ASTM E 84.

3. ASTM G22.

4. ASTM G21, ASTM C 1338.

E. Field Measurements: Take field measurements where required prior to installation to ensure proper fitting of Work.

1.03 SUBMITTALS

A. Shop Drawings: Submit for approval Shop Drawings showing the following:

1. Manufacturers' catalog literature, specifications, and illustrations with the following information:

a. Thermal properties.

b. Physical properties.

c. Fire hazard ratings.

d. Facing information.

e. Installation instructions.

f. Insulation Jackets.

g. Jointing recommendations for butt joints and longitudinal seam.

2. Fabrication instructions for duct fittings and valve insulation and coatings.

1.04 PRODUCT DELIVER, STORAGE AND HANDLING

A. Delivery of Material: Material shall be delivered to the job site in corrugated cartons.

B. Storage of Material:

1. Store material in clean, dry area, out of the weather.

2. Material shall be tightly covered to protect against dirt, water, mechanical injury or chemical damage.

3. Material shall remain in original cartons till time of installation.

1.05 JOB CONDITIONS

A. Protection:

1. All material applied in one day shall have the vapor barrier applied the same day and any exposed ends shall be temporarily protected with a moisture barrier and sealed to the duct.

2. Insulating materials shall, at all times, be protected from moisture.

3. Material shall be warehoused on or near the job site and drawn from this protected area as used.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe Insulation:

1. Manufacturer: Provide one of the following:

a. Armacell, LLC. Armaflex..

b. Nomaco, K-Flex.

c. Aeroflex, Aerocell.

d. Or Approved Equal.

2. Insulation material shall be a flexible, closed-cell elastomeric insulation and meet the requirements of ASTM C 534.

3. Material shall have a flame spread index of less than 25 and a smoke-developed index of less than 50 when tested in accordance with ASTM E 84, latest revision. In addition, the product, when tested shall not melt or drip flaming particles, the flame shall not be progressive and all materials shall pass simulated end-use fire tests.

4. Materials shall have a maximum thermal conductivity of 0.25 Btu-in./h-ft2- °F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518, latest revisions.

5. Materials shall have a maximum water vapor transmission of 0.05 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision.

6. The material shall be manufactured under an independent third party supervision testing program covering the properties of fire performance, thermal conductivity and water vapor transmission.

7. Temperature Range: -40° F to +200° F, ASTM C 411.

8. Field-Applied Jacket: ASTM B209, 0.016” Aluminum jacket with moisture barrier sealed water tight. Longitudinal slip joint with 2 inch laps. Fittings 0.016” thick die shaped fitting covers with factory attached protective liner. Finish shall be embossed.

PART 3 - EXECUTION

3.01 INSPECTION

A. Ensure that surfaces of pipes and fittings are clean and dry before applying insulation.

3.02 PREPARATION

A. Ensure that piping has been inspected and released for application of insulation.

3.03 INSTALLATION

A. Pipe insulation shall be continuous through walls and floor openings except where walls or floors are required to be fire-stopped or required to have a fire resisting rating.

B. Insulation shall be applied to clean, dry piping and equipment. All pipe systems shall be pressure tested, and any leaks sealed prior to installation of insulation systems. Compression joints with adhesive applied shall be used on all butt edges.

C. Follow manufacturer's application instructions for all materials used.

3.04 APPLICATION

A. Condensate Pipe Insulation: 0.5” elastomeric.

B. Pipe Supports and Wall Penetrations. 2.0” calcium silicate.

C. Refrigerant Pipe Insulation Thickness: 1.0”.

D. Field Applied Jacket: Exposed Insulation.

3.05 FIELD QUALITY CONTROL

A. Ensure that insulation is dry when installed, and before and during application of any finish.

- END OF SECTION -

SECTION 15300

DUCTWORK INSULATION

PART 1 - GENERAL

1.01 SCOPE

A. Contractor shall furnish all labor, material, equipment and incidentals to provide insulation for ductwork with all accessories as shown and specified.

1.02 QUALITY ASSURANCE

A. Design Criteria: Insulation systems including covering, mastics, adhesives, sealers and facings shall have the following fire hazard classifications:

1. Flame spread, 25 maximum.

2. Fuel contributed, 50 maximum.

3. Smoke developed, 50 maximum.

B. Source Quality Control: Perform the following tests and inspections at the factory:

1. Flame spread.

2. Smoke developed.

3. Fuel contributed.

C. Requirements of Regulatory Agencies:

1. Permits: Contractor shall obtain and pay for all required fees, inspections and approvals by authorities having jurisdiction.

2. Building Codes: Comply with applicable requirements of all State and local building codes.

3. Underwriters' Laboratories, Incorporated.

4. National Fire Protection Association.

D. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified:

1. ASTM C 534.

2. ASTM E 84.

3. ASTM G22.

4. ASTM G21, ASTM C 1338.

E. Field Measurements: Take field measurements where required prior to installation to ensure proper fitting of Work.

1.03 SUBMITTALS

A. Shop Drawings: Submit for approval Shop Drawings showing the following:

1. Manufacturers' catalog literature, specifications, and illustrations with the following information:

a. Thermal properties.

b. Physical properties.

c. Fire hazard ratings.

d. Facing information.

e. Installation instructions.

f. Jointing recommendations for butt joints and longitudinal seam.

2. Fabrication instructions for duct fittings and valve insulation and coatings.

1.04 PRODUCT DELIVER, STORAGE AND HANDLING

A. Delivery of Material: Material shall be delivered to the job site in corrugated cartons.

B. Storage of Material:

1. Store material in clean, dry area, out of the weather.

2. Material shall be tightly covered to protect against dirt, water, mechanical injury or chemical damage.

3. Material shall remain in original cartons till time of installation.

1.05 JOB CONDITIONS

A. Protection:

1. All material applied in one day shall have the vapor barrier applied the same day and any exposed ends shall be temporarily protected with a moisture barrier and sealed to the duct.

2. Insulating materials shall, at all times, be protected from moisture.

3. Material shall be warehoused on or near the job site and drawn from this protected area as used.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Indoor Insulation:

1. Manufacturer: Provide one of the following:

a. Aeroflex, Aerocell.

b. Armacell, Armaflex.

c. Nomaco, K-flex.

2. Insulation material shall be a flexible, closed-cell elastomeric insulation and meet the requirements of ASTM C 534.

3. Material shall have a flame spread index of less than 25 and a smoke-developed index of less than 50 when tested in accordance with ASTM E 84, latest revision. In addition, the product, when tested shall not melt or drip flaming particles, the flame shall not be progressive and all materials shall pass simulated end-use fire tests.

4. Materials shall have a maximum thermal conductivity of 0.25 Btu-in./h-ft2- °F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518, latest revisions.

5. Materials shall have a maximum water vapor transmission of 0.05 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision.

6. The material shall be manufactured under an independent third-party supervision testing program covering the properties of fire performance, thermal conductivity and water vapor transmission.

7. Supply and Outside Air Intake Duct Insulation Thickness: 1.5".

8. Temperature Range: -40° F to +200° F, ASTM C 411.

9. Exposed Insulation Field-Applied Jacket: ASTM B209, 0.016" thick Aluminum jacket with moisture barrier sealed water tight. Longitudinal slip joints and 2 inch laps. Fittings 0.016" thick die shaped fitting covers with factory attached protective liner. Jacket bands shall be 3/8 inch wide; 0.015 inch thick aluminum. Finish shall be embossed.

PART 3 - EXECUTION

3.01 INSPECTION

A. Ensure that surfaces of ducts and fittings are clean and dry before applying insulation.

3.02 PREPARATION

A. Ensure that ductwork has been inspected and released for application of insulation.

3.03 INSTALLATION

A. Duct insulation shall be continuous through walls and floor openings except where walls or floors are required to be fire-stopped or required to have a fire resisting rating.

B. Insulation shall be applied to clean, dry ductwork and equipment. All duct systems shall be pressure tested, and any leaks sealed prior to installation of insulation systems. Compression joints with adhesive applied shall be used on all butt edges.

C. Follow manufacturer's application instructions for all materials used.

3.04 FIELD QUALITY CONTROL

A. Ensure that insulation is dry when installed, and before and during application of any finish.

- END OF SECTION -

SECTION 15500

BASIC HVAC REQUIREMENTS

PART 1 – GENERAL

RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The Contractor shall furnish all labor, equipment and material for the complete installation of the heating, ventilation, air conditioning systems as indicated on the drawings and specified herein.

B. Air conditioning systems shall be furnished and installed to operate as a system. The Contractor shall coordinate all requirements between manufacturers to insure unit responsibility and compatibility of the systems. Similar type of equipment shall be by the same manufacturer.

C. Control wiring between Control Panels and to field devices and equipment shall be provided under this Section in accordance with the requirements specified in Division 16, Electrical.

D. Work Included Under Other Sections:

1. 480V, 208V and 120V wiring under Division 16, Electrical.

2. All electrical conduits under Division 16, Electrical.

3. Motor starters under Division 16, Electrical, unless factory mounted and wired by equipment manufacturer.

1.03 SCHEDULES ON DRAWINGS

A. In general, all capacities of equipment and motor and starter characteristics are shown in schedules on the Drawings. Reference shall be made to the schedules for such information. The capacities shown are minimum capacities. Variations in capacities of the scheduled equipment supplied under this Contract will be permitted only with the written direction of the Engineer.

B. Motors and wheel diameters shown on the schedules are the minimum. If a larger wheel diameter or horsepower is required, it shall be so quoted and noted.

1.04 SUBMITTALS

A. The Contractor shall submit shop drawings on all equipment, accessories and appurtenances and all fabrication work or other mechanical and air conditioning work required, all in accordance with the requirements of Section 01300, Submittals.

B. Data to be submitted shall include but not be limited to:

1. Catalog data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the various parts and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.

2. Complete assembly and installation drawings with clearly marked dimensions. This information shall be in sufficient detail to serve as a guide for assembly and disassembly and for ordering parts.

3. Weight of all component parts and assembled weight.

4. Electrical characteristics, wiring diagrams and control panels.

5. Sample data sheet of equipment nameplate(s) including information contained thereon.

6. Insulation materials, coating, jackets, material density, thermal conductivity and thickness of all insulation materials to be furnished.

7. Details of special fasteners and accessories.

8. Proposed insulation procedures and installation methods.

9. Spare parts list.

C. The Contractor shall obtain from the manufacturer and submit to the engineer copies of the results of all certified shop tests.

1.05 OPERATIONS AND MAINTENANCE MANUALS

A. The Contractor shall submit operation and maintenance manual in accordance with the procedures and requirements set forth in the General Conditions and Division 1.

B. Operation and Maintenance Manuals shall be submitted for all equipment.

1.06 MANUFACTURER'S INSTRUCTIONS

A. Installation of all equipment shall be in accordance with manufacturer's data.

B. All changes from the installation procedures in manufacturers' data shall be submitted for approval in accordance with the requirements for shop drawings.

C. Keep all manufacturers' data provided in a secure manner at the job site at all times. Catalog and index this data for convenient reference.

D. Manufacturers' data shall be available for the information of the Owner, Engineer, and the use of other trades.

E. Turn over all data to the Owner through the Owner's representative at completion of the Work and final testing.

F. Submit all instruction books and manuals in accordance with Division 1.

1.07 CODES, PERMITS AND STANDARDS

A. The Contractor shall obtain and pay for all permits (unless specifically excluded under Division 1 requirements) and shall comply with all laws and codes that apply to the Work.

B. The Contractor shall be responsible for all added expense due to his choice of equipment, materials or construction methods.

C. All work and materials shall be in full accordance with the latest State rules and regulations or publications including those of the State Fire Marshall, Mechanical Code, Energy Code, and all local codes. Nothing in the Plans and/or Specifications shall be construed to permit work not conforming to the above codes, rules and regulations.

D. All equipment, materials and installations shall conform to the requirements of the most recent edition with latest revisions, supplements and amendments of the following, as applicable:

1. Air Conditioning and Refrigeration Institute (ARI).

2. Air Diffusion Council (ADC).

3. Air Moving and Conditioning Association (AMCA).

4. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE).

5. American National Standards Institute (ANSI).

6. American Society for Testing and Materials (ASTM).

7. American Society of Mechanical Engineers (ASME).

8. Factory Mutual (FM).

9. National Electric Code (NEC).

10. NFPA 90A Air Conditioning and Ventilation Systems 2009 edition.

11. Occupational Safety and Health Standards (OSHA).

12. Sheet Metal & Air Conditioning Contractors National Association (SMACNA).

13. Florida Building Code.

14. Florida Mechanical Code.

15. Local codes, ordinances and statutes.

16. Underwriters Laboratories (UL).

17. Others as designated in the specifications.

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified for HVAC systems and/or shown on the HVAC Drawings shall have minimum five (5) years documented experience and shall issue complete catalog data on total product. References shall be provided if requested of Engineer.

B. The Manufacturer of the equipment shall provide documentation supporting compliance with ISO-9000:2000 (Model for Quality Assurance in Design/Development, Production, Installation and Servicing). Product literature provided by the manufacturer shall contain the ISO-9000:2000 Certification Mark from the applicable registrar.

C. All material and equipment shall be the latest design, new, not deteriorated, and the first quality standard product of manufacturers regularly engaged in the production of such material and equipment.

D. When two or more units of the same class of material or equipment are required, they shall be products of a single manufacturer.

E. All work shall be performed in a neat and workmanlike manner by workers skilled in their respective trades, and all materials and equipment shall be installed as recommended by the manufacturers and in accordance with specified codes and standards.

F. Touch up and/or repaint to match original factory finishes for all finished or painted equipment and materials which are scratched or marred during shipment or installation.

1.09 IDENTIFICATION MARKERS

A. Provide manufacturer's standard laminated plastic, color coded duct markers. Conform to the following color codes:

1. Yellow/Green: Supply air.

2. Blue: Exhaust, outside, return and mixed air.

3. Nomenclature: Include the following: Direction of air flow.

4. Control ID Placard: Include identification for all control elements listing units being controlled by control devices.

PART 2 – PRODUCTS

2.01 GENERAL

A. Each item of equipment shall be furnished and installed complete with all supports, mounting frames, duct work, piping, louvers, panels, grilles, electric drive units and controls, mechanical equipment, electrical work, insulation and appurtenances ready for operation.

B. All equipment and appurtenances shall be anchored or connected to supporting members as specified or as indicated on the Plans.

C. All mechanisms or parts shall be amply proportioned for the stresses which may occur during operation or for any other stresses which may occur during fabrication and erection. Individual parts furnished which are alike in all units shall be alike in workmanship, design, and materials and shall be interchangeable. All equipment shall be of the manufacturer's top line, industrial commercial grade.

D. The Contractor shall ascertain that all chassis, shafts, and openings are correctly located otherwise he shall cut all new openings required at his own expense. Cutting of new openings shall be coordinated with other trades. Proposed new cutting shall be submitted to the Engineer for review and acceptance prior to cutting.

E. The Plans shall be taken as diagrammatic. The Contractor shall check the Structural Plans and sections for detail dimensions and clearances. Sizes of ducts and their locations are indicated, but not every offset, fitting, or structural obstruction is shown.

F. Alignment of ducts may be varied where necessary to account for slight architectural changes or to avoid conflict with the Work of other trades without additional expense to the Owner.

G. All supports required for the proper installation of the equipment, but not forming an integral part of the building structure, shall be provided, unless specifically noted otherwise. Equipment shall be supported on spring type vibration isolators.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Floor mounted equipment shall be installed on a minimum 4-inch high housekeeping pad.

3.02 CLEANING

A. Clean dirt and marks and other debris from exterior of equipment weekly.

B. Remove debris and waste material resulting from installation weekly.

- END OF SECTION

SECTION 15590

FANS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. The Contractor shall furnish all labor, equipment and material for the complete installation of the fans as indicated on the Drawings and specified herein.

B. Fans systems shall be furnished and installed to operate as a system. The Contractor shall coordinate all requirements between manufacturers to insure unit responsibility and compatibility of the systems.

C. Control wiring and conduit between Control Panels and to field devices (including dampers) and equipment shall be provided under this Section in accordance with the requirements specified in Division 16, Electrical.

D. Work Included Under Other Sections:

1. 480V, 3-phase power wiring and conduit under Division 16, Electrical.

2. Motor starters under Division 16, Electrical, unless factory mounted and wired by equipment manufacturer.

3. 120V, 1-phase wiring and conduit to Control Panels under Division 16, Electrical.

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings on all equipment, accessories and appurtenances and all fabrication work or other mechanical and air conditioning work in accordance with the requirements of Section 01300, Submittals.

B. Data to be submitted shall include but not be limited to:

1. Catalog data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the various parts and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.

2. Complete assembly and installation drawings with clearly marked dimensions. This information shall be in sufficient detail to serve as a guide for assembly and

disassembly and for ordering parts.

3. Weight of all component parts and assembled weight.

4. Electrical characteristics, wiring, diagrams, etc.

5. Sample data sheet of equipment nameplate(s) including information contained thereon.

6. Details of special fasteners and accessories.

7. Spare parts list.

8. Special tools list.

C. The Contractor shall obtain from the manufacturer and submit to the Engineer copies of the results of all certified shop tests.

D. The Contractor shall obtain from the manufacturer and submit to the Engineer copies of certified letters of compliance in accordance with the Specifications.

E. The Contractor shall submit operation and maintenance manual in accordance with the procedures and requirements set forth in the General Conditions and Division 1. Operation and Maintenance Manuals shall be submitted for all equipment.

1. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists and wiring diagrams.

2. In addition to a full set of manuals with closeout documentation, each unit shall ship with its own manual in a watertight enclosure.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to the Project Site under the provisions of Division 1.

B. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures and finish.

D. Protect openings in casing and seal them with plastic wrap to keep dirt and debris. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.05 EXTRA MATERIALS

A. Provide one additional set of specified fan belts, and sheaves for each unit, packaged for storage. Tag products to identify associated unit.

1.06 SCHEDULES ON DRAWINGS

A. In general, all capacities of equipment and motor and starter characteristics are shown in schedules on the Drawings. Reference shall be made to the schedules for such information. The capacities shown are minimum capacities. Variations in capacities of the scheduled equipment supplied under this Contract will be permitted only with the written direction of the Engineer.

B. Motors and wheel diameters shown on the schedules are the minimum. If a larger wheel diameter or horsepower is required, it shall be so quoted and noted.

1.07 MANUFACTURER'S INSTRUCTIONS

A. Installation of all equipment shall be in accordance with manufacturer's data.

B. All changes from the installation procedures in manufacturers' data shall be submitted for approval in accordance with the requirements for shop drawings.

C. Keep all manufacturers' data provided in a secure manner at the job site at all times. Catalog and index this data for convenient reference.

D. Manufacturers' data shall be available for the information of the Owner, Engineer, and the use of other trades.

E. Turn over all data to the Owner through the Owner's representative at completion of the Work and final testing.

F. Submit all instruction books and manuals in accordance with Division 1.

1.08 CODES, PERMITS AND STANDARDS

A. The Contractor shall obtain and pay for all permits (unless specifically excluded under Division 1 requirements) and shall comply with all laws and codes that apply to the Work.

B. The Contractor shall be responsible for all added expense due to his choice of equipment, materials or construction methods.

C. All work and materials shall be in full accordance with the latest State rules and regulations or publications including those of the State Fire Marshall, the Florida Mechanical and Energy Codes, and all local codes. Nothing in the Plans and/or Specifications shall be construed to permit work not conforming to the above codes, rules and regulations.

D. All equipment, materials and installations shall conform to the requirements of the most recent edition with latest revisions, supplements and amendments of the following, as applicable:

1. Air Diffusion Council (ADC)

2. Air Moving and Conditioning Association (AMCA)

3. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE)

4. American National Standards Institute (ANSI)

5. American Society for Testing and Materials (ASTM)

6. American Society of Mechanical Engineers (ASME)

7. Factory Mutual (FM)

8. National Electric Code (NEC)

9. NFPA 90A Air Conditioning and Ventilation Systems 2009 edition

10. Occupational Safety and Health Standards (OSHA)

11. National Roofing Contractors Association (NRCA)

12. Sheet Metal & Air Conditioning Contractors National Association (SMACNA)

13. Underwriters Laboratories (UL)

14. Others as designated in the specifications.

1.09 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience, who issues complete catalog data on total product.

B. All material and equipment shall be the latest design, new, not deteriorated, and the first quality standard product of manufacturers regularly engaged in the production of such material and equipment.

C. Performance ratings: Conform to AMCA standard 211 and 311. Fans must be tested in accordance with ANSI/AMCA Standard 210-99 and AMCA Standard 300-96 in an AMCA accredited laboratory. Fans shall be certified to bear the AMCA label for air and sound performance seal.

D. Classification for Spark Resistant Construction, levels A, B, and C conform to AMCA 99.

E. The High Wind models shall be analyzed and stamped by a state license P.E. to the ASCE Standard which meets the Florida codes.

F. When two or more units of the same class of material or equipment are required, they shall be products of a single manufacturer.

G. All work shall be performed in a neat and workmanlike manner by workers skilled in their respective trades, and all materials and equipment shall be installed as recommended by the manufacturers and in accordance with specified codes and standards.

H. Touch up and/or repaint to match original finishes all factory finished or painted equipment and materials which are scratched or marred during shipment or installation.

PART 2 - PRODUCTS

2.01 GENERAL

A. Each item of equipment shall be furnished and installed complete with all supports, mounting frames, duct work, panels, grilles, electric drive units and controls, mechanical equipment, electrical work, insulation and appurtenances ready for operation.

B. All equipment and appurtenances shall be anchored or connected to supporting members as specified or as indicated on the Plans.

C. All mechanisms or parts shall be amply proportioned for the stresses which may occur during operation or for any other stresses which may occur during fabrication and erection. Individual parts furnished which are alike in all units shall be alike in workmanship, design, and materials and shall be interchangeable. All equipment shall be of the manufacturer's top line, industrial commercial grade.

D. The Contractor shall ascertain that all chassis, shafts, and openings are correctly located otherwise he shall cut all new openings required at his own expense. Cutting of new openings shall be coordinated with other trades. Proposed new cutting shall be submitted to the Engineer for review and acceptance prior to cutting.

E. The Plans shall be taken as diagrammatic. The Contractor shall check the Structural Plans and sections for detail dimensions and clearances. Sizes of ducts and their locations are indicated, but not every offset, fitting, or structural obstruction is shown.

F. Alignment of ducts may be varied where necessary to account for slight architectural changes or to avoid conflict with the Work of other trades without additional expense to the Owner.

G. All supports required for the proper installation of the equipment, but not forming an integral part of the building structure, shall be provided, unless specifically noted otherwise. Equipment shall be supported on spring type vibration isolators.

2.02 ROOF AND WALL EXHAUST AIR FANS

A. General:

1. Provide fans manufactured by one of the following:

   a. Greenheck (Basis of Design).

   b. Cook.

   c. Aerovent.

   d. Or Engineer Approved Equal.

2. Fans shall be tested in accordance with ANSI/ASHRAE 51 and ANSI/AMCA 210 test codes and shall be guaranteed by the manufacturer to deliver at the rated published performance levels. In addition, each unit shall be factory run tested prior to shipment.

3. The High Wind models shall be analyzed and stamped by a state license P.E. the ASCE Standard which meets the IBC, Florida and Miami-Dade codes. Fans shall be provided complete with anchorage designed by the manufacturer for operational conditions and restrained against hurricane winds.

B. Centrifugal Exhaust:

1. Spun aluminum exhaust fans shall be centrifugal belt-driven type. The fan wheel shall be centrifugal backward-inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced. The fan housing shall be constructed of heavy-gauge aluminum with a rigid internal support structure. The windband shall be one-piece and 100% continuously welded to the one-piece aluminum curb cap, including all sizes with UL/cUL 762.

2. Motors shall be heavy-duty ball bearing type, carefully matched to the fan load, and furnished at the specified voltage, phase and enclosure. Drive frame assembly shall be constructed of heavy-gauge steel. Motors and drives shall be mounted on vibration isolators, out of the airstream where no steel-to-steel contact between rotating components and the base shall occur. Fresh air for motor cooling shall be drawn into the motor compartment through a ten-square-inch tube free of discharge contaminants.

3. Motors and drives shall be readily accessible for maintenance.

4. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum L10 life in excess of 100,000 hours (L 50 life of 500,000 hours) at maximum cataloged operating speed. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the cast type, keyed and securely attached to the wheel and motor shafts.

5. Motor pulleys shall be adjustable for final system balancing. A disconnect switch shall be factory-installed and wired from the fan motor to a junction box installed within the motor compartment. A conduit chase shall be provided through the base to the motor compartment for ease of electrical wiring.

6. All fans shall bear the AMCA Sound and Air Performance Seal.

7. Each fan shall bear a permanently affixed manufacturer’s engraved metal nameplate containing the model number and individual serial number for future identification.

8. A leakproof fan housing shall be constructed with a one-piece windband with an integral rolled bead for added strength and shall be joined to the curb cap with a

continuously welded seam.

9. Wheel:

    a. Material type: aluminum.

    b. Non-overloading, backward inclined centrifugal.

    c. Statically and dynamically balanced in accordance to AMCA Standard 204-05.

    d. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency.

10. Motors:

    a. Motors shall be TEFC, premium efficient motors.

    b. Mounted on vibration isolators, out of the air stream.

    c. For motor cooling there shall be fresh air drawn into the motor compartment through an area free of discharge contaminants.

    d. Accessible for maintenance.

11. Options:

    a. Aluminum Bird Screen.

    b. Hi-Pro Polyester coating system on roof fan and all components.

    c. Epoxy coating system on wall fan and all components.

    d. 18” High Roof Curb.

    e. Backdraft Damper Greenheck or Approved Equal.

2.03 CONTROLS

A. Contractor shall provide automatic temperature controls as specified and shown.

B. Sequence of Operation shall be as specified on Drawing Schedules.

C. Damper actuators for wall louvers associated with fans shall be BELIMO or Approved Equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements.

B. All installation shall be in accordance with manufacturer’s published recommendations.

C. All exterior equipment shall be properly secured and anchored to structure to withstand wind

D. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

E. All installation shall be in accordance with manufacturer’s published recommendations.

F. All exterior equipment shall be properly secured and anchored to structure to withstand Florida Building Code High Velocity Hurricane Zone requirements.

G. Install units on vibration isolators, where fans are not internally isolated.

H. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation of the Owner's representative(s).

I. Provide the minimum access space for maintenance of individual components such as fans, filters, coils, humidifiers, etc., as scheduled or shown on the Drawings. Arrange these components in a manner that allows for ease of replacement.

J. Arrange fans and surrounding components in such a way that poor fan performance does not result.

3.02 MANUFACTURER’S SERVICES

A. Fan Units:

1. Furnish services of qualified manufacturer's factory trained service personnel to assist in the installation of the equipment, check the installation before it is placed into operation, supervise initial operations and instruct plant operators in the care, operation and maintenance of the equipment. A certificate from the manufacturer relative to these services is required.

3.03 GUARANTEE

A. Unless otherwise specified, all components, parts, and assemblies shall be guaranteed against defects in materials and workmanship for a period of one (1) year. The period of such warranties shall start on the date the particular equipment is placed in use by the Owner with corresponding start-up certification provided by the manufacturer’s technical representative as specified herein, provided that the equipment demonstrates satisfactory performance during the thirty day operational period after the equipment startup. If the equipment does not perform satisfactorily during the thirty-day operational period, the start of the warranty period will be delayed until the equipment demonstrates proper operation. The Equipment Supplier shall repair or replace without charge to the Owner any part of equipment which is defective or showing undue wear within the guarantee period, or replace the equipment with new equipment if the mechanical

performance is unsatisfactory; furnishing all parts, materials, labor, etc., necessary to return the equipment to its specified performance level.

3.04 CLEANING

A. Clean dirt and marks and other debris from exterior of equipment weekly.

B. Remove debris and waste material resulting from installation weekly.

-END OF SECTION-

SECTION 15800

AIR CONDITIONING UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. The Contractor shall furnish all labor, equipment and material for the complete installation of the air conditioning system as indicated on the Drawings and specified herein.

B. Heating, Ventilating and Air Conditioning systems shall be furnished and installed to operate as a system. The Contractor shall coordinate all requirements between manufacturers to insure unit responsibility and compatibility of the systems.

C. Control wiring and conduit between Control Panels and to field devices (including dampers) and equipment shall be provided under this Section in accordance with the requirements specified in Division 16, Electrical.

D. Work Included Under Other Sections:

1. 480V, 3-phase power wiring and conduit under Division 16, Electrical.

2. Motor starters under Division 16, Electrical, unless factory mounted and wired by equipment manufacturer.

3. 120V, 1-phase wiring and conduit to Control Panels under Division 16, Electrical.

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings on all equipment, accessories and appurtenances and all fabrication work or other mechanical and air conditioning work required, all in accordance with the requirements of Section 01300, Submittals.

B. Data to be submitted shall include but not be limited to:

1. Catalog data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the various parts and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.

2. Complete assembly and installation drawings with clearly marked dimensions. This information shall be in sufficient detail to serve as a guide for assembly and disassembly and for ordering parts.

3. Weight of all component parts and assembled weight.

4. Electrical characteristics, wiring, diagrams, etc.

5. Piping connection drawings.

6. Sample data sheet of equipment nameplate(s) including information contained thereon.

7. Insulation materials, coating, jackets, detail density, thermal conductivity and thickness of all insulation materials to be furnished.

8. Details of special fasteners and accessories.

9. Type of adhesives, binders, joint cement, mastics.

10. Proposed insulation procedures and installation methods.

11. Spare parts list.

12. Special tools list.

13. Control Panels:

    a. Panel layout drawings indicating dimensions and device layout for panel mounted devices, sub-panel mounted devices and internal components.

    b. Wiring schematics indicating factory installed wiring as well as field installed interconnection wiring between control panels, remote mounted starters, and remote mounted equipment.

    c. Catalog data for all control panel components including but not limited to enclosures, controllers, starters, pilot lights, selector switches, pushbuttons, etc.

C. The Contractor shall obtain from the manufacturer and submit to the Engineer copies of the results of all certified shop tests.

D. The Contractor shall obtain from the manufacturer and submit to the Engineer copies of certified letters of compliance in accordance with the Specifications.

E. The Contractor shall submit operation and maintenance manual in accordance with the procedures and requirements set forth in the General Conditions and Division 1. Operation and Maintenance Manuals shall be submitted for all equipment.

1. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists and wiring diagrams.

2. Equipment capacity (input and output).

3. Complete written narrative of how each system is intended to operate.

4. System control maintenance and calibration information, including wiring diagrams, schematics, and control sequence of operation descriptions. Desired

or field determined set points shall be recorded on control drawings, at control devices, or for digital control systems, in programming comments.

5. In addition to a full set of manuals with closeout documentation, each unit shall ship with its own manual in a watertight enclosure.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to the Project Site under the provisions of Division 1.

B. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures and finish.

D. Protect openings in casing and seal them with plastic wrap to keep dirt and debris. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.05 EXTRA MATERIALS

A. Provide one additional set of specified fan belts, sheaves, and filters for each unit, packaged for storage. Tag products to identify associated unit.

1.06 SCHEDULES ON DRAWINGS

A. In general, all capacities of equipment and motor and starter characteristics are shown in schedules on the Drawings. Reference shall be made to the schedules for such information. The capacities shown are minimum capacities. Variations in capacities of the scheduled equipment supplied under this Contract will be permitted only with the written direction of the Engineer.

B. Motors and wheel diameters shown on the schedules are the minimum. If a larger wheel diameter or horsepower is required, it shall be so quoted and noted.

1.07 MANUFACTURER'S INSTRUCTIONS

A. Installation of all equipment shall be in accordance with manufacturer's data.

B. All changes from the installation procedures in manufacturers' data shall be submitted for approval in accordance with the requirements for shop drawings.

C. Keep all manufacturer data in a secure manner at the job site. Catalog and index this data for convenient reference.

D. Manufacturers' data shall be available for the information of the Owner, Engineer, and the use of other trades.

E. Turn over all data to the Owner through the Owner's representative at completion of the Work and final testing.

F. Submit all instruction books and manuals in accordance with Division 1.

1.08 CODES, PERMITS AND STANDARDS

A. The Contractor shall obtain and pay for all permits (unless specifically excluded under Division 1 requirements) and shall comply with all laws and codes that apply to the Work.

B. The Contractor shall be responsible for all added expense due to his choice of equipment and materials or construction methods.

C. All work and materials shall be in full accordance with the latest State rules and regulations or publications including those of the State Fire Marshall, the Mechanical and Energy Codes, and all local codes. Nothing in the Plans and/or Specifications shall be construed to permit work not conforming to the above codes, rules and regulations.

D. All equipment, materials and installations shall conform to the requirements of the most recent edition with latest revisions, supplements and amendments of the following, as applicable:

1. Air Conditioning and Refrigeration Institute (ARI)
2. Air Diffusion Council (ADC)
3. Air Moving and Conditioning Association (AMCA)
4. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE)
5. American National Standards Institute (ANSI)
6. American Society for Testing and Materials (ASTM)
7. American Society of Mechanical Engineers (ASME)
8. Factory Mutual (FM)
9. National Electric Code (NEC)
10. NFPA 90A Air Conditioning and Ventilation Systems
11. Occupational Safety and Health Standards (OSHA)
12. Sheet Metal & Air Conditioning Contractors National Association (SMACNA)
13. Building Code
14. Mechanical Code
15. Plumbing Code
16. Energy Code
17. Local codes, ordinances and statutes
18. Underwriters Laboratories (UL)
19. Others as designated in the specifications.

1.09 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience, who issues complete catalog data on total product.

B. The Manufacturer of the equipment shall provide documentation supporting compliance with ISO-9000:2000 (Model for Quality Assurance in Design/Development, Production, Installation and Servicing). Product literature provided by the manufacturer shall contain the ISO-9000:2000 Certification Mark from the applicable registrar.

C. All material and equipment shall be the latest design, new, not deteriorated, and the first quality standard product of manufacturers regularly engaged in the production of such material and equipment.

D. When two or more units of the same class of material or equipment are required, they shall be products of a single manufacturer.

E. All work shall be performed in a neat and workmanlike manner by workers skilled in their respective trades, and all materials and equipment shall be installed as recommended by the manufacturers and in accordance with specified codes and standards.

F. Touch up and/or repaint to match original factory finishes for all finished or painted equipment and materials which are scratched or marred during shipment or installation.

PART 2 - PRODUCTS

2.01 GENERAL

A. Each item of equipment shall be furnished and installed complete with all supports, mounting frames, duct work, piping, louvers, panels, grilles, electric drive units and controls, mechanical equipment, electrical work, insulation and appurtenances ready for operation.

B. All equipment and appurtenances shall be anchored or connected to supporting members as specified or as indicated on the Plans.

C. All mechanisms or parts shall be amply proportioned for the stresses which may occur during operation or for any other stresses which may occur during fabrication and erection. Individual parts furnished which are alike in all units shall be alike in workmanship, design, and materials and shall be interchangeable. All equipment shall be of the manufacturer's top line, industrial commercial grade.

D. The Contractor shall ascertain that all chassis, shafts, and openings are correctly located otherwise he shall cut all new openings required at his own expense. Cutting of new openings shall be coordinated with other trades. Proposed new cutting shall be submitted to the Engineer for review and acceptance prior to cutting.

E. The Plans shall be taken as diagrammatic. The Contractor shall check the Structural Plans and sections for detail dimensions and clearances. Sizes of ducts and their locations are indicated, but not every offset, fitting, or structural obstruction is shown.

F. Alignment of ducts may be varied where necessary to account for slight architectural changes or to avoid conflict with the Work of other trades without additional expense to the Owner.

G. All supports required for the proper installation of the equipment, but not forming an integral part of the building structure, shall be provided, unless specifically noted otherwise. Equipment shall be supported on spring type vibration isolators.

2.02 AIR CONDITIONING UNITS (SPLIT SYSTEMS 5 TONS AND SMALLER)

A. Provide air conditioning unit(s) manufactured by one of the following:

1. Trane.
2. Carrier.
3. Or Approved Equal.

B. Air conditioning units shall be complete package with air handler matched with air cooled condensing unit. Controls shall be factory mounted and wired.

C. Air Handling Unit:

1. Multi-Position UP/Down Flow Horizontal Left /Right
2. Painted metal cabinet with captured foil face insulation
3. 2% or less air leakage
4. R-4.2 Insulating Value
5. Multi-Position UP/Down Flow, Horizontal Left /Right
6. ALL Aluminum Coil with Enhanced Patented Coil Fin
7. Electric Heaters with polarized plug connections (sold as accessory)
8. R-410A Thermal Expansion Valve
9. Variable Speed ECM Motor
10. Low Voltage Pigtail Connections
11. Draw Through Design
12. Horizontal Drain Pan
13. Single Color
14. Fused 24V Power

D. Air Cooled Condensing Unit:

1. General

a. The Outdoor Units shall be fully charged from the factory for up to 15 feet of piping. Unit shall be designed to operate at outdoor ambient temperatures as high as 115°F. Cooling capacities shall be matched with a wide selection of air handlers and furnace coils that are AHRI certified. The unit shall be certified to UL 1995. Exterior shall be designed for outdoor application.

2. Casing

a. Unit casing shall be constructed of heavy gauge, galvanized steel and painted with a weather-resistant powder paint finish on all louvered panels and the fan top panel. The corner panels shall be pre-painted. Corrosion coatings shall withstand a 1,000-hour salt spray test. The base shall be made of a weatherproof material to resist corrosion.

3. Refrigerant Controls

a. Refrigeration system controls shall include condenser fan, compressor contactor and high-pressure switch. High-Low pressure controls shall be inherent to the compressor. A factory supplied liquid line drier shall be standard.

4. Compressor

a. The compressor shall feature internal over temperature, pressure protection and total include dipped hermetic motor. Other features shall include: Centrifugal oil pump and low vibration and noise.

5. Condenser Coil

a. The outdoor coil shall provide low airflow resistance and efficient heat transfer. The coil shall be protected on all four sides by louvered panels.

b. System shall include Low Ambient Cooling controls.

c. Glossy corrosion resistant finish

d. Liquid line filter-drier

e. R-410A refrigerant

f. Indoor fan delay kit

g. Anti-short cycle timer

h. Extreme condition mounting kit

i. Defrost control system for evaporator coil

j. Low Pressure Switch

k. High Pressure Switch

l. Compressor Sump Heat

6. S.E.E.T. design testing

7. 100% line run test

8. Low ambient cooling to 0°F with BAYLOAM103

E. Coil Coating: As scheduled on Drawings.

F. Sequence of Operation:

1. The air handler unit fan shall be controlled by a fan ON/AUTO switch. In the “AUTO” position the fan shall run when the thermostat calls for cooling or heating. In the “ON” position the fan shall run continuously.

2. System shall Auto re-start on power failure.

2.03 NAME PLATES

A. White laminated phenolic plastic with minimum 3/16 inch high black engravings if viewing distance is less than 24 inches, 1/2 inch high lettering for distances up to 72 inches, and proportionately larger lettering for greater distances.

B. Nameplates shall be affixed with weatherproof adhesive.

C. Nameplates shall be provided at all thermostats, control switches, panels, or any other device providing information on equipment being controlled. Name plates shall be provided on all HVAC equipment matching equipment scheduled identification numbering.

D. Provide manufacturer's standard laminated plastic, color coded duct markers. Conform to the following color codes:

1. Yellow/Green: Supply air

2. Blue: Exhaust, outside, return and mixed air

3. Nomenclature: Include the following:

a. Direction of air flow.

b. Duct service (supply, return, exhaust, etc.)

2.04 GASKETS AND CONNECTORS

A. Provide new gaskets wherever gasketed mating equipment items or pipe connections have been dismantled. Gaskets shall be in accordance with manufacturer's recommendations.

B. Replace all assembly bolts, studs, nuts and fasteners of any kind which are bent, flattened, corroded or have their threads, heads or slots damaged.

C. Furnish all bolts, studs, nuts and fasteners for make-up of all connections to equipment and replace any of these items damaged in storage, shipment or moving.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

C. Install units on vibration isolators, where fans are not internally isolated.

D. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation of the Owner's representative(s).

E. Provide the minimum access space for maintenance of individual components such as fans, filters, coils, humidifiers, etc., as scheduled or shown on the Drawings. Arrange these components in a manner that allows for ease of replacement.

3.02 MANUFACTURER’S SERVICES

A. Heating, Ventilating and Air Conditioning Equipment:

1. Furnish services of qualified manufacturer's factory trained service personnel to assist in the installation of the equipment, check the installation before it is placed into operation, supervise initial operations and instruct plant operators in the care, operation and maintenance of the equipment.

3.03 COMMISSIONING

A. Commissioning of system shall be provided and include commissioning report. Report shall signed and dated by the commissioning technician and the Owner’s representative and include the following:

B. The Commissioning Report shall consist of completed Pre- Functional Performance Test Checklists and completed Functional Performance Tests organized by system and by subsystem and submitted as one package. The Commissioning Report shall also include all HVAC systems test reports, inspection reports (Preparatory, Initial and Follow-up inspections), start-up reports, Controls start-up test reports and Controls Performance Verification Test (PVT) report. The results of failed tests shall be included along with a description of the corrective action taken.

3.04 CLEANING

A. Clean dirt and marks and other debris from exterior of equipment weekly.

B. Remove debris and waste material resulting from installation weekly.

3.05 GUARANTEE

A. Unless otherwise specified, all components, parts, and assemblies shall be guaranteed against defects in materials and workmanship for a period of one (1) year. The period of

such warranties shall start on the date the particular equipment is placed in use by the Owner with corresponding start-up certification provided by the manufacturer's technical representative as specified herein, provided that the equipment demonstrates satisfactory performance during the thirty day operational period after the equipment startup. If the equipment does not perform satisfactorily during the thirty day operational period, the start of the warranty period will be delayed until the equipment demonstrates proper operation. The Equipment Supplier shall repair or replace without charge to the Owner any part of equipment which is defective or showing undue wear within the guarantee period, or replace the equipment with new equipment if the mechanical performance is unsatisfactory; furnishing all parts, materials, labor, etc., necessary to return the equipment to its specified performance level.

-END OF SECTION-

SECTION 15815

DUCTWORK

PART 1 - GENERAL

1.01 SCOPE

A. This section includes metal ducts for supply, return, exhaust, and outdoor air intake distribution systems.

1.02 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Permits: Contractor shall obtain and pay for all required fees, inspections and approvals by authorities having jurisdiction.

2. Building Codes: Comply with applicable requirements of all State and local building codes.

3. Underwriters' Laboratories, Incorporated.

4. NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

5. SMACNA, “HVAC Duct Construction Standards Metal and Flexible – Third Edition." (Figure and table references in this section are to this standard.)

B. Field Measurements: Take field measurements where required prior to installation to ensure proper fitting of Work.

C. Welding: If welding is used, qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel," for hangers and supports, AWS D1.2, "Structural Welding Code - Aluminum," for aluminum supporting members, and/or AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

1.03 SUBMITTALS

A. Metal material.

B. SMACNA Details.

C. Support Details.

D. Seal Material Safety Data Sheets.

E. Seal Class and Fabrication Detail.

F. Fastener type and material.

G. Turning vanes detail.

H. Welding certificates if welding is used.

I. Registers, Diffusers and Grilles.

J. Coordinated with other trades, scaled ¼" per foot duct layout drawings showing locations of supports and flanged connections.

K. Field quality-control test reports.

1.04 DELIVER, STORAGE, AND HANDLING

A. Deliver ductwork products to site in undamaged condition.

B. If ductwork is stored on site, store in locations selected to minimize potential for damage due to weather exposure and other possible sources of damage.

C. If ductwork is damaged, repair or replace it.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Comply with SMACNA "HVAC Duct Construction Standards Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Provide 316-L stainless steel ductwork, supports and hardware.

C. Provide FRP ductwork where indicated on drawings.

2.02 SEAL CLASS

A. All ductwork shall be manufactured to Seal Class A.

2.03 STATIC PRESSURE CLASS

A. All ductwork shall conform to a minimum pressure classification of minus 2.0-inches to plus 2.0-inches of water gauge unless otherwise required, specified or shown on the Drawings.

2.04 METAL DUCT

A. Ductwork shall be constructed in accordance with the construction details and installation details in the SMACNA HVAC Duct Construction Standards: Metal & Flexible 2005, 3rd Edition. Ductwork shall be connected by mechanical flanged joining system with neoprene gaskets manufactured by Ductmate Industries, Inc, or approved equal. Ductwork support shall be in accordance with the SMACNA Standard, except all rectangular ductwork shall be supported from trapeze type hangers, rods, fasteners, anchors, angles, attachments, etc. Hanger rods shall be minimum 3/8-inch diameter. A pair of hanger rods shall be provided at each support point. Maximum hanger spacing shall be 8-feet.

B. Accessories:

1. Flexible Connectors:

a. Self-extinguishing material shall meet NFPA 90A and UL-214 Standards.

b. Material: Woven Fiberglass with Hypalon Coating.

c. Extra wide metal edge connectors factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 4-3/8-inch-wide, 0.028-inch-thick, stainless sheets or select metal compatible with connected ducts.

d. Provide flexible connectors at inlet and outlet of all fans and air handling equipment connected to ductwork.

2. Instrument Test Holes: Stainless steel or cast aluminum to suit duct material, including screw cap and gasket. Size holes to allow insertion of pitot and other testing instruments, and length to suit duct insulation thickness.

C. Flexible Insulated Ducts:

1. Product Manufacturer: Hart & Cooley.

2. Certification: UL 181 and NFPA 90A-90B.

3. R-Value: 4.2.

4. Black polyethylene jacket and double-ply polyester core.

D. Diffusers and Grilles:

1. Manufacturer: Provide product(s) of one of the following:

a. Krueger.

b. Anemostat.

c. Titus.

d. Or approved equal.

2. Supply Air Ceiling Diffusers: Aluminum. Finish Color shall be selected by Architect.

3. Return Air Ceiling Grilles: Aluminum. Finish Color shall be selected by Architect.

E. Dampers:

1. Products and Manufacturers: Provide dampers as made by one of the following:

a. GREENHECK (Basis of Design)

b. Ruskin.

c. Or Approved Equal.

2. Round Volume Control:

a. Construction Material: 304-stainless steel.

b. Model: GREENHECK VCDR-50, or Equal.

3. Rectangular Volume Control:

a. Construction Material: 316-stainless steel.

b. Model: GREENHECK SEVCD-23, or Equal.

4. Backdraft:

a. Construction Material: 316-stainless steel.

b. Model: GREENHECK SEBR, or Equal.

F. Duct-Mounted Access Doors and Panels:

1. Provide access doors at all duct connections to wall louvers for access and maintenance of louver motor actuators and linkages.

2. Fabricate doors and panels airtight and suitable for duct pressure class.

3. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

4. Door and frame to be of same material as duct.

5. Insulation: 1-inch thick, fibrous-glass or polystyrene-foam board.

G. Turning Vanes: Provide turning vanes manufactured by DUCTMATE, PRORAIL, or Approved Equal. Double vane for ducts greater than 18”x18” and single vane for ducts up to 18”x18”.

1. Ductmate Size: 4-inches.

2. Pressure tested to 15 inches W.G with no separation.

3. Material: Same as duct.

4. Fasten to duct wall per the SMACNA recommendations.

5. Radius: R=4-1/2-inches.

6. Spacing: S=3-1/4 inches.

2.05 FIBERGLASS REINFORCED PLASTIC DUCTWORK (FRP)

A. FRP duct as manufactured by Spunstrand, Inc., or Approved Equal, and shall be used to convey and distribute air with continuous mixtures of chemical fumes and environmental conditions for sodium hypochlorite process ventilation areas.

B. FRP duct materials and fabrication shall be in accordance with SMACNA’s Thermoset FRP Duct Construction Manual, Second Edition.

C. Rectangular elbows shall have turning vanes.

PART 3 - EXECUTION

3.01 DUCT INSTALLATION

A. Construct and install ducts according to SMACNA "HVAC Duct Construction Standards Metal and Flexible," unless indicated otherwise.

B. Minimize the number of duct joints.

C. Seal joints and seams in accordance with the indicated seal class. Seal ducts before external insulation is applied.

D. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA "Duct Cleanliness for New Construction."

E. Paint interiors of metal ducts that do not have duct liner and are visible through grilles or registers. Apply one coat of flat black, latex finish coat over a compatible primer. Paint materials and application requirements are specified in Division 9 Sections.

3.02 CLEANING

A. Remove all debris, dirt and waste materials resulting from installation.

B. Remove dirt, dust, rust, etc. from ductwork in preparation for painting, testing and insulating.

C. Clean lenses on thermometers, pressure gauges etc. where required.

D. Use service openings, as required, for physical and mechanical entry and for inspection.

1. Create other openings to comply with duct standards.

2. Disconnect flexible ducts as needed for cleaning and inspection.

3. Remove and reinstall ceiling sections to gain access during the cleaning process.

E. Internal Duct Cleaning:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.

2. Use vacuum-collection devices that are operated continuously during cleaning. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.

3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.

4. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

5. Visually inspect metal ducts for contaminants.

6. Where contaminants are discovered, re-clean and re-inspect ducts.

- END OF SECTION -

SECTION 15860

POSITIVE PRESSURIZATION UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The Contractor shall furnish all labor, equipment and material for the complete installation of the positive pressurization air scrubbing units as indicated on the Drawings and specified herein.

B. Air conditioning systems shall be furnished and installed to operate as a system. The Contractor shall coordinate all requirements between manufacturers to assure unit responsibility and compatibility of the systems.

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings on all equipment, accessories and appurtenances and all fabrication work or other mechanical and air conditioning work required, all in accordance with the requirements of Section 01300, Submittals.

B. Data to be submitted shall include but not be limited to:

1. Catalog data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the various parts and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.

2. Complete assembly and installation drawings with clearly marked dimensions. This information shall be in sufficient detail to serve as a guide for assembly and disassembly and for ordering parts.

3. Weight of scrubbing media and unit assembled weight.

4. Electrical characteristics, wiring, diagrams, etc.

5. Sample data sheet of equipment nameplate(s) including information contained thereon.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to the Project Site under the provisions of Division 1.

1.05 EXTRA MATERIALS

A. Provide a minimum of one (1) spare media filter for each type of media, one (1) spare final particulate filter and four (4) spare pre-filters for each unit.

1.06 MANUFACTURER'S INSTRUCTIONS

A. Installation of all equipment shall be in accordance with manufacturer's data.

B. All changes from the installation procedures in manufacturers' data shall be submitted for approval in accordance with the requirements for shop drawings.

C. Keep all manufacturer data in a secure manner at the job site. Catalog and index this data for convenient reference.

D. Manufacturers' data shall be available for the information of the Owner, Engineer, and the use of other trades.

E. Turn over all data to the Owner through the Owner's representative at completion of the Work and final testing.

F. Submit all instruction books and manuals in accordance with Division 1.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience, who issues complete catalog data on total product.

B. When two or more units of the same class of material or equipment are required, they shall be products of a single manufacturer.

C. All work shall be performed in a neat and workmanlike manner by workers skilled in their respective trades, and all materials and equipment shall be installed as recommended by the manufacturers and in accordance with specified codes and standards.

D. Touch up and/or repaint to match original factory finishes for all finished or painted equipment and materials which are scratched or marred during shipment or installation.

PART 2 - PRODUCTS

2.01 POSITIVE PRESSURIZATION CARBON FILTERING UNIT

A. Subject to compliance with requirements, provide positive pressure air chemical scrubber unit(s) manufactured by one of the following:

1. Purafil.

2. American Air Filter.

3. Or approved equal

B. The modular chemical scrubber shall be a complete package, designed for the removal of both organic and inorganic contaminants from the re-circulated air in gas or vapor atmospheres. Controls shall be factory mounted and wired. The manufacturer shall be a single source provider of equipment, media and testing services, and be certified to ISO-9001 standards or adhere to quality standards equal to ISO-9001:2000 with an in-house laboratory.

C. Scrubber Housing Construction:

1. The scrubber housing shall be constructed of 14 gauge cold rolled steel, seam welded. The unit shall be provided with gasketed front access door(s) for servicing all components. Latches shall have a positive locking action. All hinges and draw latches shall be constructed of stainless steel. The scrubber shall be designed for indoor installation.

2. Welding procedure qualifications and welder performance qualifications shall conform to the requirements of Section IX of the ASME Code, latest edition. Welder's performance qualification records shall be made available to Engineer upon request.

3. Housing shall be painted inside and out (before assembly) using the following three-step procedure: 1) Steam/pressure wash with a paint prep (Oakit 187SC, or approved equal); 2) Epoxy prime (CheckRust Insl-Tile Activated Epoxy Coating, EP-5000 Series, or approved equal) 3) Polyurethane final coat of no less than 1.5 mils (CheckRust Insl-Thane Heavy Duty Polyurethane Enamel, GU-2500 Series or approved equal). Color shall be gray.

4. Scrubber housing shall be provided with a base support.

5. The scrubber housing shall be designed to facilitate standard fan and motor for maintenance.

6. Door seals shall be attached by mechanical means and designed for replacement. Seals shall be glued in conjunction with mechanical attachment.

7. The scrubber shall be arranged for horizontal or vertical airflow and shall deliver the designated combined airflow (pressurization plus recirculation). There shall be a manually controlled damper located at the intake for optimization of pressurization air.

8. Aluminum nameplate shall be provided, permanently attached to the unit. Nameplate shall be engraved with the scrubber type, order number and serial number.

9. Inlet pressurization air shall be ducted by the contractor into the duct opening at top of unit. The re-circulation air shall enter in from an air intake grill located above the pre-filter. The return and discharge openings shall include grilles with four-way deflection louvers.

10. The Purafil PPU-500V shall contain four sections of scrubbing. The first stage shall contain one (1) particulate pre-filters model Purafil TP-25 and sized 24" x 24" x 1". The second stage shall contain three (3) PuraGrid Filters with Puracarb that measures 24" x 24" x 4". The 3rd stage shall contain modules consisting of two (2) 24" x 12" x 12" PK-12 polystyrene containers filled with Purafil SP Blend. The 4th stage shall contain one (1) particulate final filter model Purafil JFL-90 and sized 24" x 24" x 4".

D. Blower shall be located in the housing between the second and third stages of air cleaning. It shall have a backward curved, centrifugal, glass reinforced polyamine wheel and direct variable frequency drive. The blower system rating shall be as specified on

Drawings. Sound insulation shall be provided on the blower section for decibel reduction.

E. Motors shall be TEFC premium efficiency, inverter grade, 460 Volt, 3-phase, 60 Hz. and have a 1.15 service factor.

F. Air Scrubber Chemical Media Sections:

1. The housing shall contain two chemical media sections, designed to accommodate 12.0” modular media containment devices, utilizing filter rack tracks.

2. Modular media containment device (module) shall have a nominal size of 24.0” wide x 12.0” deep in direction of airflow with a medium bed depth of 3.0”. Device shall be completely recyclable and/or disposable. Device shall be constructed of 0.125” thick, black, high impact polystyrene.

3. Module shall be factory-filled with selected chemical media.

4. Pressure drop through each chemical media section shall not exceed 1.30 inches of water gage. Maximum airflow velocity through the chemical section shall be 250 feet per minute.

5. The residence time through the chemical media section shall not be less than 0.24 seconds total of 0.12 seconds per media bed in direction of airflow. Residence time calculations shall only include media in direct path of air.

6. Module shall be UL Class II. Manufacturer shall provide documentation.

7. Media shall be specifically for corrosive environments and consist of spherical, porous pellets composed of carbon, alumina and other binders impregnated for reaction for removal of hydrogen sulfide, sulfur dioxide and volatile organic compounds.

8. The Purafil SP Blend Media shall consist of an equal mix (by volume) of Purafil SP Media and Purakol media. Purafil SP Media shall be manufactured of generally spherical, porous pellets formed from a combination of powdered activated alumina and other binders, suitably impregnated with sodium permanganate to provide optimum adsorption, absorption, and oxidation of a wide variety of gaseous contaminants. The sodium permanganate shall be applied during pellet formation, such as the impregnate is uniformly distributed throughout the pellet volume and is totally available for reaction. Purakol Media shall be a premium grade, activated carbon with a high surface area available for adsorption.

9. Media Removal Capacity: Hydrogen Sulfide 20% minimum by weight; Sulfur Dioxide 5% minimum by weight; Chlorine 8% minimum by weight.

10. Media Application Criteria: Temperature -4° F to 125° F; Humidity 10 to 95% RH.

G. Particulate Filters:

1. Pre-filters shall be 20%-25% efficient, disposable filters. Efficiency shall be rated and tested to ASHRAE Standard 52.1-92, Dust Spot Efficiency. The clean filter

resistance shall not exceed 0.20 inches of water gage based on a face velocity of 100 feet per minute. Filters shall be 1” deep.

2. Final filters shall be 85% - 90% efficient pleated disposable filters. Efficiency shall be rated and tested to ASHRAE Standard 52.1-92, Dust Spot Efficiency. The clean filter resistance shall not exceed 0.30 inches of water gage based on a face velocity of 100 feet per minute.

H. Required Factory Options:

1. Room pressurization and airflow gage

2. Static pressure differential gages pre-filter and final filter.

3. System Auto Restart after power failures restored.

4. Gage Unit mounting panel with interconnecting tubing.

5. Manufacturer shall supply Onguard 4000 for real-time airborne molecular contaminant (AMC) monitoring.

a. Service life of 4000 Angstroms shall be provided

b. Battery operated four 94) standard AA batteries and one (1) lithium battery to be supplied by contractor. The Onguard 3000 can also be powered by an external DC power supply or a PC USB port

c. LCD Display

d. 4-20mA output signal with corresponding installation instructions or internal data logger

e. Onguard shall have two QCM sensors, one plated with copper and the other with silver which accumulation corrosion films when acid gases react with the base metal. System should be placed by contractor near the unit.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

C. Install units on vibration isolators, where fans are not internally isolated.

D. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings have been lubricated, and fan has been tested run under observation of the Owner's representative(s).

E. Provide the minimum access space for maintenance of individual components such as fans, filters, coils, humidifiers, etc., as scheduled or shown on the Drawings. Arrange these components in a manner that allows for ease of replacement.

F. Arrange ductwork and supply air surrounding components in such a way that poor fan performance does not result.

3.02 COMMISSIONING

A. The Commissioning Report shall consist of completed Pre- Functional Performance Test Checklists and completed Functional Performance Tests organized by system and by subsystem and submitted as one package. The Commissioning Report shall also include all HVAC systems test reports, inspection reports (Preparatory, Initial and Follow-up inspections), start-up reports, Controls start-up test reports and Controls Performance Verification Test (PVT) report. The results of failed tests shall be included along with a description of the corrective action taken.

B. Manufacturer or manufacturer's representative shall provide a minimum of one (1) eight-hour day for startup and training on all units.

C. The manufacturer shall be able to provide in-house lab analysis of the equipment media predicting the remaining life cycle of the media. Such service shall be provided at the manufacturer's expense for a period of ten years.

3.03 GUARANTEE

A. Unless otherwise specified, all components, parts, and assemblies shall be guaranteed against defects in materials and workmanship for a period of one (1) year. The period of such warranties shall start on the date the particular equipment is placed in use by the Owner with corresponding start-up certification provided by the manufacturer's technical representative as specified herein, provided that the equipment demonstrates satisfactory performance during the thirty day operational period after the equipment startup. If the equipment does not perform satisfactorily during the thirty-day operational period, the start of the warranty period will be delayed until the equipment demonstrates proper operation. The Equipment Supplier shall repair or replace without charge to the Owner any part of equipment which is defective or showing undue wear within the guarantee period, or replace the equipment with new equipment if the mechanical performance is unsatisfactory; furnishing all parts, materials, labor, etc., necessary to return the equipment to its specified performance level.

-END OF SECTION-

SECTION 15990

TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 SCOPE

A. This section covers final testing adjusting and balancing operations after construction of the HVAC system(s).

B. The Contractor shall secure the services of an independent testing, adjusting and balancing Agency to perform complete balance, adjustment and testing of hydronic equipment and distribution systems, including pumps, air handling units, chiller units and control systems. Agency shall have on its staff at least one certified member of the National Environmental Balancing Bureau (NEBB) who has been a member in good standing for at least 3 years, and the Agency shall be NEBB certified for a period of at least three years; or Agency shall be a member of the Associated Air Balance Council (AABC) for at least 3 years.

C. Instruments used shall be accurately calibrated and maintained in good working condition. Equipment shall be as listed by ABBC or NEBB for this type work.

D. The Agency shall provide tests to demonstrate the specified capacities and operation of all equipment and materials comprising the system(s). Such tests other than as described herein, which are deemed necessary by the Engineer to indicate the fulfillment of the Contract, shall be made. The Agency shall then make available to the Engineer such instruments and technicians as are required for spot checks of the system.

E. The drawings and specifications indicate valves, controls and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions, and it will be the responsibility of the Contractor to install these devices in a manner that will leave them accessible and readily adjustable. The Agency shall be consulted if there is a questionable arrangement of a control or adjustable device.

F. The Agency shall be responsible for inspecting, balancing, adjusting, testing and logging the data of the performance of the duct air distribution, controls and precision air conditioning units. The Contractor and the suppliers of the equipment installed shall all cooperate with the Agency to provide all necessary data on the design and proper application of the system components and shall furnish all labor and material required to eliminate any deficiencies or non-conforming operation.

1. Submit brief written report of each inspection to the Engineer, with copies to Contractor and Owner's Representative.

2. Upon completion of the installation and start-up of the mechanical equipment by the Contractor, Agency shall balance, test and adjust the system(s) components to obtain optimum conditions in each conditioned space in the building.

3. Prior to Final Application for Payment, the Contractor shall submit copies of the completed Testing, Adjusting and Balancing Report. The Testing, Adjusting and Balancing Report shall be complete with logs, data, and records as required herein.

4. The Report shall contain the following general data:

   a. Project No.

      1) Contract No.

      2) Project Title:

      3) Project Location:

      4) Engineer: (Name)

      5) Field Test Engineer: (Name)

      6) Testing Diagnosis and Analysis by: (Name)

      7) Agency: (Firm name, telephone number and address)

      8) Contractor: (Name and address)

      9) Inclusive dates tests were performed and date of Report

      10) Test Certification Number:

      11) Certification by Agency's Principal Engineer

   b. The Testing Adjusting and Balancing Report shall contain the following sections:

      1) Table of Contents

      2) General data and certification

      3) Brief Description of Tests and Test Procedures (including instruments used)

      4) Summary of Test Results (note deficiencies, if any, and action taken for correction)

      5) Logs, Data, and Records

1.02 REFERENCES

A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.

B. NEBB - Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.03 PROCEDURES

A. Operating Tests. After all mechanical systems have been completed, and prior to balance, subject each system to an operating test under design conditions to ensure proper sequence of operation in all operating modes. Make adjustments as required to ensure proper functioning of all systems.

B. Certified Data. The Contractor shall provide the Agency with the certified data on pumps, chillers and other equipment required for proper balancing of the system.

C. Adjustment. The Agency shall supervise or perform necessary adjustments to valves, pumps and other controls as required to properly balance the system.

D. Balancing. The Agency shall follow balancing and testing procedures published by the AABC, or NEBB.

E. Reports: Compile the test data on report forms as listed in the AABC "National Standards for Total System Balance".

1.04 SUBMITTALS

A. Submit Testing, Adjusting and Balancing Report as a Shop Drawing submittal under the provisions of Division 1, General Requirements.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 SYSTEM START UP AND COMMISSIONING

A. Pressure test new refrigerant piping.

B. Perform all grounding and electrical testing.

C. Equipment Certification and Startup.

1. Verify filters are properly installed. Change filters at equipment manufacturer’s recommended intervals if system is operated during on-going construction periods.

2. Verify proper installation.

3. Configure and verify proper operation of controls.

a. System auto restart after power failure.

b. Proper operation of auxiliary drain pan water detection switch.

c. High room temperature alarm indication.

d. Smoke detector shutdown/restart. Manual restart required after smoke detector shut down. Verify test and reset function for smoke detector.

4. Record voltage during operation.

3.02 TESTING, ADJUSTING AND BALANCING

A. General Requirements

1. Do all work required for complete testing, adjusting and balancing of all systems.

2. Provide all instruments and equipment required to accomplish necessary testing, adjusting and balancing, and as required to verify performance. All instruments shall be in accurate calibration.

3. Air balance tolerances shall be plus or minus 10%.

a. For systems maintaining positive area pressurization, the supply air tolerance shall be plus 10% and the exhaust air tolerance shall be minus 10%.

b. For systems maintaining negative area pressurization, the supply air tolerance shall be minus 10% and the exhaust air tolerance shall be plus 10%.

4. Prior to Final Application for Payment, submit a letter certifying:

a. That all balancing is complete.

b. That all controls are calibrated and functioning properly.

c. That all parts of the various systems are complete and ready to be turned over to the Owner for continuous operation.

B. Record, and Submit the following data for constant-volume supply and return air systems.

1. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.

2. Measure fan static pressures to determine actual static pressure as follows:

a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.

b. Measure static pressure directly at the fan outlet or through the flexible connection.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressures across each air handling unit component.

a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

b. Adjust fan speed higher or lower than design with the approval of the Engineer. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.

c. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

C. Adjust volume dampers for main duct, sub main ducts, and major branch ducts to design airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

a. Where sufficient space in sub mains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Re measure each sub main and branch duct after all have been adjusted. Continue to adjust sub mains and branch ducts to design airflows within specified tolerances.

D. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or the outlet manufacturer's written instructions and calculating factors.

E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.

1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.

2. Adjust patterns of adjustable outlets for proper distribution without drafts.

F. Record, and Submit the following data for each HVAC system:

1. For each fan:

a. CFM.

b. Fan RPM.

c. Static Pressure IN and OUT.

d. Voltage.

e. Amperage.

2. For each evaporator and condenser coil (when applicable):

a. Cooling Capacity.

b. Refrigerant.

c. Compressor Voltage, Amps and Phase (Design\Actual).

d. No. of Compressors.

e. Size of Compressors.

f. Compressor suction and discharge pressures.

g. Sound Level including location of test points and octave bands readings with unit off and on.

3. For each test instrument used:

a. Instrument/Serial No.

b. Application.

c. Dates of use.

d. Calibration test date.

4. For each air handling unit:

a. Identification Number.

b. Manufacturer.

c. Size/Model Number/Serial Number.

d. Cooling capacity (Design\Actual).

e. Heating capacity (Design\Actual).

f. Air flow (Design\Actual).

g. Fan RPM (Design\Actual).

h. Outside air flow rate (Design\Actual).

i. Motor actual amperage and voltage at balanced flow rate.

j. Motor Nameplate full load amperage, voltage, phase, hertz, service factor, type, model number, serial number and frame number.

5. For each air device:

a. Identify location and area of each.

b. Air flow CFM rate (Design/Actual).

c. Identify and list size, type and manufacturer of diffusers, grilles, registers, and variable air box equipment.

G. Each control component shall be tested and verified, including but not limited to the following:

1. Sensors.

2. Interlocks.

3. Hand-off-auto switches.

4. Control sequences.

5. Safety devices.

H. After Owner has accepted the systems, make two additional inspections of the system over a one year period (one during winter operation and 1 during summer operation) to:

1. Correct any Owner observed temperature imbalances.

2. Check correct operation of equipment and verify by letter to the Engineer on each trip. List in the letter corrections made.

3. Record the following data:

a. Date.

b. Time.

c. Outdoor Temperature (Wet Bulb and Dry Bulb).

d. Indoor Temperature (Wet Bulb and Dry Bulb).

4. In the event the system(s) do not perform to the scheduled design drawings and specifications requirements, make all necessary adjustments to bring the system(s) into compliance with the drawings and specifications.

I. At Time of Job Completion

1. Provide Owner with HVAC operation and maintenance training.

2. Provide such tools, equipment and personnel as required to conduct tests and demonstrate the acceptability of the various systems.

3. Have the authorized representatives of the various equipment manufacturers available if requested.

- END OF SECTION -

SECTION 15995

PIPELINE TESTING AND DISINFECTION

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall perform flushing and testing of all pipelines and appurtenant piping, complete, including conveyance of test water from JEA designated source to point of use and all disposal thereof, all in accordance with the requirements of the Contract Documents.

B. Reference the Section entitled “Summary of Work” for construction sequencing restrictions.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards

ANSI/AWWA B300 Hypochlorites

ANSI/AWWA B301 Liquid Chlorine

ANSI/AWWA C651 Disinfecting Water Mains

ANSI/AWWA C600 Installation of Ductile Iron Water Mains and their Appurtenances

1.03 SUBMITTALS

A. A pumping and transmission equipment, testing schedule, including proposed plans for water conveyance, control, disposal, and disinfection shall be submitted in writing for approval a minimum of 48 hours before testing on any particular pipeline is to commence.

B. The CONTRACTOR shall submit disinfection test reports and hydrostatic test reports in accordance with Sections entitled “Submittals” and “Project Closeout”.

PART 2 -- PRODUCTS

2.01 MATERIALS REQUIREMENTS

A. All test equipment, temporary valves or bulkheads, or other water control equipment and materials shall be determined and furnished by the Contractor subject to the Engineer's review. No materials shall be used which would be injurious to the construction or its future function.

PART 3 -- EXECUTION

3.01 GENERAL

A. Unless otherwise provided herein, water for testing pipelines will be from a JEA furnished source; however, the Contractor shall make all necessary provisions for conveying the water from JEA-designated source to the points of use.

B. All pressure and gravity pipelines shall be tested. All testing operations shall be performed in the presence of the Engineer.

3.02 TESTING OF PIPING

A. All equipment, including, but not limited to, pumps, gauges, and special fittings required to perform the testing shall be provided by the Contractor. The Contractor shall perform all excavation and other work required to locate and repair leaks and correct other defects which may be disclosed or develop under tests. The Contractor shall replace all coating, painting, backfill, or other permanent work removed in locating or repairing leaks and correcting defective piping. All gauges and control devices connected to lines being tested must be disconnected for the duration of the test. Water shall not be used in testing air lines, chlorine gas lines, or other gas carrying pipes. All tests shall be witnessed by the Engineer.

B. Prior to testing, all pipelines shall be flushed or blown out as appropriate. The Contractor shall test all pipelines either in sections or as a unit. No section of the pipeline shall be tested until all field-placed concrete or mortar has attained an age of fourteen days. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. The Contractor shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe. Care shall be taken to see that all air vents are open during filling.

C. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be properly purged. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least twenty-four hours to allow the concrete or mortar lining, as applicable, to absorb water and to allow the escape of air from any air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the Engineer shall be taken.

D. Gravity sewer pipe or other pipe having free surface flow shall be given a water exfiltration test as specified herein. The Contractor has the option of using a low pressure air test in lieu of the water exfiltration test. If excessive groundwater is present which precludes use of the exfiltration test, the Contractor shall use either the low pressure air test or infiltration test.

E. Water lines, sewage force mains and other pressure piping carrying liquids having bell and spigot gasketed joints shall be given a pressure and leakage test in accordance with AWWA C-600 unless specifically modified herein.

F. CPVC, steel, ductile iron or other pipe material, with solvent welded, welded, threaded, flanged, grooved end or flexible couplings and joints shall be pressure tested as specified above. No leakage shall be permitted.

G. No special pressure or leakage testing is required for gravity storm drain pipes. Leakage shall be minimized by installation in a workmanlike manner with no visible sources of leakage in accordance with the manufacturer's recommendations.

H. Pressure air and gas piping carrying air or other gasses under pressure shall be given a pressure test as specified herein. No leakage is permitted. Low pressure air piping shall be tested pneumatically. Air pressure of 20 pounds per square inch shall be applied to piping and fittings. High pressure air piping shall be tested to 200 psi unless otherwise specified. There shall be no drop in pressure in a 24-hour period. Leaks shall be located and repaired to the satisfaction of the Engineer. Pressure drops due to thermal contraction are acceptable if the pressure returns to the original test pressure after 24 hours.

I. Vent piping shall be filled with water to the top of the system for a period of 24 hours with no measurable leakage.

J. Pressure Tests

1. All pressure piping carrying liquids, including valves, shall be field-tested at a hydrostatic pressure equal to the pipe pressure class, corrected to the elevations of the test gauge, with duration of two hours minimum, for each pressure test, unless code requirements dictate a longer duration. Air piping shall be tested using air or nitrogen. Pressure tests shall be recorded by the Contractor. Copies of all test report forms shall be forwarded to the Engineer.

2. Temporary or permanent thrust blocks or bulkheads or restrained joints shall be placed as required prior to tests, and the Contractor shall provide all necessary braces, plugs, thrust blocks, caps, flanges, and other materials to permit proper performance of the pressure testing; tests shall not be conducted until it concrete thrust blocks are capable of withstanding the loads produced.

K. Leakage Tests: Leakage tests shall be conducted concurrently with the pressure test. The allowable leakage shall be determined in accordance with AWWA C-600. The duration of the test shall be not less than two hours. Measurement shall be made by means of a calibrated suction tank showing the amount of water required by the test pump to accurately maintain the specified test pressure. Tests shall be performed only in the presence of the Engineer, or, if scheduling of tests is such that the Engineer cannot attend due to conflicting commitment, tests may be performed without the Engineer's presence if the Contractor obtains written permission to do so from the Engineer prior to initiation of testing. No test report will be accepted unless proof of compliance with the foregoing requirement accompanies the test report. Low pressure air test shall be conducted in conformance with ASTM C-828.

L. In the case of pipelines that fail to pass the prescribed leakage test, the Contractor shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall repeat the test until the testing requirements are met.

3.03 FLUSHING

A. All piping shall be flushed clean of all dirt and foreign material following completion of the hydrostatic and leakage test. Air and gas piping shall be purged with air or nitrogen gas as directed by the Engineer.

B. Equipment and Supplies. The Contractor shall provide all equipment, and supplies for performing the work, and shall waste the water at locations or by procedures approved by the Engineer.

3.04 DISINFECTION

A. Disinfection of potable water lines shall be performed in accordance with AWWA Standard C-651, State of Florida and local applicable regulations. The Contractor shall provide a Disinfection Plant to the Engineer for approval. The Contractor shall be responsible for furnishing fittings and all special pipe taps required by the pipe disinfection work.

3.05 DISINFECTION

A. Provide list of equipment required and a disinfection plan to execute the Work of this Section.

B. Inject the required amount of disinfectant to yield a minimum chlorine content of 50 ppm into piping system.

C. Allow solution to remain in the pipes for twenty-four hours or longer, if required, to destroy all harmful bacteria.

D. Operate all valves and other appurtenances during disinfection to assure the sterilizing mixture is dispersed into all parts of the system.

E. After the solution has been retained for the required time, pipes shall be flushed and filled with municipal domestic water. Sterilizing water shall be disposed of in an approved manner. Sterilizing water shall not be allowed to flow into a waterway without reducing chlorine concentrations to a safe level. The CONTRACTOR shall be responsible for meeting all applicable requirements and acquiring all necessary permits for this work.

F. Take one bacteriological sample and test from every segment of pipeline tested. Samples shall be taken and tested on each of two successive days. CONTRACTOR shall submit sample to a laboratory, approved by ENGINEER, for testing. The disinfection process shall be repeated if laboratory test results reflects presence of harmful bacteria in the water.

3.06 TESTS

A. Provide analysis of treated water to meet standards and received acceptance from the Health Department.

B. Test samples in accordance with AWWA C601.

C. Quality Assurance: Testing Laboratory: Certified for examination of drinking water in compliance with applicable legislation of the State of Florida.

D. Regulatory Requirements: Conform to Chapter 17-22 of the Florida Administrative Code.

E. Submittals

1. Submit name of testing laboratory and evidence of qualification.

2. Submit three copies of reports.

F. Project Record Documents

1. Submit reports under provisions of Sections entitled “Submittals” and “Project Closeout”.

2. Bacteriological report; accurately record:

a. Date issued, project name, and testing laboratory name, address, and telephone number.

b. Time and date of water sample collection.

c. Name of person collection sample.

d. Test locations.

e. Initial and twenty-four- hour disinfectant residuals in ppm for each outlet tested.

f. Coliform bacteria test results for each outlet tested.

g. Certification that water conforms, or fails to conform to bacterial standards of State of Florida.

h. Bacteriologist's signature.

3.07 CONNECTIONS TO EXISTING SYSTEM

A. Where connections are to be made to an existing potable water system, the interior surfaces of all pipe and fittings used in making the connections shall be swabbed or sprayed with a one percent hypochlorite solution before they are installed. Thorough flushing shall be started as soon as the connection is completed and shall be continued until discolored water is eliminated.

B. Prior to actual connections to the existing potable water system, record drawings, hydrostatic pressure test results, and bacterial test results shall be submitted to the Engineer.

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SECTION 16000

BASIC ELECTRICAL REQUIREMENTS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish all labor, materials, tools, and equipment, and perform all work and services necessary for, or incidental, to the furnishing and installation of all electrical work as shown on the Drawings, and as specified in accordance with the provisions of the Contract Documents and completely coordinate with the work of other trades involved in the general construction. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work. The CONTRACTOR shall obtain approved Shop Drawings showing wiring diagrams, connection diagrams, roughing-in and hook up details for all equipment and comply therewith. All electrical work shall be complete and left in operating condition in accordance with the intent of the Drawings and the Specifications for the electrical work.

B. Where the word "CONTRACTOR" appears in these Technical Specifications it shall be construed to mean the Electrical CONTRACTOR.

C. Reference Section 17000, Control and Information System Scope and General Requirements for scope of work details as they relate to the Division 17 Subcontractor.

D. The scope of work for this project primarily includes, but is not limited to, the following:

1. Provide 3 phase 4 wire 480 volt service from Florida Power and Light Company (FPL) to the pump station.

2. Provide self-contained diesel engine – generator set with sub base fuel storage tank.

3. Coordination of electrical service with FPL.

4. Provide main circuit breaker, distribution panel, variable frequency drives, disconnect switches, lighting, fire alarm system, wiring devices and all associated raceways and wiring as shown on the drawings and specified herein.

5. Provide raceways and conductors for instruments and control devices.

6. Other electrical work as specified herein and indicated on the drawings.

E. Maintaining the operation of these facilities during the duration of the construction period is essential and required. The CONTRACTOR shall furnish and install temporary equipment as required to maintain facility operation. Reference Section

01520 of the Specifications for construction sequencing and specific operational constraint information.

F. All electrical equipment shall conform to the applicable NEMA specifications. All electrical equipment shall be properly identified in accordance with these Specifications and Contract Drawings. All panelboards, starters, control panels, cabinet enclosures, junction boxes, pull boxes, and equipment switches shall be identified per the requirements of Section 16195 – Electrical Identification

G. All materials, equipment, sizes and capacities of electrical equipment incorporated in the project shall conform to the latest requirements of the current National Electric Code, the National Electrical Manufacturer's Association, the State and local electrical codes, and to applicable rules and regulations of the local electrical utility serving the project.

H. All material and equipment must be the product of an established and reputable manufacturer; must be new and of first class construction; must be designed and guaranteed to perform the service required; and must bear the label of approval of the Underwriters Laboratories, Inc., where such approval is available for the product of the listed manufacturer as approved by the Engineer.

I. When a specified or indicated item has been superseded or is no longer available, the manufacturer's latest equivalent type or model of material or equipment as approved by the Engineer shall be furnished and installed at no additional cost to JEA.

J. Where the CONTRACTOR's selection of equipment of specified manufacturers or additionally approved manufacturers requires changes or additions to the system design, the CONTRACTOR shall be responsible in all respects for the modifications to all system designs, subject to approval of the Engineer. The CONTRACTOR's bid shall include all costs for all work of the Contract for all trades made necessary by such changes, additions or modifications or resulting from any approved substitution.

K. Furnish and install controls for each piece of equipment requiring the controls under this Contract. The controls shall be the size and type recommended by the manufacturer for the application and as otherwise specified or indicted on the Drawings. Refer to Divisions 1 and 17 of the Specifications for control, connection and coordination descriptions and requirements.

L. Furnish and install all stands, racks, brackets, supports, and similar equipment required to properly serve the equipment which is furnished under this Contract, or equipment otherwise specified or indicated on the Drawings.

1.02 DRAWINGS

A. The CONTRACTOR shall furnish, install, and place in satisfactory condition ready for operation, all conduits, cables, and all other material needed for the complete lighting, power, control and other electrical systems shown or indicated in the Contract Drawings. Additional conduits and the required wiring shall be installed by the CONTRACTOR wherever needed to complete the installation of the specific equipment furnished.

1.03 EQUIPMENT LOCATION

A. The Drawings show the general location of feeders, transformers, outlets, conduits, and circuit arrangements. Because of the small scale of the Drawings, it is not possible to indicate all of the details involved. The CONTRACTOR shall carefully investigate the structural and finish conditions affecting all of his work and shall arrange such work accordingly; furnishing such fittings, junction boxes, and accessories as may be required to meet such conditions. The CONTRACTOR shall refer to the entire Drawing set to verify openings, special surfaces, and location of other equipment, or other special equipment prior to roughing-in for panels, switches, and other outlets. The CONTRACTOR shall verify all equipment dimensions to insure that proposed equipment will fit properly in spaces indicated.

B. Where outlets are shown near identified equipment furnished by this or other Contractors, it is the intent of the Specifications and Drawings that the outlet be located at the equipment to be served. The Contractor shall coordinate the location of these outlets to be near the final location of the equipment served whether placed correctly or incorrectly on the Drawings.

1.04 LOCAL CONDITIONS

A. The CONTRACTOR shall examine the site and become familiar with conditions affecting the work. The CONTRACTOR shall investigate, determine, and verify locations of any overhead or buried utilities on or near the site, and shall determine such locations in conjunction with all public and/or private utility companies and with all authorities having jurisdiction. All costs, both temporary and permanent to connect all utilities, shall be included in the Bid. The Contractor shall be responsible for scheduling and coordinating with the local utility for temporary and permanent services.

B. In addition, the CONTRACTOR shall relocate all duct banks, lighting fixtures, receptacles, switches, boxes, and other electrical equipment as necessary to facilitate the Work included in this project. Costs for such work shall be included in the Bid.

C. The CONTRACTOR shall be responsible for coordinating all construction related issues and electric utility equipment with the JEA Electrical Utility Department.

1.05 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions, Section 01300, Submittals and the requirements of the individual specification sections, the CONTRACTOR shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Operation and Maintenance Manuals

3. Spare Parts List

4. Special Tools List

5. Proposed Testing Methods and Reports of Certified Shop Tests.

6. Reports of Certified Field Tests.

7. Manufacturer's Representative's Certification.

B. Submittals shall be sufficiently complete in detail to enable the Engineer to determine compliance with Contract requirements.

C. Submittals will be approved only to the extent of the information shown. Approval of an item of equipment shall not be construed to mean approval for components of that item for which the CONTRACTOR has provided no information.

D. Some individual Division 16 specification sections may require a Compliance, Deviations, and Exceptions (CD&E) letter to be submitted. If the CD&E letter is required and shop drawings are submitted without the letter, the submittal will be rejected. The letter shall include all comments, deviations and exceptions taken to the Drawings and Specifications by the Contractor AND Equipment Manufacturer/Supplier. This letter shall include a copy of this specification section. In the left margin beside each and every paragraph/item, a letter "C", "D", or "E" shall be typed or written in. The letter "C" shall be for full compliance with the requirement. The letter "D" shall be for a deviation from the requirement. The letter "E" shall be for taking exception to a requirement. Any requirements with the letter "D" or "E" beside them shall be provided with a full typewritten explanation of the deviation/exception. Handwritten explanation of the deviations/exceptions is not acceptable. The CD&E letter shall also address deviations, and exceptions taken to each Drawing related to this Specification Section.

1.06 APPLICABLE CODES AND REQUIREMENTS

A. Conformance

1. All work, equipment and materials furnished shall conform with the existing rules, requirements and specifications of the following:

a. Insurance Rating Organization having jurisdiction

b. The serving electrical utility company

c. The currently adopted edition of the National Electrical Code (NEC)

d. The National Electric Manufacturers Association (NEMA)

e. The Institute of Electrical and Electronic Engineers (IEEE)

f. The Insulated Cable Engineers Association (ICEA)

g. The American Society of Testing Materials (ASTM)

h. The American National Standards Institute (ANSI)

i. The requirements of the Occupational Safety Hazards Act (OSHA)

j. The National Electrical Contractors Association (NECA) Standard of Installation

k. National Fire Protection Association (NFPA)

l. InterNational Electrical Testing Association (NETA)

m. All other applicable Federal, State and local laws and/or ordinances.

2. All material and equipment shall bear the inspection labels of Underwriters Laboratories, Inc., if the material and equipment is of the class inspected by said laboratories.

3. All work shall be in accordance with local codes.

B. Nonconformance

1. Any paragraph of requirements in these Specifications, or Drawings, deviating from the rules, requirements and Specifications of the above organizations shall be invalid and their (the above organizations) requirements shall hold precedent thereto. The Contractor shall be held responsible for adherence to all rules, requirements and specifications as set forth above. Any additional work or material necessary for adherence will not be allowed as an extra, but shall be included in the Bid. Ignorance of any rule, requirement, or Specification shall not be allowed as an excuse for nonconformity. Acceptance by the Engineer does not relieve the Contractor from the expense involved for the correction of any errors which may exist in the drawings submitted or in the satisfactory operation of any equipment.

C. Certification

1. Upon completion of the work, the CONTRACTOR shall obtain certificate(s) of inspection and approval from the National Board of Fire Underwriters or similar inspection organization having jurisdiction and shall deliver same to the Engineer and JEA.

1.07 PERMITS AND INSPECTIONS

A. The CONTRACTOR shall reference the General Conditions and Section 01010, Summary of Work.

1.08 TEMPORARY LIGHTING AND POWER

A. The CONTRACTOR shall reference the General Conditions and Section 01510, Temporary Utilities.

1.09 TESTS

A. Upon completion of the installation, the CONTRACTOR shall perform tests for operation, load (Phase) balance overloads, and short circuits. Tests shall be made with and to the satisfaction of JEA and Engineer.

B. The CONTRACTOR shall perform all field tests and shall provide all labor, equipment, and incidentals required for testing and shall pay for electric power required for the tests. All defective material and workmanship disclosed shall be corrected by the CONTRACTOR at no cost to JEA. The CONTRACTOR shall show by demonstration in service that all circuits and devices are in good operating condition. Test shall be such that each item of control equipment will function not less than five (5) times.

C. The grounding system shall be tested to assure continuity and compliance with the requirement that ground resistances do not exceed five (5) ohms when measured by a megohmeter or equivalent device. Due to soil conditions and/or other unforeseen field conditions, ground resistances greater than five (5) ohms may be acceptable if approved by the Engineer. Ground resistance measurements of each grounding electrode shall be taken and certified by the CONTRACTOR. Upon completion of the Project, the CONTRACTOR shall submit to the Engineer the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system as well as the resistance and soil conditions at the time the measurements were made. Ground resistance measurements shall be made in normally dry weather not less than 48 hours after rainfall and with the ground under test isolated from other grounds. Ground resistance shall also be measured from each piece of equipment to the grounding electrode. Reference Section 16170, Grounding and Bonding, for additional requirements.

D. Each lighting and power distribution panelboard shall be tested with main circuit breaker disconnected from the feeder, branches connected, branch circuit breakers closed, all fixtures in place and permanently connected, lamps removed or omitted from the fixtures, and all wall switches closed.

E. Insulation resistance testing of all incoming and outgoing cables for switchgear, motor control centers, lighting and power distribution panelboards, and similar equipment shall be done after the cables are in place and just prior to final terminations. All data shall be recorded, as per Exhibit "A", attached to the end of this Section.

F. Feeder circuits shall be tested with the feeder conductors disconnected from the supplied equipment. Each individual power circuit shall be tested at the panel or motor control center with the power equipment connected for proper operation.

G. Megohmmeter tests of the insulation resistance of rotating machines and power feeders shall be conducted. The results will be accepted when the megger shows the insulation resistance to be not less than one megohm per 100 volts at 10°C using a 1,000-volt megger.

H. All transformers shall be Megohmmeter tested in accordance with the manufacturer's recommendations.

I. The CONTRACTOR shall furnish all equipment and personnel as required for testing.

J. Refer to each individual specification section for detailed test requirements.

K. The Contractor shall complete the installation and field testing of the electrical installation at least two (2) weeks prior to the start-up and testing of all other equipment. During the period between the completion of electrical installation and the start-up and testing of all other equipment, the Contractor shall make all components of the Work available as it is completed for their use in performing Preliminary and Final Field Tests.

L. Before each test commences, the Contractor shall submit a detailed test procedure, and also provide test engineer resume, manpower and scheduling information for the approval by the Engineer. In addition, the Contractor shall furnish detailed test procedures for any of his equipment required as part of the field tests of other systems.

M. Just prior to the final acceptance of a piece of equipment, the Contractor shall perform an infrared inspection to locate and correct all heating problems associated with electrical equipment. The infrared inspection shall apply to all new equipment and existing equipment that is in any way modified under this Contract. All heating problems detected with new equipment furnished and installed under the Scope of this Contract shall be corrected by the Contractor. All problems detected with portions of existing equipment modified under this Contract shall also be corrected by the Contractor. Any issues detected with portions of existing equipment that were not modified under this Contract are not the responsibility of the Contractor. Despite the Contractor not being held responsible for these problems, the Contractor shall report them to JEA and Engineer immediately for resolution. The infrared inspection report shall include both digital and IR pictures positioned side by side. Both the digital and IR pictures shall be clear and high quality. Fuzzy, grainy, or poorly illuminated pictures are not acceptable. The IR picture shall be provided with a temperature scale beside it, and an indication of the hot spot temperature in each picture. Reports shall be furnished in a 3-ring binder, with all pages printed in full color, with equipment assemblies separated by tabs.

1.10 DOCUMENTATION

A. The work requirements of this Section are in addition to and do not supersede testing and adjusting specified in other portions of the Contract Documents. The CONTRACTOR shall submit to the Engineer test records and reports for all testing.

1.11 FIELD TEST OF EQUIPMENT

A. The equipment to be tested shall include, but not be limited to, the following:

- Dry Type Distribution Transformers
- Panelboards
- Individual Motor Controllers
- Lighting Systems
- Variable Frequency Drives and Related Motor Control Equipment
- Conduit System
- Cable and Wire

- Grounding System
- Fire Alarm System

B. Refer to each specific specification section for detailed field tests.

1.12 FINAL FIELD TEST OF SYSTEM

A. The CONTRACTOR shall complete the installation and testing of the electrical installation at least two (2) months prior to the start-up and testing of all other equipment. During the period between the completion of electrical installation and the start-up and testing of all other equipment, the CONTRACTOR shall make all components of the Work available as it is completed for their use in performing Preliminary and Final Field Tests.

B. Before each test commences, the CONTRACTOR shall submit a detailed test procedure, and also provide test engineer resume, manpower and scheduling information for the approval by the Engineer. In addition, the CONTRACTOR shall furnish detailed test procedures for any of his equipment required as part of the field tests of other systems.

C. The CONTRACTOR shall perform an infrared inspection to locate and correct all heating problems associated with electrical equipment. The infrared inspection shall apply to all new equipment and existing equipment that is in any way modified under this Contract.

1.13 PROTECTIVE DEVICE SETTING AND TESTING

A. The CONTRACTOR shall provide the services of a qualified, independent, third party testing company using N.E.T.A. certified technicians to adjust, set, calibrate and test all protective devices in the electrical system. The company shall not be a subsidiary of the electrical equipment manufacturer. The qualifications of the testing company and resumes of the technicians as well as all data forms to be used for the field testing shall be submitted.

B. All protective devices in the electrical equipment shall be set, adjusted, calibrated and tested in accordance with the manufacturers' recommendations, the coordination study, and best industry practice.

C. Proper operation of all equipment associated with the device under test and its compartment shall be verified, as well as complete resistance, continuity and polarity tests of power, protective and metering circuits. Any minor adjustments, repairs and/or lubrication necessary to achieve proper operation shall be considered part of this Contract.

D. All solid state trip devices shall be checked and tested for setting and operation using manufacturers recommended test devices and procedures.

E. Circuit breakers and/or contactors associated with the above devices shall be tested for trip and close functions with their protective device.

F. When completed, the CONTRACTOR shall provide a comprehensive report for all equipment tested indicating condition, readings, faults and/or deficiencies in same. Inoperative or defective equipment shall be brought immediately to the attention of the Engineer.

G. Prior to placing any equipment in service, correct operation of all protective devices associated with this equipment shall be demonstrated by field testing under simulated load conditions.

1.14 POWER SYSTEM STUDIES

A. General

1. The CONTRACTOR shall provide Power System studies, performed by a professional Engineer registered with the state of Florida, to the firm providing the protective device setting and testing services.

2. The studies shall include protective devices from all affected areas of the power distribution system.

B. Data Collection for the Studies

1. The CONTRACTOR shall provide the required data for preparation of the studies.

2. The CONTRACTOR shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to release of the equipment for manufacture.

C. Short Circuit Study and Protective Device Evaluation Study

1. A protective device evaluation study shall be performed to determine the adequacy of circuit breakers, molded case switches, automatic transfer switches, and fuses by tabulating and comparing the short circuit ratings of these devices with the calculated fault currents. Appropriate multiplying factors based on system X/R ratios and protective device rating standards shall be applied. Any problem areas or inadequacies in the equipment due to short circuit currents shall be promptly brought to the attention of the Engineer.

2. All equipment furnished shall meet the requirements of this study.

D. Protective Device Coordination Study

1. A protective device coordination study shall be performed to provide the necessary calculations and logic decisions required to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage circuit breaker trip characteristics and settings.

2. The coordination study shall include circuit breakers of motor control center. The phase and ground overcurrent protection shall be included as well as settings of all other adjustable protective devices.

3. The time-current characteristics of the specified protective devices shall be drawn on log-log paper. The plots shall include complete titles, representative one-line diagram and legends, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breaker trip curves and fuses. The coordination plots shall indicate the types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents. All restrictions of the National Electrical Code shall be adhered to and proper coordination intervals and separation of characteristic curves shall be maintained. The coordination plots for phase and ground protective devices shall be provided on a system basis. A sufficient number of separate curves shall be used to clearly indicate the coordination achieved.

4. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios and connections, manufacturer and type, range of adjustment and recommended settings. A tabulation of the recommended power fuse selection shall be provided for the medium voltage fuses where applied in the system. Any discrepancies, problem areas, or inadequacies shall be promptly brought to the attention of the Engineer.

E. Arc Flash Hazard Analysis

1. An Arc Flash Hazard Analysis shall be performed with the aid of a digital computer program in accordance with IEEE Std. 1584, “IEEE Guide For Performing Arc Flash Hazard Calculations”, NFPA 70E, and OSHA 29-CFR, Part 1910 Subpart S.

2. Arc Flash Warning Labels and Bus Detail Sheets shall be produced for each bus. Labels shall be printed in color on adhesive backed labels. Labels shall be attached to the doors of the equipment. Each label and detail sheet shall list the following:

   a. Bus name

   b. System operating voltage

   c. Date of issue

   d. Flash hazard protection boundary

   e. Limited approach boundary

   f. Restricted boundary

g. Prohibited boundary

h. Incident energy level

i. Required personal protective equipment class

In addition, each Bus Detail Sheet shall list the following:

- Upstream Protective Devices Names, Type and Settings

3. Arc Flash Evaluation Summary Sheets shall be produced. Summary sheets shall list the following:

a. Bus name

b. Upstream protective device name, type and settings

c. Bus line-to-line voltage

d. Bus bolted fault

e. Protective device bolted fault current

f. Arcing fault current

g. Protective device trip / delay time

h. Breaker opening time

i. Solidly grounded column

j. Equipment type

k. Gap

l. Arc flash boundary

m. Working distance

n. Incident energy

o. Required personal protective equipment class

4. Analyze the short circuit, protective device coordination, and arc flash calculations and highlight any equipment that is determined to be underrated or causes an abnormally high incident energy calculation. Propose approaches to reduce the energy levels. Proposed major corrective modifications will be taken under advisement by the Engineer and the CONTRACTOR will be given further instructions.

F. Study Report

1. The results of the power system studies shall be summarized in a report. The report shall be submitted to the Engineer. The report shall be submitted for review and acceptance prior to submittals motor control centers, variable frequency drives, panelboards, and similar electrical equipment.

2. The report shall include the following sections:

    a. Description, purpose, basis and scope of the study and a detailed single line diagram with "nodes" cross-referenced to the calculated values tabulated in the study report of that portion of the power system which is included within the scope of the study.

    b. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties and commentary regarding same.

    c. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.

    d. Fault current calculations including a definition of terms and guide for interpretation of computer printout.

3. Prior to commencing the work, the preparer the studies shall meet with the testing firm that will do the relay field testing and JEA's representative at the site for a walk through of the facility to ensure that existing conditions are taken into account.

4. The study shall include a detailed explanation of all software programs and procedures used to arrive at the calculated values, settings, and drawings (e.g. single line diagrams) showing fault valves at all busses.

1.15 SCHEDULES AND PLANT OPERATIONS

A. Since the testing required in Article 1.12 above shall require that certain pieces of equipment be taken out of service, all testing procedures and schedules must be submitted to the Engineer for review and approval one (1) month prior to any work beginning. When testing has been scheduled, the Engineer must be notified 48 hours prior to any work to allow time for load switching and/or alternation of equipment. In addition, all testing that requires temporary shutdown of plant equipment must be coordinated with JEA/Engineer so as not to affect proper plant operations.

B. At the end of the workday, all equipment shall be back in place and ready for immediate use should a plant emergency arise. In addition, should an emergency condition occur during testing, at the request of JEA, the equipment shall be placed back in service immediately and turned over to plant personnel.

C. In the event of accidental shutdown of plant equipment, the CONTRACTOR shall notify plant personnel immediately to allow for an orderly restart of affected equipment.

1.16 MATERIALS HANDLING

A. Materials arriving on the job site shall be stored in such a manner as to keep material free of rust and dirt and so as to keep material properly aligned and true to shape. Rusty, dirty, or misaligned material shall be rejected. Electrical conduit shall be stored to provide protection from the weather and accidental damage. Rigid non-metallic conduit shall be stored on even supports and in locations not subject to direct sun rays or excessive heat. Cables shall be sealed, stored, and handled carefully to avoid damage to the outer covering or insulation and damage from moisture and weather. Adequate protection shall be required at all times for electrical equipment and accessories until installed and accepted. Materials damaged during shipment, storage, installation, or testing shall be replaced or repaired in a manner meeting with the approval of the Engineer. The CONTRACTOR shall store equipment and materials in accordance with Section 01550, Site Access and Storage.

(Continued on Next Page)

(EXHIBIT A)
TEST DATA - MEGOHMS
TEST NO. ____

Date:			Company:				
Time:			Location:				
Circuit:	Circuit Length:	Aerial:	Duct:	Buried:	No. of Conduc-tors	Size:	AMG MCM Shld:
Insulation Material:			Insulation Thickness:		Voltage Rating:		Age:
Type: _____Pothead _____Terminal					Location: Indoors_____ Outdoors_____		
Number and Type of Joints:							
Recent Operating History:							
Manufacturer:							
State if Potheads or Terminals were grounded during test:							
List associated equipment included in test:							
Miscellaneous Information:							

(EXHIBIT A)
TEST DATA - MEGOHMS
TEST NO. ____

Part Tested: Test Made:_____
Hours/Days:_____
After Shutdown:_____

Grounding Time: Dry Bulb Temperature:_____
Wet Bulb Temperature:_____

Test Voltage:

Equipment Temperature: _____
How Obtained: _____
Relative Humidity: _____
Absolute Humidity: _____
Dew Point: _____

Megohmmeter: Serial Number: _____ Range: _____
Voltage: _____ Calibration Date_____

Test Connections	To Line To Earth To Ground	To Line To Earth To Ground	To Line To Earth To Ground	Test Connections	To Line To Earth To Ground	To Line To Earth To Ground	To Line To Earth To Ground
□ Minute				5 Minutes			
□ Minute				6 Minutes			
3/4 Minute				7 Minutes			
1 Minute				8 Minutes			
2 Minutes				9 Minutes			
3 Minutes				10 Minutes			
4 Minutes				10/1 Minutes			
				Ratio			

Remarks:

PART 2 -- PRODUCTS

2.01 PRODUCT REQUIREMENTS

A. Unless otherwise indicated, the materials to be provided under this Specification shall be the products of manufacturers regularly engaged in the production of all such items and shall be the manufacturer's latest design. The products shall conform to the applicable standards of UL and NEMA, unless specified otherwise. International Electrotechnical Commission (IEC) standards are not recognized. Equipment designed, manufactured, and labeled in compliance with IEC standards is not acceptable.

B. All items of the same type or ratings shall be identical. This shall be further understood to include products with the accessories indicated.

C. All equipment and materials shall be new, unless indicated or specified otherwise.

D. The CONTRACTOR shall submit proof if requested by the Engineer that the materials, appliances, equipment, or devices that are provided under this Contract meet the requirements of Underwriters Laboratories, Inc., in regard to fire and casualty hazards. The label of or listing by the Underwriters Laboratories, Inc., will be accepted as conforming with this requirement.

2.02 SUBSTITUTIONS

A. Any reference in the Specifications or on the Drawings to any article, service, product, material, fixture, or item of equipment by name, make, or catalog number shall be interpreted as establishing the type, function, and standard of quality and shall not be construed as limiting competition.

2.03 CONCRETE

A. The CONTRACTOR shall furnish all concrete required for the installation of all electrical work, Concrete shall be Class A unless otherwise specified. Concrete and reinforcing steel shall meet the appropriate requirements of Division 3 of the Specifications.

B. The CONTRACTOR shall provide concrete equipment pads for all free standing electrical apparatus and equipment located on floors or slabs that exist or provided by others. The CONTRACTOR shall provide all necessary anchor bolts, channel iron sills, and other materials as required. The exact location and dimensions shall be coordinated for each piece of equipment well in advance of the scheduled placing of these pads. Equipment pads shall be 4 inches high unless otherwise indicated on the Drawings and shall conform to standard detail for equipment pads shown on the Contract Drawings. Equipment pads shall not have more than 3” excess concrete beyond the edges of the equipment.

C. The CONTRACTOR shall provide concrete foundations for all free standing electrical apparatus and equipment located outdoors or where floors or slabs do not exist or provided by others. The CONTRACTOR shall provide all necessary anchor bolts, channel iron sills, and other materials as required. The location and dimensions shall

be coordinated for each piece of equipment well in advance of the scheduled placing of the foundations. Equipment foundations shall be constructed as detailed on the Drawings or if not detailed on the Drawings shall be 6 inches thick minimum reinforced with #4 bars at 12-inch centers each way placed mid-depth. Concrete shall extend 6 inches minimum beyond the extreme of the equipment base and be placed on a compacted stone bed (#57 stone or ABC) 6 inches thick minimum.

2.04 RUBBER MATS

A. A three foot wide rubber mat shall be furnished and installed on the floor and in front of each piece of electrical equipment that is installed indoors. Rubber mats shall not be installed outdoors. The mat shall be long enough to cover the full length of the equipment. The mat shall be 1/4 inch thick with beveled edges, canvas back, solid-type with corrugations running the entire length of the mat. The mat shall be guaranteed extra quality, free from cracks, blow holes, or other defects detrimental to their mechanical or electrical strength. The mat shall meet OSHA requirements and the requirements of ANSI/ASTM D-178 J6-7 for Type 2, Class 2 insulating matting.

B. Mats shall be provided for the following equipment:

- PLC/RTU Enclosures
- Main Circuit Breaker
- Automatic Transfer Switch
- Variable Frequency Drives
- Panelboards
- Transformers

PART 3 -- EXECUTION

3.01 CUTTING AND PATCHING

A. Coordination

1. The Work shall be coordinated between all trades to avoid delays and unnecessary cutting, channeling and drilling. Sleeves shall be placed in concrete for passage of conduit wherever possible.

B. Damage

1. The CONTRACTOR shall perform all chasing, channeling, drilling and patching necessary to the proper execution of his Contract. Any damage to the building, structure, or any equipment shall be repaired by qualified mechanics of the trades involved at the CONTRACTOR's expense. If, in the Engineer's judgment, the repair of damaged equipment would not be satisfactory, then the CONTRACTOR shall replace damaged equipment at his own expense.

3.02 EXCAVATION AND BACKFILLING

A. The CONTRACTOR shall perform all excavation and backfill required for the installation of all electrical work. All excavation and backfilling shall be in complete accordance with the applicable requirements of Division 2.

3.03 CORROSION PROTECTION

A. Wherever dissimilar metals, except conduit and conduit fittings, come into contact, the CONTRACTOR shall isolate these metals as required with neoprene washers, nine (9) mil polyethylene tape, or gaskets.

- END OF SECTION

SECTION 16111

CONDUIT

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install conduits and conduit fittings to complete the installation of all electrically operated equipment as specified herein, indicated on the Drawings, and as required.

B. Requirements for conduit clamps, support systems, and anchoring are not included in this Section. Reference Section 16190, Electrical Supporting Devices, for these requirements.

C. Reference Section 16000, Basic Electrical Requirements.

1.02 CODES AND STANDARDS

A. Conduits and conduit fittings shall be designed, manufactured, and/or listed to the following standards as applicable:

1. American National Standards Institute (ANSI)

a. ANSI B1.20.1 – Pipe Threads, General Purpose

b. ANSI C80.1 – Electrical Rigid Steel Conduit

c. ANSI C80.3 – Steel Electrical Metallic Tubing

d. ANSI C80.5 – Electrical Rigid Aluminum Conduit

e. ANSI FB 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable

2. Underwriters Laboratories (UL)

a. UL 1 – Standard for Flexible Metal Conduit

b. UL 6 - Electrical Rigid Metal Conduit-Steel

c. UL 6A – Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel

d. UL 360 – Standard for Liquid-tight Flexible Metal Conduit

e. UL 467 – Grounding and Bonding Equipment

f. UL 514B – Conduit, Tubing, and Cable Fittings

g. UL 651 – Standard for Schedule 40 and 80 Conduit and Fittings

h. UL 797 – Electrical Metallic Tubing-Steel

i. UL 1203 - Standard for Explosion-proof and Dust-ignition-proof Electrical Equipment for use in Hazardous (Classified) Locations

j. UL 1479 – Standard for Fire Tests of Penetration Fire Stops

k. UL 1660 – Liquid-tight Flexible Nonmetallic Conduit

3. National Electrical Manufacturer's Association (NEMA)

a. NEMA RN 1 – PVC Externally Coated Galvanized Rigid Steel Conduit

b. NEMA TC-2 – Electrical PVC Conduit

c. NEMA TC-3 – PVC Fittings for Use with Rigid PVC Conduit and Tubing

B. Others

1. ACI-318 – Building Code Requirements for Structural Concrete

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300 – Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets for conduits and fittings.

2. Conduit identification methods and materials.

3. Evidence of training for all personnel that will install PVC coated rigid metal conduit.

1.05 DEFINITIONS

A. Conduits are categorized by the circuit type of the wiring to be installed inside. Conduits are defined as follows:

1. Power Conduits – Conduits that carry AC or DC power wiring from a source to a load. Conduits that carry lighting and receptacle wiring.

2. Control Conduits – Conduits that carry AC or DC discrete control wiring between devices and/or equipment. Conduits that carry fiber optic cables between devices and/or equipment.

3. Instrumentation Conduits – Conduits that carry AC or DC analog signal wiring between devices and/or equipment.

B. Conduit categories are indicated on the Drawings by the leading letter of the conduit tag. Conduit tag leading letters are defined as follows:

1. P – Power Conduit

2. C – Control Conduit

3. I – Instrumentation Conduit

PART 2 – PRODUCTS

2.01 GENERAL

A. Conduit and conduit fitting products are specified in the text that follows this article. Reference Part 3 herein for the application, uses and installation requirements of these conduits and conduit fittings.

B. All metallic conduit fittings shall be UL 514B and UL 467 Listed, and constructed in accordance with ANSI FB 1. All metallic conduit fittings for use in Class I Division I hazardous areas shall be UL 1203 Listed. All non-metallic fittings shall be UL 651 Listed and constructed in accordance with NEMA TC-3.

C. Flexible conduit couplings for use in Class I Division I hazardous areas shall have threaded stainless steel end fittings and a flexible braided core. Flexible braid shall be constructed of stainless steel where available in the conduit trade size required for the application. Where stainless steel braid is not available, the braid shall be provided with a PVC coating. No other braid types or materials are acceptable.

D. Where threading is specified herein for conduit fitting connections, the fittings shall be manufactured to accept conduit that is threaded to ANSI B1.20.1 requirements.

E. Conduit expansion fittings for all conduit materials of construction shall be capable of 4 inches of movement along the axis of the conduit for trade sizes 2 inches or less. Expansion fittings shall be capable of 8 inches of movement along the axis of the conduit for trade sizes greater than 2 inches.

F. Conduit deflection fittings for all conduit materials of construction shall be provided with a flexible neoprene outer jacket that permits up to ¾ inch of expansion/contraction along the axis of the conduit as well as up to ¾ inch of parallel misalignment between the conduit axes. Outer jacket shall be secured to the conduit hubs by stainless steel clamps.

G. Conduit seals shall either be Listed and labeled for 40% fill, or conduit reducing fittings and a trade size larger conduit seal shall be provided to achieve 25% or less fill within the seal. Percentage fill calculation shall be based on the conductors to be installed. Conduit seals shall be provided with breathers and/or drains where required by the NEC.

H. Conduit insulating bushings shall be constructed of plastic and shall have internal threading.

I. Additional conduit and conduit fitting requirements are specified in the articles that follow based on the specific conduit material of construction to be used.

2.02 RIGID GALVANIZED STEEL (RGS) CONDUIT AND ASSOCIATED FITTINGS

A. Conduit

1. Conduit shall be hot dip galvanized on the inside and outside, and made of heavy wall high strength ductile steel. Conduit shall be manufactured in accordance with ANSI C80.1, and shall be UL 6 Listed.

2. Conduit shall be provided with factory-cut 3/4 inch per foot tapered threads at each end in accordance with ANSI B1.20.1. Threads shall be cut prior to galvanizing to ensure corrosion protection adequately protects the threads. Conduit shall be provided with a matching coupling on one end and a color-coded thread protector on the other.

B. Conduit Bodies for use with Rigid Galvanized Steel

1. Conduit bodies shall be constructed of an electro-galvanized malleable iron alloy which is coated with an acrylic paint finish. Conduit bodies shall have integral threaded conduit hubs.

2. Conduit bodies for Class I Division I hazardous areas shall be provided with integrally threaded covers constructed of an electro-galvanized malleable iron alloy which is coated with an acrylic paint finish.

3. Conduit bodies for all other areas shall be provided with covers that are affixed in place by stainless steel screws which thread directly into the conduit body. Covers that utilize wedge nuts or any other method of attachment to the conduit body are not acceptable. Covers shall be constructed of an electro-galvanized malleable iron alloy which is coated with an acrylic paint finish. Covers shall be provided with matching gasket.

C. Conduit Couplings, Nipples, and Unions for use with Rigid Galvanized Steel

1. Couplings and nipples shall be threaded and shall be constructed of hot dipped galvanized steel. Split-type couplings that use compression to connect conduits are not acceptable.

2. Unions shall be threaded, rain-tight, and constructed of an electro-galvanized malleable iron alloy which is coated with an acrylic paint finish.

D. Conduit Expansion and Deflection Fittings for use with Rigid Galvanized Steel

1. Conduit expansion fittings and conduit deflection fittings shall be constructed of an electro-galvanized malleable iron alloy which is coated with an acrylic paint finish. Expansion and deflection fittings shall have threaded conduit connections.

2. Expansion fittings shall have an integral bonding jumper and deflection fittings shall have an external bonding jumper.

E. Conduit Seals for use with Rigid Galvanized Steel

1. Conduit seals shall be constructed of an electro-galvanized malleable iron alloy which is coated with an acrylic paint finish. Conduit seals shall have threaded conduit connections.

F. Conduit Termination Fittings for use with Rigid Galvanized Steel

1. Conduit hubs shall be constructed of stainless steel and shall have threaded connections to the conduit and enclosure. Hubs shall have a plastic insulated throat and shall be watertight when assembled to an enclosure.

2. Conduit locknuts shall be constructed of zinc plated steel. Locknuts shall have internal threading. Locknuts with integral gasket or seal are not acceptable. Locknuts shall have integral bonding screw where required for proper bonding.

3. Conduit bonding bushings shall be constructed of zinc plated malleable iron. Bonding bushings shall have a threaded conduit connection. Bonding bushing shall be provided with properly sized set screw for connecting bonding conductor and an integral plastic insulator rated for 150 degrees C located in the throat.

2.03 RIGID NONMETALLIC CONDUIT AND ASSOCIATED FITTINGS

A. Conduit

1. Conduit shall be Schedule 40 or 80 (dependent on application) polyvinyl chloride (PVC) construction, manufactured in accordance with NEMA TC-2, UL 651 Listed, and suitable for conductors with 90 degree C insulation.

B. Conduit Bodies for use with Rigid Nonmetallic Conduit

1. Conduit bodies shall be constructed of PVC. Conduit hubs shall be integral to the conduit body and shall be smooth inside to accept a glued conduit connection.

2. Conduit body shall be provided with cover that is affixed in place by stainless steel screws which thread directly into the conduit body. Covers that utilize wedge nuts or any other method of attachment to the conduit body are not acceptable. Covers shall be provided with matching gasket.

C. Conduit Couplings and Unions for use with Rigid Nonmetallic Conduit

1. Conduit couplings and unions shall be constructed of PVC and shall be smooth inside to accept a glued conduit connection.

D. Conduit Expansion and Deflection Fittings for use with Rigid Nonmetallic Conduit

1. Conduit expansion fittings and conduit deflection fittings shall be constructed of PVC and shall be smooth inside to accept a glued conduit connection.

E. Conduit Termination Fittings for use with Rigid Nonmetallic Conduit

1. Conduit hubs shall be constructed of PVC and shall be smooth inside to accept a glued conduit connection. Hubs shall have external threads and an accompanying PVC locknut, and shall be watertight when assembled to an enclosure.

2. Conduit locknuts shall be constructed of zinc plated steel. Locknuts shall have internal threading. Locknuts constructed of PVC and locknuts with integral gasket or seal are not acceptable.

3. Conduit end bells shall be constructed of PVC and shall be smooth inside to accept a glued conduit connection. End bell shall have a smooth inner surface that curves outward towards the edge of the fitting.

2.04 PVC COATED RIGID GALVANIZED STEEL CONDUIT AND ASSOCIATED FITTINGS

A. General

1. Where an external coating of polyvinyl chloride (PVC) is specified for conduit and fittings, the coating shall be 40 mil (minimum) thickness. Where an internal coating of urethane is specified for conduit and fittings, the coating shall be 2 mil (minimum) thickness.

2. All conduit fittings shall have a sealing sleeve constructed of PVC which covers all connections to conduit. Sleeves shall be appropriately sized so that no conduit threads will be exposed after assembly.

B. Conduit

1. Conduit shall be hot dip galvanized on the inside and outside, and made of heavy wall high strength ductile steel. Conduit shall be manufactured in accordance with ANSI C80.1, and shall be UL 6 Listed.

2. Conduit shall be provided with factory-cut 3/4 inch per foot tapered threads at each end in accordance with ANSI B1.20.1. Threads shall be cut prior to galvanizing to ensure corrosion protection adequately protects the threads. Conduit shall be provided with a matching coupling on one end and a color-coded thread protector on the other.

3. Conduit shall be coated on the exterior with a PVC jacket and coated on the interior with a layer of urethane. Conduit shall be manufactured in accordance with NEMA RN-1.

C. Conduit Bodies for use with PVC Coated Rigid Galvanized Steel Conduit

1. Conduit bodies shall be constructed of an electro-galvanized malleable iron alloy which is coated on the exterior with a PVC jacket and coated on the interior with a layer of urethane. Conduit bodies shall have integral threaded conduit hubs.

2. Conduit bodies for Class I Division I hazardous areas shall be provided with integrally threaded covers constructed of an electro-galvanized malleable iron alloy which is coated on the exterior with a PVC jacket and coated on the interior with a layer of urethane.

3. Conduit bodies for all other areas shall be constructed of an electro-galvanized malleable iron alloy which is coated on the exterior with a PVC jacket and coated on the interior with a layer of urethane. Covers shall be affixed in place by stainless steel screws which thread directly into the conduit body and have a plastic encapsulated head. Covers that utilize wedge nuts or any other method of attachment to the conduit body are not acceptable. Covers shall be provided with matching gasket.

D. Conduit Couplings, Nipples, and Unions for use with PVC Coated Rigid Galvanized Steel Conduit

1. Couplings and nipples shall be threaded and shall be constructed of hot dipped galvanized steel which is coated on the exterior with a PVC jacket and coated on the interior with a layer of urethane. Split-type couplings that use compression to connect conduits are not acceptable.

2. Unions shall be threaded, rain-tight, and constructed of an electro-galvanized malleable iron alloy which is coated on the exterior with a PVC jacket and coated on the interior with a layer of urethane.

E. Conduit Expansion and Deflection Fittings for use with PVC Coated Rigid Galvanized Steel Conduit

1. Conduit expansion fittings and conduit deflection fittings shall be constructed of an electro-galvanized malleable iron alloy which is coated on the exterior with a PVC jacket and coated on the interior with a layer of urethane. Expansion and deflection fittings shall have threaded conduit connections.

2. Expansion fittings shall have an integral bonding jumper and deflection fittings shall have an external bonding jumper.

F. Conduit Seals for use with PVC Coated Rigid Galvanized Steel Conduit

1. Conduit seals shall be constructed of an electro-galvanized malleable iron alloy which is coated on the exterior with a PVC jacket and coated on the interior with a layer of urethane. Conduit seals shall have threaded conduit connections.

G. Conduit Termination Fittings for Use with PVC Coated Rigid Galvanized Steel Conduit

1. Conduit hubs shall be constructed of an electro-galvanized malleable iron alloy which is coated on the exterior with a PVC jacket and coated on the interior with a layer of urethane. Hubs shall have threaded connections to the conduit and enclosure. Hubs shall have a plastic insulated throat and shall be watertight when assembled to an enclosure.

2. Conduit bonding bushings shall be constructed of zinc plated malleable iron which is coated on the exterior with a PVC jacket and coated on the interior with a layer of urethane. Bonding bushings shall have a threaded conduit connection. Bonding bushing shall be provided with properly sized set screw for connecting bonding conductor and an integral plastic insulator rated for 150 degrees C located in the throat.

2.05 RIGID ALUMINUM CONDUIT AND ASSOCIATED FITTINGS

A. Conduit

1. Conduit shall be made of heavy wall high strength 6063 alloy aluminum with temper designation T1. Conduit shall be manufactured in accordance with ANSI C80.5, and shall be UL 6A Listed.

2. Conduit shall be provided with factory-cut 3/4 inch per foot tapered threads at each end in accordance with ANSI B1.20.1. Threads shall be cut prior to galvanizing to ensure corrosion protection adequately protects the threads. Conduit shall be provided with a matching coupling on one end and a color-coded thread protector on the other.

B. Conduit Bodies for use with Rigid Aluminum Conduit

1. Conduit bodies shall be constructed of copper-free aluminum which is coated with an aluminum enamel finish. Conduit bodies shall have integral threaded conduit hubs.

2. Conduit bodies for Class I Division I hazardous areas shall be provided with integrally threaded covers constructed of copper-free aluminum which is coated with an aluminum enamel finish.

3. Conduit bodies for all other areas shall be provided with stamped copper-free aluminum covers that are affixed in place by stainless steel screws which thread directly into the conduit body. Covers that utilize wedge nuts or any other method of attachment to the conduit body are not acceptable. Covers shall be provided with matching gasket.

C. Conduit Couplings, Nipples, and Unions for use with Rigid Aluminum Conduit

1. Couplings and nipples shall be threaded and shall be constructed of heavy wall high strength 6063 alloy aluminum with temper designation T1. Split-type couplings that use compression to connect conduits are not acceptable.

2. Unions shall be threaded, rain-tight, and constructed of copper-free aluminum which is coated with an aluminum enamel finish.

D. Conduit Expansion and Deflection Fittings for use with Rigid Aluminum Conduit

1. Conduit expansion fittings and conduit deflection fittings shall be constructed of copper-free aluminum which is coated with an aluminum enamel finish. Expansion and deflection fittings shall have threaded conduit connections.

2. Expansion fittings shall have an integral bonding jumper and deflection fittings shall have an external bonding jumper.

E. Conduit Seals for use with Rigid Aluminum Conduit

1. Conduit seals shall be constructed of copper-free aluminum which is coated with an aluminum enamel finish. Conduit seals shall have threaded conduit connections.

F. Conduit Termination Fittings for use with Rigid Aluminum Conduit

1. Conduit hubs shall be constructed of copper-free aluminum and shall have threaded connections to the conduit and enclosure. Hubs shall have a plastic insulated throat and shall be watertight when assembled to an enclosure.

2. Conduit locknuts shall be constructed of copper-free aluminum. Locknuts shall have internal threading. Locknuts with integral gasket or seal are not acceptable. Locknuts shall have integral bonding screw where required for proper bonding.

3. Conduit bonding bushings shall be constructed of copper-free aluminum. Bonding bushings shall have a threaded conduit connection. Bonding bushing shall be provided with properly sized set screw for connecting bonding conductor and an integral plastic insulator rated for 150 degrees C located in the throat.

2.06 LIQUID TIGHT FLEXIBLE METAL CONDUIT (LFMC) AND ASSOCIATED FITTINGS

A. Conduit

1. Conduit shall be manufactured using a single strip of hot dip galvanized high strength steel alloy, helically formed into a continuously interlocked flexible metal conduit. Trade size 1-1/4 inch and smaller conduits shall be provided with an integrally woven copper bonding strip.

2. Conduit shall be covered with an outside PVC jacket that is UV resistant, moisture-proof, and oil-proof. Conduit shall be UL 360 Listed.

B. Conduit Termination Fittings for use with LFMC

1. Conduit termination fittings shall be constructed of either 304 stainless steel or an electro-galvanized malleable iron alloy which is coated on the exterior with a 40 mil (minimum) PVC jacket and coated on the interior with a 2 mil (minimum) layer of urethane. PVC coated fittings shall have a sealing sleeve constructed of PVC which covers the connection to conduit.

2. Termination fittings shall have a threaded end with matching locknut and sealing ring for termination to equipment, and shall have an integral external bonding lug where required for proper bonding. Termination fittings shall have a plastic insulated throat and shall be watertight when assembled to the conduit and equipment.

2.07 LIQUID TIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC) AND ASSOCIATED FITTINGS

A. Conduit

1. Conduit shall be constructed of rigid polyvinyl chloride (PVC), fabricated to provide flexibility. Conduit shall be covered with an outside PVC jacket that is UV resistant, moisture-proof, and oil-proof. Conduit shall be UL 1660 Listed.

B. Conduit Termination Fittings for use with LFNC

1. Conduit termination fittings shall be constructed PVC and shall have a threaded end with matching locknut and sealing ring for termination to equipment. Termination fittings shall be watertight when assembled to the conduit and equipment.

2.08 FLEXIBLE METAL CONDUIT (FMC) AND ASSOCIATED FITTINGS

A. Conduit

1. Conduit shall be manufactured using a single strip of hot dip galvanized high strength steel alloy, helically formed into a continuously interlocked flexible metal conduit. Conduit shall be UL 1 Listed.

B. Conduit Termination Fittings for use with FMC

1. Conduit termination fittings shall be constructed of an electro-galvanized malleable iron alloy. Fittings shall have a threaded end with matching locknut for termination to equipment, and a compression-style connection to the associated conduit.

2.09 ELECTRICAL METALLIC TUBING (EMT) AND ASSOCIATED FITTINGS

A. Conduit

1. Conduit shall be hot dipped galvanized on the inside and outside, and made of cold-rolled steel tubing. Conduit shall be manufactured in accordance with C80.3 and shall be UL 797 listed.

B. Conduit Bodies for use with EMT

1. Conduit bodies shall be constructed of an electro-galvanized malleable iron alloy which is coated with an acrylic paint finish. Conduit bodies shall have integral threaded conduit hubs.

2. Conduit bodies shall be provided with galvanized sheet steel covers that are affixed in place by stainless steel screws which thread directly into the conduit body. Covers that utilize wedge nuts or any other method of attachment to the conduit body are not acceptable. Covers shall be provided with matching gasket.

C. Conduit Couplings and Nipples for use with EMT

1. Couplings and nipples shall have threaded compression connectors with associated gland and shall be constructed of electro-galvanized steel. Fittings utilizing a set screw or indenter tool to secure the associated conduit to the fitting are not acceptable. Couplings and nipples shall be rain-tight and have a plastic insulated throat.

D. Conduit Expansion and Deflection Fittings for use with EMT

1. Conduit expansion fittings and conduit deflection fittings shall be constructed of an electro-galvanized malleable iron alloy which is coated with an acrylic paint finish. Expansion and deflection fittings shall have threaded conduit connections.

2. Expansion fittings shall have an integral bonding jumper and deflection fittings shall have an external bonding jumper.

E. Conduit Termination Fittings for use with EMT

1. Conduit termination fittings shall be constructed of electro-galvanized steel and have a plastic insulated throat. Termination fittings shall have a threaded compression connector with associated gland on one end and external threads on the other end. Termination fittings utilizing a set screw or indenter tool to secure the associated conduit to the fitting are not acceptable.

2. Conduit locknuts shall be constructed of zinc plated steel. Locknuts shall have internal threading. Locknuts shall have integral bonding screw where required for proper bonding.

2.10 CONDUIT BENDS

A. Rigid conduit bends, both factory fabricated and field fabricated, shall meet the same requirements listed in the articles above for the respective conduit type and material of construction.

B. Conduit bend radii for standard radius bends shall be no less than as follows:

TRADE SIZE (inches)	3/4	1	1-1/4	1-1/2	2	2-1/2	3	3-1/2	4	5	6

MIN. RADIUS (inches)	4-1/2	5-3/4	7-1/4	8-1/4	9-1/2	10-1/2	13	15	16	24	30

C. Conduit bend radii for long radius bends shall be no less than as follows:

TRADE SIZE (inches)	3/4	1	1-1/4	1-1/2	2	2-1/2	3	3-1/2	4	5	6
MIN. RADIUS (inches)	N/A	12	18	24	30	30	36	36	48	48	60

2.11 MISCELLANEOUS

A. Conduit Periphery Sealing

1. The sealing of the exterior surface of conduits to prevent water and/or air from passing around the conduit periphery from one space to another (where required) shall be through the use of one of the following:

   a. A conduit sleeve and pressure bushing sealing system. Acceptable products are FSK by OZ-GEDNEY, Link-Seal by Crouse-Hinds, or Engineer approved equal.

   b. A conduit sleeve that is two trade sizes larger than the conduit being sealed, with 2-hour fire rated UL 1479 Listed caulk filling the entire void between the conduit and sleeve. This method is only suitable for penetrations in non-fire rated walls and floors between spaces within buildings. This method shall not be used for the sealing of conduits leaving a building and/or structure.

2. Conduit penetrations through fire-rated walls and floors shall be made with an approved UL 1479 Listed product specifically intended for the trade size of the conduit.

B. Primer and Cement

1. Nonmetallic conduit shall be cleaned with primer and connected to fittings with the manufacturer's recommended cement that is labeled Low VOC.

C. Galvanizing Compounds

1. Galvanizing compounds for field application shall be the cold-applied type, containing no less than 93% pure zinc.

D. Conduit Interior Sealing

1. The sealing of the inside of conduits against water ingress shall be achieved through the use of one of the following:

a. Two-part expanding polyurethane foam sealing compound, dispensed from a single tube which mixes the two parts as it is injected into the conduit. Expanding foam shall be compatible with the conduit material of construction as well as the outer jacket of the cables in the conduit. Acceptable products are Q-Pak 2000 by Chemque, FST by American Polywater Corporation, or Hydra-seal S-60 by Duraline.

b. Inflatable bag that provides seal around cables and around inside diameter of conduit. Provide appropriate quantity of additional fittings for applications with three or more cables in the conduit to be sealed. Acceptable products are Rayflate by Raychem, or Engineer approved equal. This sealing method is only applicable to conduits trade size 2 inch and larger.

c. Neoprene sealing ring provided with the required quantity and diameter of holes to accommodate the cables in each conduit. Sealing ring shall be compressed by two stainless steel pressure plates. Acceptable products are type CSB by OZ-GEDNEY, or Engineer approved equal. This sealing method is only applicable to metallic conduits containing 4 or less cables.

2. The use of aerosol-based expanding foam sealants or any other method of sealing against water ingress not listed above is not acceptable.

E. Pull Rope

1. Pull ropes for empty and/or spare conduits shall be woven polyester, 1/2 inch wide, with a minimum tensile strength of 1250 lbs.

2. Pull ropes for the Contractors use in installing conductors shall be the size and strength required for the pull, and shall be made of a non-metallic material.

PART 3 – EXECUTION

3.01 GENERAL

A. Minimum trade size for all rigid conduits shall be 3/4 inch in exposed applications and 1 inch in embedded applications. Conduits installed within ductbanks shall be allowed to be increased in size to trade size 2 inch, at the Contractor's option, to accommodate the saddle size of the ductbank spacers. However, no combining of circuits shall be allowed in the larger conduits.

B. Minimum trade size for flexible conduits (where specifically allowed herein) shall be 1/2 inch in all applications.

C. Conduit routing and/or homeruns within structures is not shown on the Drawings. Conduits shall be installed concealed wherever practical and within the limitations specified herein. All other conduits not capable of being installed concealed shall be installed exposed.

D. Empty and/or spare conduits shall be provided with pull ropes which have no less than 12 inches of slack at each end.

E. Nonmetallic conduits for installations requiring less than a factory length of conduit shall be field cut to the required length. The cut shall be made square, cleaned of debris, and primer shall be applied to ready each joint for fusing. Conduits shall then be fused together with the conduit manufacturer's approved cement compound.

F. Metallic conduits for installations requiring less than a factory length of conduit shall be field cut to the required length. The cut shall be made square, be cleaned of all debris and be de-burred, then threaded. Conduit threading performed in the field shall be ¾ inch per foot tapered threads in accordance with ANSI B1.20.1.

G. Conduits shall be protected from moisture, corrosion, and physical damage during construction. Install dust-tight and water-tight conduit fittings on the ends of all conduits immediately after installation and do not remove until conductors are installed.

H. Conduits shall be installed to provide no less than 12 inches clearance from pipes that have the potential to impart heat upon the conduit. Such pipes include, but are not limited to, hot water pipes, steam pipes, exhaust pipes, and blower air pipes. Clearance shall be maintained whether conduit is installed in parallel or in crossing of pipes.

I. Where non-metallic instrumentation conduits are installed exposed, the following clearances to other conduit types shall be maintained:

    1. Instrumentation conduits installed parallel to conduits with conductors energized at 480V or above shall be 18 inches.

    2. Instrumentation conduits installed parallel to conduits with conductors energized at 240V and below shall be 12 inches.

    3. Instrumentation conduits installed at right angles to conductors energized at 480V and below shall be 6 inches.

    4. Instrumentation conduits installed at right angles to conductors energized at voltages above 480V shall be 12 inches.

J. Where conduit fittings do not include an integral insulated bushing, an insulated bushing shall be installed at all conduit termination points.

K. Conduits which serve multi-section equipment shall be terminated in the section where wiring terminations will be made.

L. Conduits shall not penetrate the floors or walls inside liquid containment areas without specific written authorization from the Engineer. Liquid containment areas are indicated on the Drawings.

M. In no case shall conduit be supported or fastened to another pipe or be installed in a manner that would prevent the removal of other pipes for repairs. Spring steel fasteners may only be used to affix conduits containing lighting branch circuits within EMT conduits to structural steel members.

N. All field fabricated threads for rigid galvanized steel conduit shall be thoroughly coated with two coats of galvanizing compound, allowing at least two minutes to elapse between coats for proper drying.

O. The appropriate specialized tools shall be used for the installation of PVC coated conduit and conduit fittings. No damage to the PVC coating shall occur during installation. Conduit and conduit fittings with damaged PVC coating shall be replaced at the Contractor's cost. The use of PVC coating touch-up compounds is not permitted.

P. Conduits which emerge from within or below concrete encasement shall be PVC coated rigid galvanized steel in accordance with Standard Detail 1611102 where the conduit is not protected by an equipment enclosure that surrounds the conduit on all sides at the point where it emerges from the encasement.

Q. Aluminum conduits shall not be installed in direct contact with concrete surfaces. Where aluminum conduits are routed along concrete surfaces, they shall be installed with one-hole electro-galvanized malleable iron alloy straps with matching clamp-backs to space the conduit ¼ inch away from concrete surface. Where aluminum conduit passes through concrete, CMU or brick walls, the penetration shall be made such that the aluminum conduit does not come in contact with concrete, CMU, brick or mortar.

3.02 CONCEALED AND EMBEDDED CONDUITS

A. Conduits are permitted to be installed concealed and/or embedded with the following requirements:

1. Conduits shall not be installed horizontally when concealed within CMU walls, only vertical installation is acceptable.

2. Conduits installed embedded within concrete floors or walls shall be located so as not to affect the designed structural strength of the floor or wall. Embedded conduits shall be installed in accordance with Standard Detail 0331604 and ACI-318.

3. Where conduit bends emerge from concrete embedment, none of the curved portion of the bend shall be visible. Only the straight portion of the bend shall be visible.

4. Where multiple conduits emerge from concrete embedment or from concealment below a concrete floor, ample clear space shall be provided between conduits to allow for the appropriate and required conduit termination fittings to be installed.

5. Conduits installed embedded within concrete encasement of any kind shall be installed such that conduit couplings for parallel conduits are staggered so that they are not side by side.

B. Conduits are NOT permitted to be installed concealed and/or embedded for the following situations:

1. Conduits shall not be installed embedded within any water-bearing floors or walls. Conduits shall not be installed embedded within any liquid containment area floors or walls.

2. Conduits shall not be installed concealed within CMU walls or gypsum walls that are adjacent to Class I and II hazardous areas (Division I and Division II).

3. Conduits shall not be installed concealed within CMU walls or gypsum walls that are adjacent to indoor Type 1 or Type 2 chemical storage/transfer areas.

3.03 CONDUIT USES AND APPLICATIONS

A. Rigid Conduit

1. Rigid conduit for non-hazardous areas shall be furnished and installed in the materials of construction as follows:

RIGID CONDUIT FOR NON-HAZARDOUS AREAS		
	CONDUIT CATEGORY BY WIRING/CIRCUIT TYPE	
INSTALLATION AREA DESIGNATION/ SCENARIO	**Power and Control**	**Instrumentation**
Exposed in indoor wet process areas	Rigid aluminum conduit	Same as Power and Control
Exposed in indoor dry process areas	Rigid aluminum conduit	Same as Power and Control
Exposed in indoor dry non-process areas	Choose an item.	Same as Power and Control
Exposed in indoor Type 1 chemical storage/transfer areas	Schedule 80 rigid non-metallic PVC conduit	Same as Power and Control
Exposed in indoor Type 2 chemical storage/transfer areas	PVC coated rigid galvanized steel conduit	Same as Power and Control
Exposed in outdoor areas	Rigid aluminum conduit	Same as Power and Control
Exposed within pre-fabricated electrical equipment center buildings	Electrical Metallic Tubing	Same as Power and Control
Concealed within underground direct-bury or concrete-encased ductbanks	Schedule 40 rigid non-metallic PVC conduit	Choose an item.
Concealed within non-elevated (i.e. "slab-on-grade" construction) concrete slabs	Schedule 40 rigid non-metallic PVC conduit	Rigid galvanized steel conduit
Concealed within elevated concrete slabs	Rigid galvanized steel conduit	Same as Power and Control
Concealed below concrete slabs (within earth or fill material)	Schedule 40 rigid non-metallic PVC conduit	Rigid galvanized steel conduit
Concealed within concrete walls	Schedule 40 rigid non-metallic PVC conduit	Rigid galvanized steel conduit

RIGID CONDUIT FOR NON-HAZARDOUS AREAS		
INSTALLATION AREA DESIGNATION/ SCENARIO	**CONDUIT CATEGORY BY WIRING/CIRCUIT TYPE**	
	Power and Control	**Instrumentation**
Concealed within CMU walls	Schedule 40 rigid non-metallic PVC conduit or Electrical Metallic Tubing	Rigid galvanized steel conduit or Electrical Metallic Tubing
Concealed above suspended ceilings	Electrical Metallic Tubing	Same as Power and Control
Concealed within interior walls constructed of metal studs and gypsum wall board	Electrical Metallic Tubing	Same as Power and Control
Emerging from concealment within or below a concrete floor and transitioning to exposed conduit (Reference Detail 1611102)	PVC coated rigid aluminum conduit	Same as Power and Control

2. Rigid conduit for hazardous areas shall be furnished and installed in the materials of construction as follows:

RIGID CONDUIT FOR HAZARDOUS AREAS		
	CONDUIT CATEGORY BY WIRING/CIRCUIT TYPE	
INSTALLATION AREA HAZARD/SCENARIO	Power and Control	Instrumentation
Exposed in Class I and II areas (Division I and Division II)	Rigid aluminum conduit	Same as Power and Control
Concealed within concrete slabs in Class I and II areas (Division I and Division II)	Rigid galvanized steel conduit	Same as Power and Control
Concealed below concrete slabs (within earth or fill material) in Class I and II areas (Division I and Division II)	Rigid galvanized steel conduit	Same as Power and Control
Concealed within concrete walls in Class I and II areas (Division I and Division II)	Rigid galvanized steel conduit	Same as Power and Control
Concealed below concrete slabs encased in at least two inches of concrete and buried 24 inches below top of slab in Class I Division I areas	Schedule 40 rigid non-metallic PVC conduit	Rigid galvanized steel conduit
Concealed above suspended ceilings in Class I and II areas (Division I and Division II)	Rigid aluminum conduit	Same as Power and Control

3. The tables for the materials of construction for rigid conduits are intended to exhaustively cover all possible scenarios and installation areas under this Contract. However, if a scenario or installation area is found that is not explicitly governed by these tables, it shall be assumed for bid purposes that the conduit material of construction is to be rigid galvanized steel. This discrepancy shall be brought to the attention of the Engineer (in writing) immediately for resolution.

B. Conduit Bends

1. All conduit bends shall be the same material of construction as the rigid conduit listed in the tables above, with the following exceptions:

   a. All 90 degree bends or combinations of adjacent bends that form a 90 degree bend where concealed within concrete or below a concrete slab shall be rigid galvanized steel.

2. Field fabricated bends of metallic conduit shall be made with a bending machine and shall have no kinks. Field fabricated standard radius and long radius bends shall have minimum bending radii in accordance with the associated tables in Part 2 herein.

3. Field bending of non-metallic conduits is not acceptable, factory fabricated bends shall be used.

4. Long radius bends shall be furnished and installed for the following specific applications, all other bends shall be standard radius:

    a. All conduits containing medium voltage cable.

    b. All conduits containing fiber optic cable.

    c. All conduits containing shielded VFD cable.

    d. Where specifically indicated on the Drawings.

C. Flexible Conduit

1. Flexible conduit shall only be installed for the limited applications specified herein. Flexible conduit shall not be installed in any other application without written authorization from the Engineer. Acceptable applications are as follows:

    a. Connections to motors and engine-generator sets (and similar vibrating equipment)

    b. Connections to solenoid valves and limit switches

    c. Connections to lighting fixtures installed in suspended ceilings

    d. Connections to lighting transformers

    e. Connections to pre-fabricated equipment skids

    f. Connections to HVAC equipment

    g. Connections to instrument transmitters and elements

    h. Where specifically indicated in the Standard Details

2. Flexible conduit length shall be limited to three (3) feet, maximum. Flexible conduit shall not be installed buried or embedded within any material.

3. Flexible conduit for non-hazardous areas shall be furnished and installed in the materials of construction as follows:

FLEXIBLE CONDUIT FOR NON-HAZARDOUS AREAS		
INSTALLATION AREA DESIGNATION/SCENARIO	**CONDUIT CATEGORY BY WIRING/CIRCUIT TYPE**	
	Power and Control	**Instrumentation**
Exposed in indoor wet process areas	Liquid-tight flexible metal conduit	Same as Power and Control
Exposed in indoor dry process areas	Flexible metal conduit	Same as Power and Control
Exposed in indoor dry non-process areas	Flexible metal conduit	Same as Power and Control
Exposed in indoor Type 1 chemical storage/transfer areas	Liquid-tight flexible non-metallic conduit	Same as Power and Control
Exposed in indoor Type 2 chemical storage/transfer areas	Liquid-tight flexible metal conduit	Same as Power and Control
Exposed in outdoor areas	Liquid-tight flexible metal conduit	Same as Power and Control
Concealed above suspended ceilings (all indoor areas)	Same material as exposed conduit in same area	Same as Power and Control

4. For Class I Division I hazardous areas, the NEC does not permit the installation of flexible conduit. In lieu of flexible conduit in these areas, flexible conduit couplings shall be installed as specified in Part 2 herein. Flexible conduit for all other hazardous areas shall be furnished and installed in the materials of construction as follows:

FLEXIBLE CONDUIT FOR HAZARDOUS AREAS		
INSTALLATION AREA HAZARD/SCENARIO	**CONDUIT CATEGORY BY WIRING/CIRCUIT TYPE**	
	Power and Control	**Instrumentation**
Exposed in Class I Division II areas	Liquid-tight flexible metal conduit	Same as Power and Control
Exposed in Class II (Division I and Division II) areas	Liquid-tight flexible metal conduit	Same as Power and Control
Concealed above suspended ceilings in Class I and II (Division I and Division II) areas	Same material as exposed conduit in same area	Same as Power and Control

3.04 CONDUIT FITTING USES AND APPLICATIONS

A. General

1. Conduit fittings shall be furnished and installed in the materials of construction as indicated in Part 2, herein. Conduit fitting materials of construction are dependent on the material of construction used for the associated conduit.

2. Conduit fittings shall be provided in the trade size and configuration required to suit the application.

B. Conduit Bodies

1. Conduit bodies shall be installed where wire pulling points are desired or required, or where changes in conduit direction or breaking around beams is required.

2. Where conduit bodies larger than trade size 2 inches are intended to be used as a pull-through fitting during wire installation, oversized or elongated conduit bodies shall be used. Oversized or elongated conduit bodies shall not be required if the conduit body is intended to be used as a pull-out point during wire installation.

C. Conduit Nipples and Unions

1. Conduits with running threads shall not be used in place of 3-piece couplings (unions) or close nipples. After installation of a conduit fitting of any kind, there shall be no more than ¼ inch of exposed threads visible. Factory fabricated all-thread nipples may be used between adjacent enclosures, however, the same restriction applies regarding the length of exposed threads that are visible.

D. Conduit Expansion and Deflection Fittings

1. Conduit expansion fittings shall be installed where required by the NEC and where indicated on the Drawings. Expansion fittings shall also be installed for exposed straight metallic conduit runs of more than 75 feet, in both indoor and outdoor locations. Expansion fittings for runs of non-metallic conduit shall be installed in accordance with the NEC.

2. Conduit deflection fittings shall be installed where required by the NEC and where conduits are installed (exposed and concealed) across structural expansion joints.

E. Conduit Seals

1. Conduit seals shall be installed for conduits installed within or associated with hazardous areas and other areas as required by the NEC. In addition, conduit seals shall also be furnished and installed as follows:

a. All conduits entering or leaving enclosed areas which store or distribute chlorine gas.

b. All conduits entering or leaving enclosed areas which store or distribute sulfur dioxide gas.

F. Conduit Termination Fittings

1. Where conduits terminate at enclosures with a NEMA 4, 4X, or 3R rating and the enclosure does not have integral conduit hubs, an appropriately sized watertight conduit hub shall be installed to maintain the integrity of the enclosure. The use of locknuts with integral gasket in lieu of watertight conduit hubs is not acceptable.

2. Where conduits terminate at enclosures that do not require conduit hubs, a two-locknut system shall be used to secure the conduit to the enclosure. One locknut shall be installed on the outside of the enclosure, and the other inside, drawn tight against the enclosure wall. The locknut on the interior of the enclosure shall be the type with integral bonding lug, or a conduit bonding bushing may be used in place of the locknut.

3. Conduits shall not be installed such that conduit fittings penetrate the top of any enclosure located outdoors, except in cases where specifically required by the serving electric utility. Conduits which serve outdoor equipment or an enclosure from above shall instead be routed into the side of the enclosure at the bottom. The conduit termination fitting shall be provided with a conduit drain to divert moisture from the raceway away from the enclosure.

3.05 MISCELLANEOUS

A. Conduit Periphery Sealing

1. All conduit penetrations through exterior walls shall be sealed around the periphery using the appropriate products specified in Part 2 herein to prevent air and/or water entry into the structure.

2. All conduit penetrations through interior walls and floors shall be sealed through the use of with conduit sleeves and caulk as specified in Part 2 herein. Alternatively, mortar may be used to seal around the conduit periphery.

3. Conduit penetrations through fire-rated walls as floors shall be made with the appropriate fire rated penetration product.

B. Conduit Interior Sealing

1. All conduits (including spares) entering a structure below grade shall be sealed on the interior of the conduit against water ingress. Sealing shall be at an accessible location in the conduit system located within the building structure and shall be via one of the methods specified in Part 2 herein. If conduit sealing cannot be achieved at an accessible location within the building structure, sealing shall be placed in the conduits in the nearest manhole or handhole outside the structure.

3.06 CONDUIT IDENTIFICATION

A. The identification system for the conduits furnished and installed under this Contract shall match the existing identification system used at the project location.

OR

3.07 CONDUIT IDENTIFICATION

A. Exposed conduits shall be identified at the source, load, and all intermediate components of the raceway system. Examples of intermediate components include but are not limited to junction boxes, pull boxes, and disconnect switches. Identification shall be by means of an adhesive label with the following requirements:

1. Labels shall consist of an orange background with black text. Text for the label shall be the conduit number as indicated in the conduit and wire schedules.

2. In addition, at the source end of the conduit, a second line of text shall be included to indicate the load equipment name. This second line shall consist of the word "TO:" and the text in the 'TO' column of the conduit and wire schedule (e.g. TO: Pump No. 1). At the load end of the conduit, a second line of text shall be included to indicate the source equipment name. This second line shall consist of the word "FROM:" and the text in the 'FROM' column of the conduit and wire schedule (e.g. FROM: MCC-SPS). This requirement applies only to the source and load ends of the conduit, and not anywhere in between.

3. For conduits trade sizes 3/4 inch through 1-1/2 inch, the text shall be a minimum 18 point font. For conduits trade size 2 inch and larger, the text shall be a minimum 24 point font.

4. Label height shall be 3/4 inch minimum, and length shall be as required to fit required text. The label shall be installed such that the text is parallel with the axis of the conduit. The label shall be oriented such that the text can be read without the use of any special tools or removal of equipment.

5. Labels shall be installed after each conduit is installed and, if applicable, after painting. Labels shall be printed in the field via the use of a portable label printing system. Handwritten labels are not acceptable.

6. Labels shall be made of permanent vinyl with adhesive backing. Labels made of any other material are not acceptable.

B. Conduits that are not exposed but installed beneath free standing equipment enclosures shall be identified by means of a plastic tag with the following requirements:

1. The tag shall be made of white Tyvek material, and have an orange label with black text, as described above, adhered to it. Text for the label shall be the conduit number as indicated in the conduit and wire schedules.

2. The tag shall be affixed to the conduit by means of a nylon cable tie. The tag shall be of suitable dimensions to achieve a minimum text size of 18 points.

C. Conduits for lighting and receptacle circuits shall not require identification.

D. Any problems or conflicts with meeting the requirements above shall immediately be brought to the attention of the Engineer for a decision.

3.08 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. All conduit installed below grade or concrete encased shall be tested to ensure continuity and the absence of obstructions by pulling through each conduit a swab followed by a mandrel 85% of the conduit inside diameter. After testing, all conduits shall be capped after installation of a suitable pulling rope.

3.09 TRAINING OF INSTALLATION PERSONNEL

A. All Contractor personnel that install PVC coated RGS conduit shall be trained by the PVC coated RGS conduit manufacturer. Training shall include proper conduit system assembly techniques, use of tools appropriate for coated conduit systems, and field bending/cutting/threading of coated conduit. Training shall have been completed within the past 24 months prior to the Notice to Proceed on this Contract to be considered valid. Contractor personnel not trained within this timeframe shall not be allowed to install coated conduit, or shall be trained/re-trained as required prior to commencement of conduit installation.

- END OF SECTION

SECTION 16118

UNDERGROUND ELECTRICAL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install underground duct systems, electric manholes, and electric handholes as specified herein and as indicated on the Drawings. The work shall be complete and shall include excavation, concrete construction, backfilling, and all materials, items, and components required for a complete system.

B. The provisions of this Division are applicable to all underground conduit work. All work shall be coordinated with that of the various utility companies and other Contractors as required.

C. Reference Section 16000, Basic Electrical Requirements, Section 16111, Conduit, and the applicable sections of Division 2, Sitework and Division 3, Concrete.

1.02 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit Shop Drawings. Each submittal shall be identified by the applicable Specification Section.

1.03 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to, the following:

1. Product data sheets.

2. Outline and dimensional drawings including detailed sections of the manholes and/or handholes.

3. Materials specifications and structural calculations for the manholes sealed by a Professional Engineer in the State of Florida.

1.04 IDENTIFICATION

A. Each electric manhole and handhole cover shall be lettered with the word “Electric”, the manhole or handhole identification number (e.g. EMH-1, EHH-1, etc.), manufacturer's name or trademark, and such other information as the manufacturer may consider necessary, or as specified, for complete identification.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The material covered by this Specification is intended to be standard material of proven performance as manufactured by reputable concerns. Material shall be fabricated, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as specified herein and indicated on the Drawings.

2.02 DUCT SYSTEM

A. Underground duct system shall consist of parallel runs of Schedule 40 PVC conduit or rigid galvanized steel conduit encased in concrete envelopes, unless otherwise specified herein or indicated on the Drawings.

B. Nonmetallic conduit joints shall be made with standard Schedule 40 PVC couplings and PVC solvent cement of the same manufacturer as the conduit. All PVC conduit shall be supplied by the same manufacturer. All joints shall be staggered, installed in accordance with the manufacturer’s recommendations, and made watertight.

C. Base and intermediate conduit spacers shall be furnished to provide a minimum of two-inch (2”) separation between conduits. Conduit spacers shall be provided in the proper size as required for the conduit that they secure. For example, a 4” conduit spacer shall not be used to secure a 2” conduit. Conduit spacers shall be as manufactured by Carlon Electrical Products Company, Aeroquip Corporation, Underground Devices, Incorporated, or equal.

D. All 90 degree conduit elbows and/or combinations of adjacent conduit elbows that form a 90 degree bend shall be rigid galvanized conduit.

2.03 ELECTRIC MANHOLES

A. The concrete manholes shall be complete with metal frames and covers of size and location as specified herein and shown on the Drawings.

B. Manhole frames and covers shall be Neenah R-1640C1, with Type A anchor ring and H20 heavy duty rated.

C. All electric manholes shall be provided with heavy duty non-metallic cable racks. Cable racks shall be rated for the application, minimum loading of 450lbs per rack arm. Cable rack system shall be Heavy Duty type as manufactured by Underground Devices, Incorporated.

2.04 ELECTRIC HANDHOLES

A. The electric handholes shall be a precast polymer concrete enclosure suitable for use as part of an underground electric raceway system. The enclosure shall be UL listed and meet or exceed the requirements of ANSI/SCTE 77-2010.

B. The enclosure design and test load rating shall be Tier 15 when located in an area subject to occasional non-deliberate vehicular traffic and AASHTO H-20 when located in an area subject to deliberate vehicular traffic.

C. The enclosure shall be the straight side design to allow easy adjustment of box to grade. The box shall be stackable for increased depth. The enclosure shall have a solid bottom.

D. Handhole opening size shall be as required to suit the application, ***18" X 30",*** minimum.

E. Heavy duty covers shall be used with Tier 15 enclosures and extra heavy duty covers shall be used with AASHTO H-20 enclosures. Covers shall be provided with cover hooks.

F. The electric handholes shall be Style "PG" or "PC" (as required) Quazite boxes as manufactured by Hubbell, Pencell Plastics equivalent, Highline Products equivalent, or equal.

PART 3 -- EXECUTION

3.01 GENERAL

A. The underground duct system, manholes, and handholes shall be installed as specified herein, indicated on the Drawings, and in accordance with manufacturers' instructions.

3.02 DUCT SYSTEM

A. All underground conduit shall be encased in concrete with a minimum of four (4) inches of concrete cover to the conduits. Concrete encased duct banks shall be reinforced as indicated in the standard details. Concrete shall be furnished and installed in accordance with Section 03300. Reinforcing steel shall be furnished and installed in accordance with Section 03200.

B. Concrete pours shall be complete from handhole to handhole and from manhole to manhole where practicable. Partial pours in general shall not be permitted. Where a complete pour is impractical, written authorization shall be obtained from the Engineer for the partial pour.

C. Conduit ductbank elevations at the manholes and handholes shall be maintained as shown on the Drawings. Where deviation is necessary to clear unforeseen obstacles, the elevations may be changed after authorization by the Engineer.

D. Slope all conduits continuously away from structures and buildings with a minimum slope of 3" per 100' unless otherwise indicated on the Drawings.

E. In general, the minimum clearance from the top of the concrete encasement and finished grade shall be 24" except where otherwise accepted by the Engineer or shown on the

Drawings.

F. Care shall be exercised during excavation for the duct banks to prevent digging too deep. Backfilling of low spots with earth fill will not be permitted unless thoroughly compacted and acceptable to the Engineer.

G. Conduits leaving or entering a building or structure may be shown in a different arrangement as compared to the duct bank. The Contractor shall arrange conduits penetrating the building based on field conditions. The Drawings are not meant to represent actual conduit arrangements required unless noted as such. Spare conduits shown going from ductbanks into buildings or structures shall be stubbed up in the location(s) as indicated on the Drawings.

H. A minimum of one (1), ¾" diameter, 10'–0" long, copper-clad steel ground rod shall be driven adjacent to each manhole, handhole, or other concrete box. A No. 4/0 AWG bare copper ground cable shall be connected between this rod and the copper ground strap using a silicon bronze connector. All ground rods shall be interconnected by means of the No. 4/0 AWG bare copper ground cable located within each duct bank. The ends of these cables shall also be connected to substation and/or building ground buses where the conduits terminate.

I. Care shall be exercised and temporary plugs shall be installed during installation to prevent the entrance of concrete, mortar, or other large particles of matter into the conduit systems. Conduit spacers shall be utilized to support conduit during the pouring of concrete to prevent movement and misalignment of the conduits. Conduit spacers shall be installed in accordance with manufacturer's instructions unless otherwise noted. Horizontal spacing of conduit spacers along ductbank shall be as indicated on the Standard Details.

J. Large radius elbows shall be used for all 90 degree conduit bends in the duct system. The following shall be the minimum elbow radii:

TRADE SIZE	1"	1 ½"	2"	2 ½"	3"	3 ½"	4"
MIN. RADIUS	12"	24"	24"	24"	36"	36"	48"

K. Prior to pulling cables, the Contractor shall thoroughly clean the inside of each length of conduit by swabbing. The ends of each conduit shall then be temporarily plugged to prevent the entrance of any dirt or foreign matter.

L. After all cables have been installed, all unused conduit openings shall be sealed or plugged as specified in Section 16111. A 250 lb. test pull rope shall be provided in the entire length of all unused conduits.

M. Where connections to existing underground conduits are indicated, excavate to the maximum depth necessary. After addressing the existing conductors, cut the conduits and remove loose concrete from the conduits before installing new concrete encased ducts. Provide a reinforced concrete collar, poured monolithically with the new duct line, to take the shear at the joint of the duct lines.

N. Construct concrete-encased conduits connecting to underground structures to have a flared section adjacent to the manhole to provide shear strength. Construct

underground structures to provide shear strength. Construct underground structures to provide for keying the concrete encasement of the duct line into the wall of the structure. Use vibrators when this portion of the encasement is poured to ensure a seal between the encasement and the wall of the structure.

O. Six (6) inches above all duct banks, the Contractor shall furnish and install a two (2) inch wide red plastic electrical hazard tape. Tapes shall be metallic detectable type and shall have a continuous message in bold black letters: “ELECTRIC LINE BURIED BELOW.” Tape shall be Detectable Identoline by Brady, or equal.

P. The Contractor shall perform all earthwork including excavation, backfill, bedding, compaction, shoring and bracing, grading and restoration of surfaces and seeded areas disturbed during the execution of the work.

3.03 ELECTRIC MANHOLES

A. Electric manholes shall be installed to a sufficient depth to accommodate the required grading of ducts as well as maintaining a minimum distance of 14” from the bottom of the lowest duct centerline entrances to finished floor line and/or highest duct centerline entrance to the roof. All manholes shall be built on, or placed over a 6” layer of well-tamped gravel.

B. Duct envelopes and conduit with bell ends shall enter at approximately right angles to the walls, except as may otherwise be shown on the Drawings.

C. All concrete work and fully assembled manholes shall be completely watertight and shall be furnished with a sump pit. The floors of the manholes shall be sloped in order to accommodate draining to the pit or drain. The outside surfaces shall be coated with an approved asphaltic waterproofing compound (all sides, bottom, and roof). Precast concrete manholes may be installed; however, all requirements of this section and other divisions of the Specifications shall apply. Structural calculations prepared by and sealed by a Professional Engineer registered in the State of Florida shall be submitted.

D. Install pulling eye irons imbedded in walls opposite each duct entrance securely fastened to manhole reinforcing rods. All hardware shall be hot-dipped galvanized steel. Copper bars shall be provided in the walls for grounding. No. 4/0 AWG bare copper cables shall be connected to these bars and all non-current carrying metal parts shall be grounded to these copper bars.

E. All cables shall be well supported on walls by nonmetallic cable racks. The cable racks shall be heavy-duty type for medium and low voltage power cables and light duty type for control, signal, communications and similar small conductors. All racks shall be rigidly attached to the wall and equipped with adjustable rack arms.

3.04 ELECTRIC HANDHOLES

A. Electric handholes shall be installed to a sufficient depth to accommodate the required grading of ducts as well as maintaining a minimum distance of 9” from the bottom of the lowest duct centerline entrances to finished floor line and/or highest duct centerline entrance to roof. All handholes shall be built on, or placed over a 6” layer of well-tamped gravel.

B. Duct envelopes and conduit with bell ends shall enter at approximately right angles to the walls, except as may otherwise be shown on the Drawings.

C. All fully assembled handholes shall be completely watertight.

D. All individual cables and/or bundles of conductors shall be identified and “dressed” along the wall of the enclosure. Cable racks as specified herein shall be provided if any handhole dimension exceeds 24 inches.

3.05 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Field tests

a. Field tests for all completed duct systems shall consist of pulling a swab through each conduit followed by a mandrel equal in size to 85% of the conduit inside diameter.

b. After testing, all conduits shall be capped after installation of a suitable pull rope. All field tests shall be witnessed by the Engineer.

- END OF SECTION -

SECTION 16123

BUILDING WIRE AND CABLE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, connect, test, and place in satisfactory operating condition, ready for service, all cables and wires indicated on the Drawings and as specified herein or required for proper operation of the installation, with the exception of internal wiring provided by electrical equipment manufacturers. The work of connecting cables to equipment, machinery, and devices shall be considered a part of this Section. All hardware, junction boxes, bolts, clamps, insulators, and fittings required for the installation of cable and wire systems shall be furnished and installed by the Contractor.

B. The wire and cable to be furnished and installed for this project shall be the product of manufacturers who have been in the business of manufacturing wire and cable for a minimum of ten (10) years.

C. Reference Section 16000, Basic Electrical Requirements.

1.02 TESTING

A. All testing shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Witness Shop Tests

a. Not required.

2. Shop Test

a. Cable and wiring shall be tested in accordance with the applicable ICEA Standards. Wire and cable shall be physically and electrically tested in accordance with the manufacturer's standards.

3. Field Tests

a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and NETA acceptance testing specifications referenced in Section 16000, Basic Electrical Requirements.

b. After installation, all wires and cables shall be tested for continuity. Testing for continuity shall be "test light" or "buzzer" style.

c. After installation, all wires and cables shall be tested for insulation levels. Insulation resistance between conductors of the same circuit and between

conductor and ground shall be tested. Testing for insulation levels shall be as follows:

i. For 600V power and control cable, apply 1,000 VDC from a Megaohmeter for one (1) minute for all 600V wires and cables installed in lighting, control, power, indication, alarm and motor feeder circuits. Resistance shall be no less than 100 Megaohms.

ii. 600V instrumentation signal cable shall be tested from conductor to conductor, conductor to shield, and conductor to ground using a Simpson No. 260 volt-ohmmeter, or approved equal. The resistance value shall be 200 Megaohms or greater.

B. Low voltage wires and cables shall be tested before being connected to motors, devices or terminal blocks.

C. Voltage tests shall be made successively between each conductor of a circuit and all other conductors of the circuit grounded.

D. If tests reveal defects or deficiencies, the Contractor shall make the necessary repairs or shall replace the cable as directed by the Engineer, without additional cost to JEA

E. All tests shall be made by and at the expense of the Contractor who shall supply all testing equipment. Test reports shall be submitted to the Engineer.

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the wire and cable manufacturer and submit the following:

1. Shop Drawings

2. Reports of Field Tests

3. Wiring Identification Methods

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed material's compliance with the Contract Documents.

B. Partial, incomplete, or illegible Submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

2. Cable pulling calculations (if required).

3. Wiring identification methods and materials.

1.05 IDENTIFICATION

A. Each cable shall be identified as specified in Part 3, Execution, of this Specification.

1.06 CABLE PULLING CALCULATIONS

A. The Contractor shall submit cable pulling calculations. These calculations, to be performed by a currently registered professional engineer in the State of Florida, shall define pulling tension and sidewall loading (sidewall bearing pressure values) for all installations of 600VAC, #1/0 conductors and larger greater than 200 feet in length. Calculations for straight horizontal installations of 600VAC, #1/0 conductors and larger greater than 200 feet are not required.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The wire and cable covered by this Specification is intended to be standard equipment of proven performance. Wire and cable shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as specified herein and indicated on the Drawings. Only one (1) manufacturer for each wire and cable type shall be permitted.

B. The wire and cable manufacturer shall be ISO 9000 registered.

2.02 600 VOLT POWER WIRE AND CABLE

A. 600 volt cable and wire shall consist of stranded, copper conductor with insulation rated THHN, 90°C for dry locations and THWN, 75°C for wet locations.

B. Conductors shall be stranded copper per ASTM-B8 and B-33, and Class B or C stranding contingent on the size unless otherwise specified. Minimum size wire shall be No. 12 AWG.

C. 600 volt individual power wire and cable shall be Okoseal-N as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent with SIMPull jacket, or equal. Multi-conductor power cables shall be Okoseal-N Type TC Cable as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent, or equal.

D. For motor controlled by a Variable Frequency Drives (VFD) provide VFD power cables. The cable shall be shielded, flexible motor supplied cable for variable speed drives, subject to non-linear power distortion. The VFD cable shall be used to interconnect the

AC VFD to the AC motor. The VFD cable shall be 1000V rated UL flexible motor supply cable, with 3 stranded tinned copper conductors with XLPE insulation, 1 stranded tinned copper ground wire with PVC insulation, overall combination tinned copper braid shield and foil shield, and black PVC jacket. The cable shall be Belden VFD cable, or approved equal.

2.03 600 VOLT CONTROL CABLE

A. 600 volt control cable shall consist of stranded, copper conductor with insulation rated THHN, 90°C for dry locations and XHHW, 75°C for below grade and wet locations. The individual conductors of the multiple conductor cable shall be color coded for proper identification. Color coding shall be equal to ICEA S-68-514, Method 1, E2. Cables shall meet requirements of IEEE-383.

B. Conductors shall be stranded copper per ASTM B-8 and B-33, and Class B or C stranding contingent on the size unless otherwise specified. Minimum wire size shall be No. 14 AWG.

C. 600 volt individual conductor control wire shall be Okoseal-N as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent with SIMPull jacket, or equal. Multi-conductor control cable shall be Okoseal-N Type TC Cable as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent, or equal.

2.04 LIGHTING AND RECEPTACLE WIRE AND CABLE

A. The lighting and receptacle branch circuit wire shall consist of solid, copper conductors with insulation rated THHN, 90°C for dry locations and THWN, 75°C for wet locations.

B. Conductors shall be solid copper per ASTM- B-33. Minimum size wire shall be No. 12 AWG.

C. Lighting and receptacle cables and wire shall be Okoseal-N as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent with SIMPull jacket, or equal.

2.05 INSTRUMENTATION CABLE

A. Single Twisted Pair Instrument Cable

1. The cable shall be single, shielded, twisted pairs or triads with 600 volt insulation and shall have a 90°C insulation rating.

2. Conductors shall be tin or alloy coated (if available), soft, annealed copper, stranded per ASTM-B8, Class B stranding unless otherwise specified. Minimum size wire shall be No. 16 AWG.

3. Conductors shall be with foil and braided shield.

B. Multi-conductor Twisted Pair Instrument Cable

1. The cable shall be insulated stranded conductors, twisted pairs or triads with foil shield over each pair, a common overall foil and braided shield, 600 volt insulation, and 90°C insulation rating.

Conductors shall be tin or alloy coated (if available), soft, annealed copper, stranded per ASTM-B8, Class B stranding unless otherwise specified. Minimum size wire shall be No. 20 AWG.

C. The instrumentation cable for analog signals shall be Okoseal-N Type P-OS for single pair or triad applications and Okoseal-N Type SP-OS for multiple pair or triad applications as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent, or equal.

2.06 CABLE PULLING LUBRICANTS

A. Cable pulling lubricants shall be non-hardening type and approved for use on the type of cable installed. Lubricant shall be Yellow #77 by Ideal, Cable Gel by Greenlee, Poly-Gel by Gardner Bender, or equal.

PART 3 -- EXECUTION

3.01 600V CABLE INSTALLATION

A. The cable and wires shall be installed as specified herein and indicated on the Drawings.

B. The cables shall be terminated in accordance with the cable and/or termination product manufacturer's instructions for the particular type of cable.

C. To minimize oxidation and corrosion, wire and cable shall be terminated using an oxide-inhibiting joint compound recommended for "copper-to-copper" connections. The compound shall be Penetrox E as manufactured by Burndy Electrical, or equal.

D. Splices shall not be allowed in the underground manhole and handhole systems. If splices are required, the Contractor shall obtain approval in writing from the Engineer prior to splicing. Splicing materials shall be barrel type butt splice connectors and heat shrink tubing as manufactured by 3M, Ideal, or equal. No splicing of instrumentation cable is allowed. The use of screw-on wire connectors (wire nuts) shall only be permitted for lighting and receptacle circuits. Reference Section 16130 for additional requirements regarding control wiring.

E. Wire and Cable Sizes

1. The sizes of wire and cable shall be as indicated on the Drawings, or if not shown, as approved by the Engineer. If required due to field routing, the size of conductors and respective conduit shall be increased so that the voltage drop measured at the load does not exceed 2-1/2%.

2. Minimum wire size within control panels, motor control centers, switchboards and similar equipment shall be No. 12 AWG for power and No. 14 AWG for control.

F. Number of Wires

1. The number of wires indicated on the Drawings for the various control, indication, and metering circuits were determined for general schemes of control and for particular indication and metering systems.

2. The actual number of wires installed for each circuit shall, in no case, be less than the number required; however, the Contractor shall add as many wires as may be required for control and indication of the actual equipment selected for installation at no additional cost to JEA. The addition of conductors shall be coordinated with and approved by the Engineer to avoid violations of the NEC regarding conduit fill.

3. All spare conductors shall be terminated on the terminal blocks mounted within the equipment.

G. Wiring Identification

1. In addition to color coding, all wiring shall be identified at each point of termination. This includes but is not limited to identification at the source, load, and in any intermediate junction boxes where a termination is made. The Contractor shall meet with JEA and Engineer to come to an agreement regarding a wire identification system prior to installation of any wiring. Wire numbers shall not be duplicated.

2. Wire identification shall be by means of a heat shrinkable sleeve. Sleeves shall have a white background with black text. Wire sizes #14 AWG through #10 AWG shall have a minimum text size of 7 points. Wire sizes #8 AWG and larger shall have a minimum text size of 10 points. Sleeves shall be of appropriate length to fit the required text. The use of handwritten text for wire identification shall not be permitted.

3. Sleeves shall be suitable for the size of wire on which they are installed. When installation is complete, sleeves shall be tightly affixed to the wire and shall not move. Sleeves shall be heat shrunk onto wiring with a heat gun approved for the application. Sleeves shall not be heated by any means which employs the use of an open flame. The Contractor shall take special care to ensure that the wiring insulation is not damaged during the heating process.

4. Sleeves shall be installed prior to the completion of the wiring terminations and shall be oriented so that they can be easily read.

5. Sleeves shall be white polyolefin as manufactured by Brady, Seton equivalent, Panduit equivalent, or equal.

6. Where sleeves are not available in the size required for the wire, the Contractor shall use an adhesive label with a white background and black text. Text size shall be in accordance with the requirements listed above.

7. Adhesive labels, for the case when sleeves are not suitable for the wire size, shall be white permanent vinyl as manufactured by Brady, Seton equivalent, Panduit equivalent, or equal.

8. Wire identification in manholes, handholes, pull boxes, and other accessible components in the raceway system where the wiring is continuous shall be accomplished by means of a tag installed around the bundled group of conductors. Identification shall utilize a FROM-TO system. Each group of conductors shall consist of all of the individual conductors in a single conduit or duct. The tag shall have text that identifies the bundle in accordance with the 'FROM' and 'TO' column for that particular conduit number in the conduit and wire schedule. Minimum text size shall be 10 point. The tag shall be affixed to the wire bundle by the use of nylon wire ties, and shall be made of polyethylene as manufactured by Brady, Seton equivalent, Panduit equivalent, or equal.

H. Cable Installation

1. All interior cable not protected by a compartment enclosure shall be installed in conduit.

I. Wiring Supplies

1. Only electrical wiring supplies manufactured under high standards of production and meeting the approval of the Engineer shall be used.

2. Rubber insulating tape shall be in accordance with ASTM Des. D119. Friction tape shall be in accordance with ASTM Des. D69.

J. Training of Cable

1. The Contractor shall furnish all labor and material required to train cables around cable vaults within buildings and in manholes and handholes in the outdoor underground duct system. Sufficient length of cable shall be provided in each handhole, manhole, and vault so that the cable can be trained and racked in an approved manner. Instrumentation cable shall be racked separate from all other AC and DC wiring to maintain the required separation specified herein. In training or racking, the radius of bend of any cable shall be not less than the manufacturer's recommendation. The training shall be done in such a manner as to minimize chaffing. Reference Section 16118.

K. Connections at Control Panels, Limit Switches, and Similar Devices

1. Where stranded wires are terminated at panels, and/or devices, connections shall be made by solderless lug, crimp type ferrule, or solder dipped.

2. Where enclosure sizes and sizes of terminals at limit switches, solenoid valves, float switches, pressure switches, temperature switches, and other devices make 7-strand, No. 12 AWG, wire terminations impractical, the Contractor shall terminate external circuits in an adjacent junction box of proper size complete with terminal strips and shall install No. 14 AWG stranded wires from the device to the junction box in a conduit. The #12 AWG field wiring shall also be terminated in the same junction box to complete the circuit.

L. Pulling Temperature

1. Cable shall not be flexed or pulled when the temperature of the jacket is such that damage will occur due to low temperature embrittlement. When cable will be pulled with an ambient temperature of 40°F or less within a three (3) day period prior to pulling the cable reels shall be stored three (3) days prior to pulling in a protected storage area with an ambient temperature of 55°F or more. Cable pulling shall be completed during the work day for which the cable is removed from the protected storage. Any remaining cable reels shall be returned to storage at the completion of the workday.

M. Color Coding

1. Conductor insulation shall be color coded as follows:

a. 480/277V AC Power

Phase A - BROWN
Phase B - ORANGE
Phase C - YELLOW
Neutral - GREY

b. 120/208V or 120/240V AC Power

Phase A - BLACK
Phase B - RED
Phase C - BLUE
Neutral - WHITE

c. DC Power

Positive Lead - RED
Negative Lead - BLACK

d. DC Control

All wiring - BLUE

e. 120VAC Control

Single conductor 120 VAC control wire shall be RED except for a wire entering a motor control center compartment or control panel which is an interlock. This conductor shall be color coded YELLOW.

f. 24VAC Control

All wiring – ORANGE

g. Equipment Grounding Conductor

All wiring - GREEN

2. Conductors No. 2 AWG and smaller shall be factory color coded with a separate color for each phase and neutral, which shall be used consistently throughout the system. Larger cables shall be coded by the use of colored tape in accordance with the requirements listed above.

3. Low voltage feeder and branch circuit conductors shall be identified in accordance with the NEC. The method utilized for conductor identification for each nominal voltage system shall be permanently posted at each feeder or branch circuit distribution equipment assembly. Reference Articles 200, 210, and 215 of the NEC.

3.02 INSTRUMENTATION CABLE INSTALLATION

A. The Contractor shall install all cable or conductors used for instrumentation wiring (4-20 mA DC, etc.) in rigid galvanized steel or PVC coated rigid galvanized steel conduit. The use of asbestos cement or PVC conduit shall not be permitted. Analog signal wires shall exclusively occupy these conduits. No other wiring for AC or discrete DC circuits shall be installed in these conduits.

B. All shielding shall be continuous and shall be grounded at one point only, or in accordance with the instrumentation equipment manufacturer's recommendations.

C. Where instrumentation cables are installed in panels, manholes, handholes, and other locations, the Contractor shall arrange wiring to provide maximum clearance between these cables and other conductors. Instrumentation cables shall not be installed in same bundle with conductors of other circuits.

D. Additional pullboxes shall be furnished and installed for ease of cable pulling and the cable manufacturer's recommended conduit fill factor shall be followed. Where required or specifically directed by the Engineer, the Contractor shall moisture seal the cables at all connections with OZ Gedney Type "CSB", or equal, sealing bushings.

E. Special instrument cable shall be as specified or recommended by the manufacturer of the equipment or instruments requiring such wiring. Installation, storage, terminations, etc., shall be per manufacturer's recommendations.

F. All cable insulation and jackets shall have adequate strength for it to be pulled through the conduit systems. All conductors shall be color coded and all wires shall be suitably tagged with permanent markers as specified herein.

3.03 FIBER OPTIC CABLE INSTALLATION

A. The Contractor shall install the fiber optic cable furnished by the General Contractor and/or the Instrumentation and Control Subcontractor. The cable shall be installed in its respective raceway system(s) as specified herein, indicated on the Drawings, and in accordance with the cable manufacturer's instructions. Reference Division 17 for additional information regarding the fiber optic cable.

- END OF SECTION –

SECTION 16130

BOXES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The scope of work under this Section includes furnishing and installing all pull boxes, junction boxes, and outlet boxes.

B. Requirements for other boxes and enclosures are not included in this Section. Reference each specific Division 16 equipment Section for requirements related to that equipment's respective enclosure.

C. Reference Section 16000, Basic Electrical Requirements, and Section 161111, Conduit.

1.02 CODES AND STANDARDS

A. Boxes shall be designed, manufactured, and/or listed to the following standards as applicable:

1. UL 514A - Metallic Outlet Boxes

2. UL 514C - Standard for Non-metallic Outlet Boxes, Flush Device Boxes, and Covers

3. UL 50 – Enclosures for Electrical Equipment, Non-environmental Considerations

4. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations

5. UL 1203 - Standard for Explosion-proof and Dust-ignition-proof Electrical Equipment for use in Hazardous (Classified) Locations.

6. NEMA 250 – Enclosures for Electrical Equipment

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer(s) and submit the following:

1. Shop Drawings

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete or illegible Submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets for boxes, terminal strips, and all accessories

1.05 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in the General Conditions and Division 1.

B. As-built drawings showing dimensions, internal box layout, terminal strip information, and terminal strip identification information shall be provided for all junction boxes. As-built drawings are not required for pull boxes or outlet boxes.

1.06 IDENTIFICATION

A. Each pull and junction box shall be identified with the box name as indicated on the Contract Drawings (e.g. PPB-XXX, CJB-YYY) or as directed by the Engineer. A nameplate shall be securely affixed in a conspicuous place on each box. Nameplates shall be as specified in Section 16195, Electrical – Identification.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

2.02 PULL AND JUNCTION BOXES

A. General

1. All pull and junction boxes shall be UL listed and labeled.

2. Pull and junction boxes shall not be provided with eccentric or concentric knockouts.

3. Pull and junction boxes mounted embedded in concrete shall be UL listed for embedment.

4. Where metallic boxes are used they shall be of cast type or all welded construction as specified herein. Tack welded boxes are not acceptable.

B. Pull Boxes

1. All pull boxes shall be provided with a matching gasketed cover. For covers with dimensions of 24 inches by 24 inches or less, the cover shall be held in place by machine screws. Other screw types are not acceptable. For covers with dimensions greater than 24 inches by 24 inches, the cover shall be hinged and held in place by screw-operated clamp mechanisms. Hinge pins shall be removable. Clamp mechanism material of construction shall match that of the associated box.

2. Pull boxes shall not have any wire terminations inside, other than those for grounding/bonding. A ground bar shall be provided with the necessary number of screw type terminals. Twenty (20) percent of the total amount of terminals otherwise required for the pull box (minimum of two) shall be provided as spare terminations. Boxes requiring any other wire terminations shall be furnished and installed in accordance with the requirements for junction boxes herein.

3. Pull boxes shall be 6 inches wide by 6 inches tall by 4 inches deep, minimum. For applications requiring larger boxes, the box shall be sized in accordance with the fill requirements and dimensional requirements of the NEC.

4. Barriers shall be provided in pull boxes to isolate conductors of different voltages, types, and functions. Barrier material of construction shall match that of the box. Isolation shall be provided between the following groups:

    a. Power wiring

    b. AC control wiring

    c. DC control wiring

    d. Instrumentation wiring

C. Junction Boxes

1. Junction boxes used for lighting and receptacle circuits only shall be provided with a matching gasketed cover held in place by machine screws. Other screw types are not acceptable.

2. Junction boxes for all uses other than lighting and receptacle circuits shall be provided with a hinged, gasketed cover. Hinge pins shall be removable. Cover shall be held in place by screw-operated clamp mechanisms. Clamp mechanism material of construction shall match that of the associated box.

3. Barriers shall be provided in junction boxes to isolate conductors and terminal blocks of different voltages, types, and functions. Barrier material of construction shall match that of the box. Isolation shall be provided between the following groups:

    a. Power wiring

    b. AC control wiring

    c. DC control wiring

    d. Instrumentation wiring

4. Junction boxes used for lighting and receptacle circuits only shall be allowed to have screw-on (wire nut) type connectors for wire terminations/junctions.

5. Junction boxes for all uses other than lighting and receptacle circuits shall be provided with terminal strips, consisting the necessary number of screw type terminals. Current carrying parts of the terminal blocks shall be of ample capacity to carry the full load current of the circuits connected, with a 10A minimum capacity. Terminal strips shall be rated for the voltage of the circuits connected. A separate ground bar shall be provided with the necessary number of screw type terminals. Twenty (20) percent of the total amount of terminals otherwise required for the junction box (minimum of two) shall be provided as spare terminations. When barriers are provided within the box, separate terminal strips shall be provided in each barrier area. Terminals shall be lettered and/or numbered to conform to the wiring labeling scheme in place on the project.

6. Junction boxes shall be 6 inches wide by 6 inches tall by 4 inches deep, minimum. For applications requiring larger boxes, the box shall be sized in accordance with the fill requirements and dimensional requirements of the NEC. Terminal blocks (including spare terminals) shall be considered when sizing the junction box.

D. Enclosure Types and Materials

1. In non-hazardous locations, pull and junction boxes shall be furnished with the following enclosure type and material of construction, dependent upon the designation of the area in which they are to be installed. Area designations are indicated on the Drawings.

AREA DESIGNATION	**ENCLOSURE TYPE AND MATERIAL**
Indoor Wet Process Area	NEMA 4X, Aluminum Construction
Indoor Dry Process Area	NEMA 12, Galvanized Steel
Indoor Dry Non-process Area	NEMA 1, Galvanized Steel
Indoor Type 1 Chemical Storage/Transfer Area	NEMA 4X, Fiberglass or PVC
Indoor Type 2 Chemical Storage/Transfer Area	NEMA 4X, Type 316 Stainless Steel
All Outdoor Areas	NEMA 4X, Aluminum Construction

2. In hazardous locations, pull and junction boxes shall be furnished with the following enclosure type and material of construction, dependent upon the classification of the area in which they are to be installed. Area classifications are indicated on the Drawings.

AREA CLASSIFICATION	ENCLOSURE TYPE AND MATERIAL
Class 1, Division 1, Group D	NEMA 7, Die Cast Aluminum
Class 1, Division 2, Group D	NEMA 4X, Cast Aluminum
Class 2, Division 1, Group F	NEMA 9, Die Cast Aluminum
Class 2, Division 2, Group F	NEMA 4X, Cast Aluminum

3. Non-metallic enclosures, NEMA 7 enclosures, and NEMA 9 enclosures shall be provided with threaded integral conduit hubs.

2.03 OUTLET BOXES

A. General

1. Outlet boxes shall be provided with a trim appropriate for the wiring device installed inside. Reference Section 16141, Wiring Devices, for outlet box trim requirements. An appropriate outlet box trim is required to achieve the NEMA rating of the outlet boxes as specified herein.

B. Surface Mount Outlet Boxes

1. Outlet boxes shall be the deep type, no less than 2.5 inches deep.

2. Outlet boxes shall be provided in single or multi-gang configuration as required, sized in accordance with the requirements of the NEC.

3. In non-hazardous locations, outlet boxes shall be furnished with the following enclosure type and material of construction, dependent upon the designation of the area in which they are to be installed. Area designations are indicated on the Drawings.

AREA DESIGNATION	ENCLOSURE TYPE AND MATERIAL
Indoor Wet Process Area	NEMA 4X, Cast Aluminum
Indoor Dry Process Area	NEMA 1, Cast Aluminum
Indoor Dry Non-process Area	NEMA 1, Cast Aluminum
Indoor Type 1 Chemical Storage/Transfer Area	NEMA 4X, PVC
Indoor Type 2 Chemical Storage/Transfer Area	NEMA 4X, Cast Aluminum
All Outdoor Areas	NEMA 4X, Cast Aluminum

4. In hazardous locations, outlet boxes shall be furnished with the following enclosure type and material of construction, dependent upon the classification of

the area in which they are to be installed. Area classifications are indicated on the Drawings.

AREA CLASSIFICATION	ENCLOSURE TYPE AND MATERIAL
Class 1, Division 1, Group D	NEMA 7, Die Cast Aluminum
Class 1, Division 2, Group D	NEMA 4X, Cast Aluminum
Class 2, Division 1, Group F	NEMA 9, Die Cast Aluminum
Class 2, Division 2, Group F	NEMA 4X, Cast Aluminum

5. Outlet boxes shall be provided with integral threaded conduit hubs mounted external to the box. Boxes with threaded conduit hubs mounted internal to the box or as a part of the box wall are not acceptable.

C. Flush Mount Outlet Boxes

1. Outlet boxes shall be no less than 2-1/8 inches deep, and 4-11/16 inches square. Boxes shall be UL listed and labeled. Pre-punched single diameter conduit knockouts are acceptable, however, concentric and eccentric knockouts are not acceptable.

2. Outlet boxes mounted flush in CMU walls shall be made of galvanized, tack welded steel, and suitable for installation in masonry walls. Sectional type boxes are not acceptable for this application.

3. Outlet boxes mounted flush in gypsum walls shall be made of galvanized pressed steel. Tack welded boxes are not acceptable for this application. Sectional type boxes are not acceptable for this application.

4. Outlet boxes mounted cast into concrete shall be concrete tight, and shall be made of galvanized steel or PVC.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Pull and Junction Boxes

1. Pull boxes and junction boxes shall be solidly attached to structural members prior to installation of conduit and set true and plumb. Boxes shall not be supported by their associated conduits.

2. Wooden plugs are not permitted for securing boxes to concrete. Appropriately rated anchors specifically suited for use in concrete shall be used.

3. Box penetrations for conduits shall be made with a punch tool, and penetrations shall be of the size required for the conduit entry and/or hub. Oversized penetrations in boxes are not acceptable.

4. Watertight conduit hubs shall be provided for boxes where a NEMA 4X enclosure rating is specified. Reference Section 16111, Conduit, for conduit hub requirements.

5. Pull and junction boxes may be installed flush mounted in gypsum, concrete or CMU walls where appropriate provided that covers are easily removed or opened.

6. Pull and junction boxes shall be provided in the enclosure type and material of construction required for the area in which it is installed. Reference the requirements in Part 2 herein, and the area designations indicated on the Drawings.

B. Outlet Boxes

1. Outlet boxes shall be solidly attached to structural members prior to installation of conduit and set true and plumb. Boxes shall not be supported by their associated conduits.

2. Wooden plugs are not permitted for securing boxes to concrete. Appropriately rated anchors specifically suited for use in concrete shall be used.

3. Flush mounted outlet boxes shall be arranged and located so that tile and grout lines fit closely around the boxes, and so placed that the cover or device plate shall fit flush to the finished wall surface.

4. Outlet boxes shall be flush mounted in finished areas and other areas where practical. Flush mounted outlet boxes shall not be installed in hazardous areas and type 1 or 2 chemical storage/transfer areas.

5. For the below-named items, mounting heights from finished floor, or finished grade to top is applicable, depending on the type of wiring device to be installed in the outlet box. Mounting heights for outlet boxes shall be as follows, unless otherwise specified herein, indicated on the Drawings, or required by the Americans with Disability Act (ADA):

   a. Light switches and wall mounted occupancy sensors, 48 inches

   b. Receptacles in indoor dry process/non-process areas, 16 inches

   c. Receptacles in indoor wet process areas and all indoor chemical storage/ transfer areas, 48 inches

   d. Receptacles in outdoor locations, 24 inches

6. Outlet boxes shall be provided in the material of construction required for the area in which it is installed. Reference the requirements in Part 2 herein, and the area designations indicated on the Drawings.

- END OF SECTION -

SECTION 16141

WIRING DEVICES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all switches and receptacles for lighting and miscellaneous power applications of the type and at the locations as specified herein and as shown on the Drawings.

B. All switches and receptacles shall be furnished and installed in outlet boxes as specified in Section 16130, Boxes.

C. Reference Section 16000, Basic Electrical Requirements.

1.02 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit shop drawings. Each submittal shall be identified by the applicable specification section.

1.03 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include, but not be limited to:

1. Product data sheets.

1.04 SUPPLIES AND SPARE PARTS

A. The Contractor shall furnish 10% (minimum of 1) spare of each receptacle, switch, and plug furnished and installed for this project.

B. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

C. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number.

Those parts which are identical for more than one size shall have the same parts number.

1.05 IDENTIFICATION

A. Each switch and receptacle shall be identified with the equipment item number, manufacturer's name or trademark, and such other information as the manufacturer may consider necessary, or as specified, for complete identification.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by these Specifications is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

B. The Contractor shall use the products of a single manufacturer for each type of wiring device.

C. The Contractor shall use the products of a single manufacturer for all device plates. Plate variations are allowed for the following devices:

1. Where the selected plate manufacturer does not manufacture a suitable finish plate.

2. For heavy-duty receptacles rated at more than 30A.

3. Where non-standard plates are required, specified, or shown.

D. The Contractor shall furnish and install all wiring devices and device plates. Wiring devices as listed herein are intended to indicate type, function, and quality of the products.

E. The receptacles, switches, device plates, and other appurtenances shall comply with the requirements of these Specifications. Receptacles installed in toilet, locker, and bathrooms shall be of ground fault interrupter type to meet the minimum NEC requirements. Ground fault circuit interrupter receptacles shall also be furnished and installed as specified herein, indicated on the Drawings, and required by the NEC.

F. Wiring devices shall be approved for use with stranded conductors, if stranded conductors are to be used with the device. Reference Section 16123, Building Wire and Cable.

G. The Contractor shall provide specification grade devices which shall be as manufactured by Appleton, Crouse-Hinds, Leviton, Harvey Hubbell Co., Bryant Electric Company, Pass & Seymour, or equal.

2.02 WIRING DEVICES

A. Wiring devices shall be in accordance with the following for nonhazardous areas:

1. Wall Switches, Single Pole, 20 A, 120-277V equivalent to Hubbell No. 1221, Pass & Seymour No. 20AC1, Leviton equivalent, or equal. Switches rated 30 A, 120-277V shall be Leviton 3031, Hubbell equivalent, Pass & Seymour equivalent, or equal.

2. Wall Switches, Double Pole, 20 A, 120-277V equivalent to Hubbell No. 1222, Pass & Seymour No. 20AC2, Leviton equivalent, or equal. Switches rated 30 A, 120-277V shall be Leviton 3032, Hubbell equivalent, Pass & Seymour equivalent, or equal.

3. Wall Switches, Three-Way, 20 A, 120-277V equivalent to Hubbell No. 1223, Pass & Seymour No. 20AC3, Leviton equivalent, or equal. Switches rated 30 A, 120-277V shall be Leviton 3033, Hubbell equivalent, Pass & Seymour equivalent, or equal.

4. Wall Switches, Four-Way, 20 A, 120-277V equivalent to Hubbell No. 1224, Pass & Seymour No. 20AC4, Leviton equivalent, or equal.

5. Convenience Receptacles 20 A, 125V, duplex polarized with grounding connection equivalent to Hubbell No. 5362, Pass & Seymour equivalent, Leviton equivalent, or equal.

6. Hubbell Cat. No. GF-5362, Pass & Seymour equivalent, Leviton equivalent, or equal, for 20A, 120V, duplex, ground fault circuit interrupting type.

B. Special Purpose Receptacles shall be rated to carry, at least where required the full load amperes and voltage of the unit connected thereto. These receptacles shall be provided with grounding poles and shall be equivalent to the following:

1. Hubbell Cat. No. HBL-5661, Pass & Seymour No. 5871, Leviton equivalent, or equal, for 20A, 250VAC, 1-phase service.

2. Hubbell Cat. No. HBL-9330, Pass & Seymour No.3801, Leviton equivalent, or equal, for 30A, 250VAC, 1-phase service.

3. Hubbell Cat. No. 9430, Pass & Seymour No. 5740, Leviton equivalent, or equal, for 30A, 208/120V, 3-phase service.

4. Hubbell Cat. No. 9450, Pass & Seymour No. 5750, Leviton equivalent, or equal, for 50A, 208/120V, 3-phase service.

5. Hubbell Cat. No. 9460, Pass & Seymour No. 5760, Leviton equivalent, or equal, for 60A, 208/120V, 3-phase service.

6. Hubbell Cat. No. 9330, Pass & Seymour No. 5930, Leviton equivalent, or equal, for 30A, 208V, single-phase service.

7. Hubbell Cat. No. 9315, Pass & Seymour equivalent, Leviton equivalent, or equal, for 30A, 277V, single-phase service.

8. Hubbell Cat. No. 23CM10, Pass & Seymour equivalent, Leviton equivalent, or equal, for 20A, single, 125V, polarized with grounding connection, twist lock type. Matching plug shall be Hubbell Cat. No. 23CM11, Pass & Seymour equivalent, Leviton equivalent, or equal.

9. Crouse-Hinds "Arktite" Series, Appleton equivalent, Killark equivalent, or equal, 30A, 3P, 600 Volt, twist lock, weatherproof, power receptacle and box with matching plug.

C. For hazardous areas the following shall be provided:

1. Wall Switches, single pole, 20 A, 120 V equivalent to Crouse Hinds Cat. No. EFD3591 or EFDC3591 (as required); Appleton No. EDS175F1 or EDSC175F1, Killark equivalent, or equal.

2. Convenience Receptacles 20 A, 120-250 VAC, 2 wire, 3 pole equivalent to Crouse Hinds Cat. No. CPS152-201, Appleton No. CPE1-2375, Killark equivalent, or equal.

D. Plugs for hazardous and non-hazardous receptacles shall be provided:

1. Plugs and respective cable shall be provided for equipment furnished under other Divisions (steam cleaners, welders, etc.) as necessary.

2.03 DEVICE PLATES

A. Wall plates with gaskets for flush-mounted receptacles and switches shall be made of Type 304 stainless steel, not less than 0.032 of an inch thick, with beveled edges and milled on the rear so as to lie flat against the wall. Wall plates shall be equivalent to Hubbell Series 9600, Pass & Seymour series 93000, Leviton equivalent, or equal.

B. Device plates for outdoor installations and indoor wet process area installations shall be Appleton Type FSK, Crouse-Hinds #DS185, or equal for wall switches. Device plates for receptacles shall be “in-use” style. “In-use” weatherproof covers shall be rugged, minimum 3 ¼” depth, die-cast aluminum as manufactured by Thomas & Betts "Red Dot," Intermatic International, Inc., or equal.

C. Device plates for indoor dry process areas with surface mounted boxes shall be Crouse-Hinds DS32, or equal for switches, and Crouse-Hinds DS23 or equal for receptacles.

2.04 PLUGS

A. The Contractor shall furnish suitable plugs with equipment furnished under the respective Contract. Plugs shall be black rubber or plastic. For waterproof receptacles, the plugs shall be similar in construction to the receptacles and shall be encased in corrosion resistant yellow housing provided with clamping nuts and stuffing gland cable outlets.

2.05 PROCESS INSTRUMENTS

A. The Contractor shall furnish and install a local disconnect switch at each process instrument (e.g., level transmitter, flow transmitter, analytical instrument etc.,) to disconnect the 120VAC power supply to the instrument. The device shall be a NSSC series manual motor starting switch without overload protection as manufactured by Crouse-Hinds, Appleton equivalent, or equal. For hazardous locations, the device shall be a front operated general use snap switch mounted in an EFS enclosure as manufactured by Crouse-Hinds, Appleton equivalent, or equal.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Switch boxes shall be of unit construction and of sizes as required to adequately house the number of switches required. No sectional type switch boxes shall be permitted.

B. Where more than one (1) switch occurs at one (1) point, gang plates shall be used.

C. All device plates shall be set true and plumb, and shall fit tightly against the finished wall surfaces and outlet boxes.

D. All devices shall be flush-mounted in finished areas, unless otherwise noted. The Contractor shall determine the proper position of every outlet, and relocate any outlet without additional cost to JEA if same is incorrectly or improperly located. The Engineer reserves the right to change the location of any outlet or connecting equipment up to the time of roughing in without additional cost to JEA, provided conduit runs are not increased by more than ten (10) feet.

E. In all areas where thermal or acoustic insulation is applied to the ceiling or walls, outlet boxes shall be set to finish flush with the finished surface of the insulation.

F. When indicated height would place any of the equipment at an unsuitable location such as at a molding or break in wall finish, the contractor shall bring it to the attention of the Engineer for a decision.

G. For the below-named items, mounting heights from finish floor, or finish grade to top is applicable. Mounting heights shall be as follows, unless otherwise specified herein, indicated on the Drawings, or required by the Americans with Disability Act (ADA):

   1. Single-pole light switches, 48 inches.

   2. Duplex receptacles in dry areas, 16 inches

   3. Duplex receptacles in pump rooms, 48 inches

H. The Contractor shall furnish and install switches as indicated on the Drawings. Switches shall be single pole, double pole, 3-way, or 4-way as indicated on the

Drawings and as required. Switches located outdoors or in wet indoor locations shall be installed in cast boxes complete with yellow, fiberglass weatherproof covers. Reference Section 16141, Wiring Devices.

I. All receptacles shall have a self-adhesive label installed on the top at the respective device plate that indicates which panel and which circuit number the receptacle is supplied from. Labels shall have a white background and black lettering in 14 point font.

3.02 CIRCUITING

A. Convenience receptacles shall be grouped on circuits separate from the lighting circuits. A maximum of eight (8) convenience receptacles are permitted per 20A, 120V circuit.

- END OF SECTION -

SECTION 16170

GROUNDING AND BONDING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install grounding systems complete in accordance with the minimum requirements established by Article 250 of the NEC. Article 250 of the NEC shall be considered a minimum requirement for compliance with this Specification.

B. Grounding of all instrumentation and control systems shall be furnished and installed in accordance with the manufacturer/system requirements and IEEE 1100-92, Powering and Grounding of Sensitive Electronic Equipment. Conflicts shall be promptly brought to the attention of the Engineer.

C. In addition to the NEC requirements, building structural steel columns shall be permanently and effectively grounded:

D. Reference Section 16000, Basic Electrical Requirements.

1.02 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Reports of certified field tests.

B. Each submittal shall be identified by the applicable specification section.

1.03 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

2. Drawings and written description of how the Contractor intends to furnish and install the grounding system.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by these specifications shall be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

2.02 GROUND RODS AND GRID

A. Ground rods shall be rolled to a commercially round shape from a welded copper-clad steel manufactured by the molten-welding process or by the electro-formed process (molecularly bonded). They shall have an ultimate tensile strength of 75,000 pounds per square inch (psi) and an elastic limit of 49,000 psi. The rods shall be not less than 3/4 inch in diameter by 10 feet in length; and the proportion of copper shall be uniform throughout the length of the rod. The copper shall have a minimum wall thickness of 0.010 inch at any point on the rod. Ground rods shall be UL 467 listed. The ground rods shall be manufactured by Erico Products, Blackburn, or equal.

B. Except where specifically indicated otherwise, all exposed non current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductors in nonmetallic raceways and neutral conductors of wiring systems shall be grounded.

C. The ground connection shall be made at the main service equipment and shall be extended to the ground grid surrounding the structure. The ground grid shall also be connected to the point of entrance of the metallic water service. Connection to the water pipe shall be made by a suitable ground clamp or lug connection to a plugged tee. If flanged pipes are encountered, connection shall be made with the lug bolted to the street side of the flanged connection.

D. Where ground fault protection is employed, care shall be taken so that the connection of the ground and neutral does not interfere with the correct operation of the ground fault protection system.

2.03 FITTINGS

A. Grounding connections to equipment shall be bolted. Cable end connections shall be made by hydraulic crimp or exothermically welded. Split bolt type connectors are not acceptable. Fittings shall be UL 467 listed.

2.04 BARE GROUND CABLE

Bare ground cable shall be soft-drawn, bare copper stranded cable complying with ASTM B8. No. 4/0 AWG minimum size unless otherwise shown or indicated on the Drawings.

2.05 EQUIPMENT GROUNDING CONDUCTORS

A. An insulated equipment grounding conductor, which shall be separate from the electrical system neutral conductor, shall be furnished and installed for all circuits. Insulation shall be of the same type as the underground conductors in the raceway and shall be green in color. Equipment grounding conductors shall be furnished and installed in all conduits. Use of conduits as the NEC required equipment grounding conductor is not acceptable.

2.06 EQUIPMENT GROUNDS

A. Equipment grounds shall be solid and continuous from a connection at earth to all distribution panel boards. Ground connections at panelboards, outlets, equipment, and apparatus shall be made in an approved and permanent manner.

2.07 EXOTHERMIC WELDS

A. All exothermic welding shall be completed per welding kit manufacturer's instructions. Exothermic welds shall be CadWeld by Erico or ThermoWeld.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Metal surfaces where grounding connections are to be made shall be clean and dry. Steel surfaces shall be ground or filed to remove all scale, rust, grease, and dirt. Copper and galvanized steel shall be cleaned with emery cloth to remove oxide before making connections.

B. Ground Grid

1. A main ground grid shall be provided for each structure and interconnecting structure grids consisting of driven ground rods as shown on the Drawings. The ground rods shall be interconnected by the use of copper cable exothermically welded to the rods. The grounding cables shall be installed after the excavations for the building have been completed and prior to the pouring of concrete for the footings, mats, etc. Copper "pigtails" shall be exothermically welded to the ground grid and shall enter the buildings and structure from the outside and shall be connected to steel structures, and equipment as described in this Section and as required to provide a complete grounding system.

2. Grounding conductors shall be continuous between points of connection; splices shall not be permitted.

3. Where conductors are exposed and subject to damage from personnel, traffic, etc., conductors shall be installed in metal raceway. The raceway shall be bonded to the grounding system.

4. Where subsurface conditions do not permit use of driven ground rods to obtain proper ground resistance, rods shall be installed in a trench or plate electrodes

shall be provided, as applicable and necessary to obtain proper values of resistance.

5. Buried exothermic welds and ground ring shall not be backfilled until inspected by Engineer.

C. Raceways

1. Conduit which enters equipment such as switchgear, motor control centers, transformers, panelboards, variable frequency drives, instrument and control panels, and similar equipment shall be bonded to the ground bus or ground lug, where provided, and as otherwise required by the NEC.

3.02 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Witnessed Shop Tests

a. None required.

2. Field Tests

a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and NETA acceptance testing specifications referenced in Section 16000, Basic Electrical Requirements.

b. Fall of potential tests shall be performed on the ground grid per IEEE81 recommendations by a third party, independent testing firm. A fall of potential plot shall be submitted at the conclusion of testing for Engineer review. Documentation indicating the location of the rod and grounding system as well as the resistance and soil conditions at the time the measurements were made shall be submitted. Testing shall show that the ground grid has 5 ohms resistance or less. Due to soil conditions and/or unforeseen field conditions, ground resistances greater than 5 ohms may be acceptable if specifically approved in writing by the Engineer. Ground resistance measurements shall be made in normally dry weather not less than 48 hours after rainfall and with the ground grid under test isolated from other grounds.

c. Continuity tests for the grounding electrode conductor shall also be performed. Test will be accepted when a resistance of less than 1 ohm is shown for this conductor.

- END OF SECTION -

SECTION 16190

SUPPORTING DEVICES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install structural supports for mounting and installing all conduit, electrical equipment, lighting, alarm systems, instrumentation, and communications equipment furnished under this Contract.

B. Equipment shall be installed strictly in accordance with recommendations of the manufacturer and best practices of the trade resulting in a complete, operable, and safe installation. The Contractor shall obtain written installation manuals from the equipment manufacturer prior to installation.

C. Reference Section 16000, Basic Electrical Requirements.

1.02 CODES AND STANDARDS

A. Equipment and materials covered under this Section shall be designed, manufactured, and/or listed to the following standards as applicable:

1. ASTM A123 – Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

2. ASTM A153 – Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

3. ASTM A240 – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

4. ASTM A276 – Standard Specification for Steel Bars and Shapes

5. ASTM B783 – Standard Specification for Materials for Ferrous Powder Metallurgy Structural Parts

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop drawings

2. Structural support calculations (if required)

B. Each submittal shall be identified by the applicable Specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

2. Complete assembly, layout, installation, and foundation drawings with clearly marked dimensions.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

2.02 MATERIALS

A. Support channel shall be 1-5/8” by 1-5/8” minimum, with 12 gage material thickness.

B. Support channel, support channel fittings, and threaded rod shall be furnished with the following material of construction, dependent upon the designation of the area in which they are to be installed. Area designations are indicated on the Drawings.

AREA DESIGNATION	**MATERIAL OF CONSTRUCTION**
Indoor Wet Process Area	Type 316 Stainless Steel
Indoor Dry Process Area	Aluminum
Indoor Dry Non-process Area	Aluminum
All Outdoor Areas	Type 316 Stainless Steel
All Hazardous Areas	Type 316 Stainless Steel

C. Fastening hardware (bolts, nuts, washers, and screws) shall be furnished with the following material of construction, dependent upon the designation of the area in which they are to be installed. Area designations are indicated on the Drawings.

AREA DESIGNATION	MATERIAL OF CONSTRUCTION
Indoor Wet Process Area	Type 316 Stainless Steel
Indoor Dry Process Area	Type 316 Stainless Steel
Indoor Dry Non-process Area	Type 316 Stainless Steel
All Outdoor Areas	Type 316 Stainless Steel
All Hazardous Areas	Type 316 Stainless Steel

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Concrete or Masonry Inserts

1. The Contractor shall be responsible for the furnishing and installation of all anchor bolts, masonry inserts, and similar devices required for installation of equipment furnished under this Contract.

2. If a time delay for the arrival of any special inserts or equipment drawings, etc. occurs, the Contractor may, if permitted by the Engineer, make arrangements for providing approved recesses and openings in the concrete or masonry and, upon subsequent installation, the Contractor shall be responsible for filling in such recesses and openings. Any additional costs that may be incurred by this procedure shall be borne by the Contractor.

3. The Contractor shall furnish leveling channels for all switchgear, switchboards, motor control centers, and similar floor mounted equipment. The leveling channels shall be provided for embedment in the equipment housekeeping pads. Coordination of the installation of these channels with the concrete pad is essential and required. Pad height shall be as required to maintain concrete coverage of the reinforcement bars while not causing associated equipment to exceed the maximum mounting height requirements of the NEC.

B. Support Fastening and Locations

1. All equipment fastenings to columns, steel beams, and trusses shall be by beam clamps or welded. No holes shall be drilled in the steel.

2. Unless otherwise indicated on the Drawings or in the Specifications, handrails/guardrails shall not be utilized as supports for electrical equipment, devices, or appurtenances. Handrails/guardrails shall not be cut, drilled, or otherwise modified in order to accommodate electrical supports without written approval from the Engineer.

3. All holes made in reflected ceilings for support rods, conduits, and other equipment shall be made adjacent to ceiling grid bars where possible, to facilitate removal of ceiling panels.

4. Support channel shall be provided wherever required for the support of starters, switches, panels, and miscellaneous equipment.

5. All equipment, devices, and raceways that are installed on the dry side of a water bearing wall shall not be installed directly onto the wall. Support channel shall be used to allow ventilation air to pass behind the equipment, devices, or raceway.

6. All supports shall be rigidly bolted together and braced to make a substantial supporting framework. Where possible, control equipment shall be grouped together and mounted on a single framework.

7. Aluminum support members shall not be installed in direct contact with concrete. Stainless steel or non-metallic "spacers" shall be used to prevent contact of aluminum with concrete.

8. Actual designs for supporting framework should take the nature of a picture frame of support channels and bracket with a plate for mounting the components. The Contractor is responsible for the design of supporting structure; Contractor shall submit design details to the Engineer for acceptance before proceeding with the fabrication.

9. Wherever dissimilar metals come into contact, the Contractor shall isolate these metals as required with neoprene washers, nine (9) mil polyethylene tape, or gaskets.

10. For all installations where fiberglass supporting materials are required, the Contractor shall submit structural calculations and the details of the proposed system of support. Structural calculations shall be signed and sealed by a registered professional engineer in the state in which the project is located.

11. For the following installations where conduits are provided with a support system suspended from the above or attached to a vertical structure, the Contractor shall submit structural calculations and details of the proposed system of support. Structural calculations shall be signed and sealed by a registered professional engineer in the state in which the project is located.

    a. A quantity of twelve (12) or more conduits trade size 1” and smaller are proposed for a conduit support rack.

    b. A quantity of eight (8) or more conduits trade sizes 1 ½” to 2 1/2” are proposed for a conduit support rack.

    c. A quantity of four (4) or more conduits trade sizes 3” and larger are proposed for a conduit support rack.

12. Single conduits installed exposed along walls and ceilings shall be secured to the wall or ceiling with a one-hole conduit clamp and clamp-back. Where multiple conduits are installed exposed together, support channel and conduit clamps shall be used.

C. Equipment, boxes, and enclosures which are factory-constructed with integral mounting provisions (such as brackets, mounting feet, bolt holes, etc.) shall be installed/supported utilizing those mounting provisions. Equipment, boxes and enclosures shall not be field modified to enable mounting by any other means. Equipment, boxes, and enclosures that are field-modified by any means which compromises the UL Listing or NEMA rating of the enclosure/assembly shall be removed and replaced by the Contractor at no additional cost to JEA

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SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. All electrical equipment shall be properly identified in accordance with these Specifications and the Contract Drawings. All switchgear, switchboards, motor control centers, variable frequency drives, lighting and distribution panelboards, combination starters, control panels, pull and junction boxes, enclosures, disconnect switches, control stations, and similar equipment shall be identified in the manner described, or in an equally approved manner.

B. The types of electrical identification specified in this section include, but are not limited to, the following:

1. Operational instructions and warnings.

2. Danger signs.

3. Equipment/system identification signs.

4. Nameplates.

1.02 SIGNS

A. "DANGER-HIGH-VOLTAGE" signs shall be securely mounted on the entry doors of all electrical rooms.

1.03 LETTERING AND GRAPHICS

A. The Contractor shall coordinate names, abbreviations, and other designations used in the electrical identification work with the corresponding designations shown, specified or scheduled. Provide numbers, lettering, and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of the electrical systems and equipment.

1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit shop drawings. Each submittal shall be identified by the applicable specification section.

1.05 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The material covered by these Specifications is intended to be standard material of proven performance as manufactured by reputable concerns. Material shall be fabricated, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as specified herein and shown on the Drawings.

2.02 NAMEPLATES

A. Nameplates shall be engraved, high pressure plastic laminate, white with black lettering.

B. Nameplates shall be attached to NEMA 4X enclosures utilizing UL-recognized mounting kits designed to maintain the overall UL Type rating of the enclosure. Mounting kit fasteners shall be stainless steel Type AHK10324X as manufactured by Hoffman, or equal.

2.03 HIGH VOLTAGE SIGNS

A. Standard "DANGER" signs shall be of baked enamel finish on 20 gage steel; of standard red, black and white graphics; 14 inches by 10 inches size except where 10 inches by 7 inches is the largest size which can be applied where needed, and except where a larger size is needed for adequate identification.

2.04 CONDUIT IDENTIFICATION

A. Conduit identification shall be as specified in Section 16111, Conduit.

2.05 WIRE AND CABLE IDENTIFICATION

A. Field installed wire and cable identification shall be as specified in Section 16123, Low Voltage Wire and Cable.

B. A plastic laminate nameplate shall be provided at each panelboard, motor control center, switchgear assembly, and switchboard assembly. This nameplate shall be used

to clearly convey the conductor identification means used at that piece of equipment (i.e. Phase A=Brown, Phase B=Orange, C = Yellow).

C. Wiring identification for factory installed wiring in equipment enclosures shall be as specified in the respective section.

2.06 BOX IDENTIFICATION

A. Pull, junction and device box identification shall be as specified in Section 16130 – Boxes.

PART 3 -- EXECUTION

3.01 NAMEPLATES

A. Nameplates shall be attached to the equipment enclosures with (2) two stainless steel sheet metal screws for nameplates up to 2-inches wide. For nameplates over 2-inches wide, four (4) stainless steel sheet metal screws shall be used, one (1) in each corner of the nameplate. The utilization of adhesives is not permitted.

3.02 OPERATIONAL IDENTIFICATION AND WARNINGS

A. Wherever reasonably required to ensure safe and efficient operation and maintenance of the electrical systems and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install plastic signs or similar equivalent identification, instruction, or warnings on switches, outlets, and other controls, devices, and covers or electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for the intended purposes. Signs shall be attached as specified above for nameplates.

3.03 POWER SOURCE IDENTIFICATION

A. After installation of all field equipment (i.e. valves, motors, fans, unit heaters, instruments, etc) install nameplates at each power termination for the field equipment. Nameplate data shall include equipment designation (tag number), power source (MCC number, panelboard, etc), circuit number, conduit number from schedule and voltage/phase.

B. Contractor to coordinate with the Engineer and JEA regarding exact nameplate placement during construction.

C. Nameplates shall be as specified herein.

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SECTION 16440

DISCONNECT SWITCHES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install separately mounted, individual disconnect switches as specified herein and indicated on the Drawings.

B. Disconnect switches for process instruments are not included in the scope of this Section and shall be as specified in Section 16141 – Wiring Devices.

1.02 CODES AND STANDARDS

A. Disconnect switches shall be designed, manufactured, and/or listed to the following standards as applicable:

1. UL 98 – Enclosed and Dead-Front Switches

2. UL 1203 – Standard for Explosion-proof and Dust-ignition-proof Electrical Equipment for use in Hazardous (Classified) Locations.

3. NEMA 250 – Enclosures for Electrical Equipment

4. NEMA KS 1 – Heavy Duty Enclosed and Dead-Front Switches

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Spare Parts List

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

2. Complete layout and installation drawings with clearly marked dimensions for each type/size/rating of disconnect switch.

3. Assembled weight of each unit.

D. The shop drawing information shall be complete and organized in such a way that the Engineer can determine if the requirements of these Specifications are being met. Copies of technical bulletins, technical data sheets from "soft-cover" catalogs, and similar information which is "highlighted" or somehow identifies the specific equipment items that the Contractor intends to provide are acceptable and shall be submitted.

1.05 SPARE PARTS

A. The equipment shall be furnished with all spare parts as recommended by the equipment manufacturer.

B. One (1) complete set of spare fuses for each ampere rating installed shall be furnished and delivered to JEA at the time of final inspection.

C. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

D. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.05 IDENTIFICATION

A. Each equipment item shall be identified with a nameplate. The nameplate shall be engraved indicating the circuit number and equipment name with which it is associated. Equipment identification shall be in accordance with Section 16195, Electrical - Identification.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

B. Switches shall be manufactured by the Square D Company, Eaton, the General Electric Company, or Siemens Energy and Automation, Inc.

2.02 DISCONNECT SWITCHES

A. Disconnect switches shall be heavy-duty type and/or as specified in these Specifications. Switches shall be furnished and installed as shown on the Drawings and as required by the NEC. Handles shall be lockable.

B. Disconnect switches for non-hazardous areas shall be UL 98 Listed. Disconnect switches for hazardous areas shall be UL 1203 Listed.

C. Switches shall meet NEMA Standard KS 1 type HD requirements, be, single-throw, be externally operated, and be fused or non-fused as indicated on the Drawings. Switches shall have the number of the poles, voltage, and ampere ratings as shown on the Drawings.

D. In non-hazardous locations, disconnect switches shall be furnished with the following enclosure type and material of construction, dependent upon the designation of the area in which they are to be installed. Area designations are indicated on the Drawings.

AREA DESIGNATION	**ENCLOSURE TYPE AND MATERIAL**
Indoor Wet Process Area	NEMA 4X, Type 316 Stainless Steel
Indoor Dry Process Area	NEMA 12, Painted Steel
Indoor Dry Non-process Area	NEMA 1, Painted Steel
Indoor Type 1 Chemical Storage/Transfer Area	NEMA 4X, Fiberglass
Indoor Type 2 Chemical Storage/Transfer Area	NEMA 4X, Type 316 Stainless Steel
All Outdoor Areas	NEMA 4X, Type 316Stainless Steel

E. In hazardous locations, disconnect switches shall be furnished with the following enclosure type and material of construction, dependent upon the classification of the area in which they are to be installed. Area classifications are indicated on the Drawings.

AREA CLASSIFICATION	**ENCLOSURE TYPE AND MATERIAL**
Class 1, Division 1, Group D	NEMA 7, Die Cast Aluminum
Class 1, Division 2, Group D	NEMA 7, Die Cast Aluminum
Class 2, Division 1, Group F	NEMA 9, Die Cast Aluminum
Class 2, Division 2, Group F	NEMA 9, Die Cast Aluminum

F. Disconnect switches shall be quick-make, quick-break and with an interlocked cover which cannot be opened when switch is in the "ON" position and capable of being locked in the "OPEN" position.

G. A complete set of fuses for all switches shall be furnished and installed as required. Time-current characteristic curves of fuses serving motors or connected in series with circuit breakers shall be coordinated for proper operation. Fuses shall have voltage rating not less than the circuit voltage.

H. Disconnect switches shall be furnished with a factory installed internal barrier kit that helps prevent accidental contact with live parts and provides “finger-safe” protection when the door of the enclosed switch is open.

I. Disconnect switches shall be furnished with a manufacturer-supplied ground lug kit for termination of equipment grounding conductors. Where a grounded (neutral) conductor is shown on the Drawings in the conduits connected to the disconnect switch, a manufacturer-supplied neutral bar shall be furnished for termination of the grounded conductors. Third party ground lug and neutral lug kits not supplied by the disconnect switch manufacturer are not acceptable.

J. Fused disconnect switches shall be furnished for motor operated valve and gate actuators where shown on the Drawings. The Contractor shall coordinate the supply of these fused switches with the specific requirements of the actuator. Fuses with fast fault clearing times may be required for modulating valve actuators.

K. Disconnect switches for all motors connected to variable frequency drives (VFDs) and other pump starters, where indicated on drawings, shall be furnished with a factory installed electrical interlock kit that includes one (1) early-break auxiliary contact rated for 5A (minimum) at 120 VAC to be used to open the control circuit before the main switch blades break.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. All disconnect switches shall be mounted five (5) feet above the floor or finished grade, at the equipment height where appropriate, or where shown otherwise.

B. Disconnect switches shall be provided in the enclosure type and material of construction required for the area in which it is installed. Reference the requirements in Part 2 herein, and the area designations indicated on the Drawings.

3.02 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Field Tests

a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and NETA Acceptance Testing Specifications, latest edition.

- END OF SECTION -

SECTION 16461

DRY TYPE DISTRIBUTION TRANSFORMERS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, and test transformers for power and lighting distribution systems as specified herein, as indicated on the Drawings, and as required to complete the electrical installations.

B. All equipment specified in this Section shall be furnished by the transformer manufacturer who shall be responsible for the suitability and compatibility of all included equipment.

C. Reference Section 16000, Basic Electrical Requirements.

1.02 CODES AND STANDARDS

A. Transformers shall conform to all applicable Federal, UL, and NEMA standards. Materials and components shall be new and conform to grades, qualities and standards as specified herein and shown on the Drawings.

B. Transformers shall comply with the following standards:

1. UL 1561 – Dry Type General Purpose and Power Transformers

2. U.S. Department of Energy 2016 Efficiency

3. National Electrical Code

4. NEMA ST-20 – Dry Type Transformers for General Applications

5. ANSI C57 – Standard General Requirements for Dry Type Distribution and Power Transformers

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Division 1, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings.

2. Operation and Maintenance Manuals.

3. Spare Parts List.

4. Reports of Certified Shop Field Tests.

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein, and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

2. Drawings showing clearly marked dimensions and weight for each transformer.

3. Sample equipment nameplate diagram.

D. The submittal information shall reflect the specific equipment identification number as indicated on the Drawings (e.g. TX-LP-SC5).

E. The shop drawing information shall be complete and organized in such a way that the Engineer can determine if the requirements of these Specifications are being met. Copies of technical bulletins, technical data sheets from "soft-cover" catalogs, and similar information which is "highlighted" or somehow identifies the specific equipment items that the Contractor intends to provide are acceptable and shall be submitted.

1.05 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in the General Conditions and Division 1.

1.06 SPARE PARTS

A. All spare parts as recommended by the equipment manufacturer shall be furnished to JEA by the Contractor.

B. Spare parts lists, included with the Shop Drawing submittal, shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

C. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.07 IDENTIFICATION

A. Each transformer shall be identified with the equipment item number indicated on the Contract Drawings and the accepted Shop Drawings. A nameplate shall be securely affixed in a conspicuous place on each transformer. Nameplates shall be as specified in Section 16195, Electrical - Identification.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

B. Dry type distribution transformers shall be Energy Star compliant and manufactured by the Square D Company, the General Electric Company, Eaton, or Siemens Energy and Automation, Inc.

2.02 DRY TYPE TRANSFORMERS

A. Furnish and install single-phase and three-phase general purpose, dry-type transformers, as specified herein and indicated on the Drawings. The transformers shall be 60 Hz, self-cooled, quiet-design insulated of the two winding type.

B. The transformers shall be UL 1561 Listed.

C. The primary windings shall be rated 480 VAC for use on 3-phase systems and connected delta unless indicated otherwise on the Drawings. KVA ratings shall be as shown on the Drawings. Furnish transformers with two 2-1/2% primary taps above, and four 2-1/2% primary taps below rated voltage for transformers 15 KVA and above, and two 2-1/2% primary taps above, and two 2-1/2% primary taps below rated voltage for transformers less than 15 kVA. All taps shall be full capacity rated.

D. The ratings of the secondary windings shall be as indicated on the Drawings.

E. Transformers shall be designed for continuous operation at rated KVA, 24 hours a day, 365 days a year, with normal life expectancy as defined in IEEE 65 and ANSI C57.96. This performance shall be obtainable without exceeding 150 degrees Celsius average temperature rise by resistance or 180 degrees Celsius hot spot temperature rise in a 40 degrees Celsius maximum ambient and 30 degrees Celsius average ambient. The maximum coil hot spot temperature shall not exceed 220 degrees Celsius. All insulating materials shall be flame retardant and shall not support combustion as defined in ASTM Standard Test Method D 635. All insulating materials shall be in accordance with NEMA ST 20 Standard for a 220 degrees Celsius UL component recognized insulation system.

F. Transformer coils shall be of the continuous wound copper construction and shall be impregnated with nonhygroscopic, thermosetting varnish.

G. All cores are to be constructed of high grade, nonaging, grain-oriented silicon steel with high magnetic permeability and low hysteresis and eddy current loses. Magnetic flux densities are to be kept well below the saturation point. The core laminations shall be tightly clamped and compressed with structural steel angles. The completed core and coil shall then be bolted to the base by means of vibration-absorbing mounts to minimize sound transmission. There shall be no metal-to-metal contact between the core and coil assembly and the enclosure.

H. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure shall not exceed 90 degrees Celsius. Transformers shall be furnished with lugs of the size and quantity required and suitable for termination of the field wiring.

I. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, and ANSI standards.

J. Transformers shall have core and coil assemblies mounted on rubber isolation pads to minimize the sound levels. Transformers shall not exceed the sound levels listed in NEMA ST-20.

K. Transformers shall be furnished with the following enclosure type and material of construction, dependent upon the designation of the area in which they are to be installed. Area designations are indicated on the Drawings.

AREA DESIGNATION	**ENCLOSURE TYPE AND MATERIAL**
Indoor Wet Process Area	NEMA 3R, Painted Steel
Indoor Dry Process Area	NEMA 2, Painted Steel
Indoor Dry Non-process Area	NEMA 2, Painted Steel
All Outdoor Areas	NEMA 3R, Painted Steel

L. The enclosure shall be made of heavy gauge steel and shall be degreased, cleaned, primed, and finished with a baked weather-resistant enamel using the manufacturer's standard painting process. Color shall be ANSI 61.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. The transformers shall be furnished and installed as shown on the Drawings and as recommended by the equipment manufacturer.

B. Conduit routed to and from the transformer shall be arranged for easy removal of the transformer access covers.

C. Where transformers 50 kVA and smaller are shown to be wall mounted, a transformer manufacturer supplied wall mounting kit shall be used. The lowest point of the wall mounting bracket shall be no lower than 7'-0" above the finished floor. Field fabricated mounting hardware is not acceptable unless reviewed and approved in writing by the Engineer.

D. Prior to final completion of the work, all metal surfaces of the equipment shall be cleaned thoroughly, and all scratches and abrasions shall be retouched with the same lacquer as used for shop finishing coats.

3.02 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Certified Shop Tests

a. The transformers shall be given routine factory tests in accordance with the requirements of the ANSI and NEMA standards. Temperature rises may be certified from basic design.

b. As a minimum, the following tests shall be made on all transformers:

i. Ratio tests on the rated voltage connection and on all tap connections.

ii. Polarity and phase-relation tests on the rated voltage connection.

iii. Applied potential tests.

iv. Induced potential tests.

v. No-load and excitation current at rated voltage on the rated voltage connection.

2. Field Tests

a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and NETA Acceptance Testing Specifications, latest edition.

b. Insulation between windings shall be tested by 1000 VDC Megaohmeter for one (1) minute. Resistance value shall be no less than 100 Megaohms.

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SECTION 16470

PANELBOARDS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install panelboards of voltage and current ratings as specified herein and indicated on the Drawings. Panelboards shall be furnished with circuit breaker ratings, number of breakers, number of poles and locations conforming to the panelboard schedules on the Drawings.

B. Reference Section 16000, Basic Electrical Requirements.

1.02 CODES AND STANDARDS

A. Panelboards shall conform to all applicable Federal, UL, and NEMA standards. Materials and components shall be new and conform to grades, qualities and standards as specified herein and shown on the Drawings.

B. Panelboards shall comply with the following industry standards:

1. UL Listing/Approval

2. UL Standards

a. Panelboards - UL 67

b. Cabinets and Boxes - UL 50

3. National Electrical Code

4. NEMA Standard - PB1

5. National Electrical Contractors Association (NECA) Standard 407

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings.

2. Spare Parts List.

3. Operation and Maintenance Manuals.

4. Reports of Field Tests.

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

2. Complete assembly, layout, and installation drawings with clearly marked dimensions for each panelboard.

3. Complete panelboard schedules indicating circuit designations as shown on the Drawings for each panelboard.

D. The submittal information shall reflect the specific equipment identification number as indicated on the Drawings (e.g., LP-SC5, etc.).

1.05 SPARE PARTS

A. For each panelboard, the Contractor shall furnish to JEA all spare parts as recommended by the equipment manufacturer. All spaces in the panelboards shall be furnished with a spare breaker as indicated in the panelboard schedules shown on the Drawings.

B. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

C. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size shall have the same parts number.

1.06 IDENTIFICATION

A. Each panelboard shall be identified with the identification name/number indicated on the Drawings. A nameplate shall be securely affixed in a conspicuous place on each panelboard. Nameplates shall be as specified in Section 16195, Electrical - Identification.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

2.02 CONDUCTORS (MAIN BUS AND BRANCH CONNECTORS)

A. All main bus shall be copper sized in accordance with UL standards to limit the temperature rise on any current carrying part to a maximum of 50 degrees C above a maximum ambient temperature of 40 degrees C.

2.03 LIGHTING PANELBOARDS

A. General

1. Lighting panelboards shall be dead-front type with automatic trip-free, non-adjustable, thermal-overload, branch circuit breakers. Panelboards shall be of the configuration and rating as specified herein and indicated on the Drawings. Panelboards shall be service entrance rated where indicated on the Drawings.

2. Lighting panelboards shall be equipped with a main breaker or main lugs complete with branch circuit breakers, as indicated on the Drawings. The panelboards shall be suitable for flush or surface mounting.

3. Lighting panelboards shall be fully rated and shall have a minimum short circuit rating of 22,000 amperes symmetrical, unless otherwise indicated on the Drawings.

4. Lighting panelboards shall be Eaton Pow-R-Line Series, the Square D Company equivalent, the General Electric Company equivalent, or Siemens Energy and Automation, Inc. equivalent.

B. Enclosures

1. Enclosures shall have a NEMA rating as indicated on the Drawings, and be constructed of No. 12 U.S.S. code gauge galvanized steel. The door shall be fastened to the enclosure with concealed hinges and shall be equipped with flush-type catches and locks. The Contractor shall equip cabinet doors exceeding 40 inches in height with vertical bolt three point locking mechanism. All locks shall be keyed alike. The panelboard trim shall have a removable hinge assembly, in addition to the door hinge, that allows work inside the enclosure without the need to remove the trim. The enclosure shall have wiring gutters on sides and shall be at least 5-3/4 inches deep. The panelboard shall be provided with an information label. The information label shall include the panelboard designation, voltage, phase, wires, and bus rating.

2. All metal surfaces of the panelboard enclosures shall be thoroughly cleaned and given one prime of zinc chromate primer. All interior surfaces shall then be

given one shop finishing coat of a lacquer of the nitro-cellulose enamel variety. All exterior surfaces shall be given three coats of the same lacquer. The color of finishing coats shall be light gray ANSI #61.

3. An Underwriter's Laboratories, Inc. inspection label shall appear on the interior of the cabinet.

C. Bus Work

1. Main bus bars shall be of ample size so that a current density of not more than 1000 amperes per square inch of cross section will be attained. This current density shall be based on the application of the full load connected to the panel plus approximately 25% of the full load for spare capacity. The main bus shall be full capacity as based on the preceding for the entire length of the panel so as to provide full flexibility of circuit arrangement.

2. Solid neutral bus bars are required and neutral bus ampacity shall be the same as the main bus bars unless otherwise noted. Ratings shall be in accordance with applicable standards.

3. A separate ground bus shall be provided with lugs for termination of equipment grounding conductors.

4. Branch bus work shall be rated to match the maximum branch circuit breaker which may be installed in the standard space.

5. All bus shall be tin plated copper and shall extend the entire useable length of the panelboard, including spaces.

D. Circuit Breakers

1. Circuit breakers shall be bolt-on, molded-case type conforming to NEMA Standard AB 1. All circuit breakers shall have quick-make, quick-break, toggle mechanism for manual as well as automatic operation. Tandem or half-size circuit breakers are not acceptable

2. Where indicated on the Drawings, or where required by Code, circuit breakers shall be equipped with integrally mounted ground fault interrupters complete with "TEST" push button and shall be of a type which fit standard panelboard spaces for the breaker continuous current rating required. Circuit breakers used for lighting circuit switching shall be approved for the purpose and shall be marked "SWD". Where required by Article 440 of the NEC, circuit breakers installed for air conditioning units shall be HACR type.

3. Circuit breaker voltage ratings shall meet or exceed the panelboard voltage indicated on the Drawings. Trip elements of circuit breakers shall be 20A unless otherwise indicated on the Drawings. Circuit breakers shall have an interrupting rating at 240 VAC that matches the panelboard short circuit rating.

4. Where indicated on the Drawings, branch circuit breakers shall be provided with a padlockable hasp or handle padlock attachment for padlocking in the off position as required to meet the NEC requirement for disconnecting means and/or OSHA lock-out/tagout standard. Locking hardware shall remain in place even when the packlock is removed. Branch circuit breakers used for control, instrumentation, telephone, fire alarm, or auxiliary equipment circuits requiring continuous operation shall be provided with a similar lock-on device where indicated on the Drawings.

E. Directories

1. Approved directories with noncombustible plastic cover, and with typewritten designations of each branch circuit, shall be furnished and installed in each panelboard. The Contractor shall maintain in each panel, during the duration of the Contract, a handwritten directory clearly indicating the circuit breakers in service. This directory shall be updated as work progresses, and final, typewritten directories, as specified above, shall be installed at the end of the project. Designations and circuit locations shall conform to the panelboard schedules on the Drawings, except as otherwise authorized by the Engineer.

2.04 POWER DISTRIBUTION PANELBOARDS

A. General

1. Power distribution panelboards shall be of the configuration and rating as specified herein and as indicated on the Drawings. The panelboards shall be dead-front type with automatic trip-free, non-adjustable, thermal overload branch circuit breakers. Panelboards shall be service entrance rated where indicated on the Drawings.

2. Power panelboards shall be equipped with a main breaker or main lugs complete with branch circuit breakers as indicated on the Drawings. The panelboards shall be suitable for flush or surface mounting.

3. Power distribution panelboards shall be fully rated and shall have a minimum short circuit rating of 65,000 amperes symmetrical unless otherwise indicated on the Drawings.

4. Power distribution panelboards shall be Eaton Pow-R-Line Series, the Square D Company equivalent, the General Electric Company equivalent, or Siemens Energy and Automation, Inc. equivalent.

B. Enclosures

1. Enclosures shall have a NEMA rating as indicated on the Drawings, and be constructed of No. 12 U.S.S. code gauge galvanized steel. The door shall be fastened to the enclosure with concealed hinges and shall be equipped with flush-type catches and locks. The Contractor shall equip cabinet doors exceeding 40 inches in height with vertical bolt three point locking mechanism. All locks shall be keyed alike. The panelboard trim shall have a removable hinge assembly, in addition to the door hinge, that allows work inside the

enclosure without the need to remove the trim. The enclosure shall have wiring gutters on sides and shall be at least 5-3/4 inches deep. The panel shall be provided with an information label. The information label shall include the panelboard designation, voltage, phase, wires, and bus rating.

2. All metal surfaces of the panelboard enclosures shall be thoroughly cleaned and given one prime of zinc chromate primer. All interior surfaces shall then be given one shop finishing coat of a lacquer of the nitro-cellulose enamel variety. All exterior surfaces shall be given three coats of the same lacquer. The color of finishing coats shall be light gray ANSI #61.

3. An Underwriter's Laboratories, Inc. inspection label shall appear on the interior of the cabinet.

C. Bus Work

1. Main bus bars shall be of ample size so that a current density of not more than 1,000 amperes per square inch of cross section will be attained. This current density shall be based on the application of the full load connected to the panel plus approximately 25% of the full load for spare capacity. The main bus shall be full capacity as based on the preceding for the entire length of the panel so as to provide full flexibility of circuit arrangement.

2. Solid neutral bus bars, where required, shall be provided. Neutral bus shall have the same ampacity as the main bus, unless otherwise indicated. Ratings shall be in accordance with applicable standards.

3. A separate ground bus shall be provided with lugs for termination of equipment grounding conductors.

4. Branch bus work shall be rated to match the maximum branch circuit breaker which may be installed in the standard space.

5. All bus shall be tin plated copper and shall extend the entire useable length of the panelboard, including spaces. Panelboards Listed and Labeled as a four-wire panel shall not be used in place of a three-wire panel where a neutral conductor does not exist in the supply conductors to that panel.

D. Circuit Breakers

1. Circuit breakers shall be bolt-on, molded-case type conforming to NEMA Standard AB 1. All circuit breakers shall have quick-make, quick-break, toggle mechanism for manual as well as automatic operation.

2. Circuit breakers used for lighting circuit switching shall be approved for the purpose and shall be marked “SWD” where required by Article 440 by the NEC. Circuit breakers installed for air conditioning units shall be HACR type.

3. Circuit breaker voltage rating shall meet or exceed the panelboard voltage indicated on the Drawings. Trip elements of circuit breakers shall be 20A,

unless otherwise indicated on the Drawings. Circuit breakers shall have an interrupting rating at 480 VAC that matches the panelboard short circuit rating.

4. Where indicated on the Drawings, branch circuit breakers shall be provided with a padlockable hasp or handle padlock attachment for padlocking in the off position as required to meet the NEC requirement for disconnecting means and/or OSHA lock-out/tagout standard. Locking hardware shall remain in place even when the packlock is removed. Branch circuit breakers used for control, instrumentation, telephone, fire alarm, or auxiliary equipment circuits requiring continuous operation shall be provided with a similar lock-on device where indicated on the Drawings.

E. Directories

1. Approved directories with noncombustible plastic cover, and with typewritten designations of each branch circuit, shall be provided in each panel. The Contractor shall maintain in each panel, during the duration of the Contract, a handwritten directory clearly indicating the circuit breakers in service. This directory shall be updated as work progresses, and final, typewritten directories, as specified above, shall be installed at the end of the project. Designations and circuit locations shall conform to the panelboard schedules on the Drawings, except as otherwise authorized by the Engineer.

2.07 SURGE PROTECTIVE DEVICES

A. The panelboards shall be furnished with integrated Type II surge protective devices (SPD). SPDs shall be provided in the location and quantity as shown on the Drawings.

B. The SPD shall be rated, designed, tested, listed, and labeled in accordance with UL-1449, latest edition.

C. The SPD shall be factory installed by the panelboard manufacturer using a direct bus connection. There shall be no cable connection between the bus bar and the SPD device.

D. The SPD shall have a fault current rating equal to or greater than that of the fault current rating of the panelboard. The SPD shall employ metal-oxide varistor (MOV) technology. If integral fusing is used, the fuses shall allow the maximum rated surge current to pass without fuse operation.

E. The SPD shall have a maximum continuous operating voltage (MCOV) of at least 115% of the nominal voltage of the panelboard. The Voltage Protection Rating (VPR) of each SPD shall <u>not exceed</u> the following:

SYSTEM VOLTAGE	L-N	L-G	L-L	N-G
208Y/120	700V	700V	1200V	700V
480Y/277	1200V	1200V	1800V	1200V
480 DELTA	N/A	1200V	2000V	N/A

SYSTEM VOLTAGE	L-N	L-G	L-L	N-G
240 DELTA	N/A	1200V	1200V	N/A
120/240	700V	700V	1200V	700V

F. The Nominal Discharge Current (I_n) of the SPD shall be 20kA. Peak surge current ratings shall not be used as a basis for applying the SPD to the system.

The surge current rating for each SPD shall be as indicated on the Drawings. Surge current ratings are indicated in panel schedules. Surge current rating indicated is on a per phase basis.

G. Each SPD system shall provide surge protection in all possible modes. Surge protection shall be as follows:

SYSTEM CONFIGURATION	MODES OF PROTECTION	NUMBER OF MODES
3-Phase Wye	L-N, L-G, N-G	7
3-Phase Delta	L-L, L-G	6
3-Phase Impedence Grounded	L-L, L-G	6
Single-Phase	L-N, L-G, N-G	3

H. The SPD shall be furnished with an audible alarm and silence pushbutton, integral SPD status LEDs (one per phase), and a Form C dry contact for remote indication of alarm. A surge counter shall also be provided.

I. The SPD equipment shall be SPD Series by Eaton, SurgeLogic by the Square D Company, Tranquell by the General Electric Company, Siemens Energy and Automation Inc. equivalent, or equal.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Panelboards shall be furnished and installed as shown on the Drawings and as recommended by the equipment manufacturer, and as required by NECA 407.

B. Panelboards shall be set true and plumb in locations as shown on the Drawings. The top of panelboard enclosure shall not exceed six (6) feet above finished floor elevation.

C. Enclosures shall not be fastened to concrete or masonry surfaces with wooden plugs. Appropriate cadmium plated or galvanized steel bolts shall be used with expansion shields or other metallic type concrete insert for mounting on concrete or solid masonry walls. Cadmium plated or galvanized steel toggle bolts shall be used for mounting on concrete block or other hollow masonry walls. Bolt diameter shall be as required considering the size and weight of the completed panelboard and enclosure to provide adequate structural support.

D. The Contractor shall not use factory furnished knockouts with surface mounted back boxes. The Contractor shall punch or drill required openings during installation and shall equip flush mounted back boxes with manufacturer's standard pattern of knockouts.

E. The Contractor shall install cabinets (and other enclosure products) in plumb with the building construction. Flush mounted enclosures shall be installed so that the trim will rest against the surrounding surface material and around the entire perimeter of the enclosure.

F. Prior to final completion of the work, all metal surfaces of the equipment shall be cleaned thoroughly, and all scratches and abrasions shall be retouched with the same lacquer as used for shop finishing coats.

3.02 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Field Tests

a. Prior to termination of any conductors to the circuit breakers , all bus work and circuit breakers shall be tested from phase to phase and phase to ground with a 1000 VDC megaohmeter for 1 minute in accordance with NECA 407. Resistance values shall be recorded and shall not be less than 100 megohms.

b. Prior to terminating any wires to the circuit breakers, the resistance of the connection between the bus work and each circuit breaker shall be tested through the use of a low-resistance ohmmeter. Record the resistance values for each circuit breaker.

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SECTION 16476

ENCLOSED CIRCUIT BREAKERS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install enclosed circuit breakers of voltage and current ratings as specified herein and indicated on the Drawings.

B. This specification is intended to apply to circuit breakers separately-mounted from other equipment in an individual enclosure. This Section does not apply to circuit breakers as part of an equipment assembly such as motor control centers, panelboards, switchboards, etc.

C. Reference Section 16000, Basic Electrical Requirements.

1.02 CODES AND STANDARDS

A. Enclosed circuit breakers shall comply with the following codes and standards:

1. UL 489 - Molded Case Circuit Breakers, Molded Case Switches, and Circuit Breaker Enclosures

2. NEMA 250 – Enclosures for Electrical Equipment

3. National Electrical Code

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings.

2. Spare Parts List.

3. Operation and Maintenance Manuals.

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

2. Complete assembly, layout, and installation drawings with clearly marked dimensions for each enclosed circuit breaker.

1.05 SPARE PARTS

A. For each enclosed circuit breaker, the Contractor shall furnish to JEA all spare parts as recommended by the equipment manufacturer.

1.06 IDENTIFICATION

A. Each enclosed circuit breaker shall be identified with the identification name and/or number indicated on the Drawings. A nameplate shall be securely affixed in a conspicuous place on the front of each enclosed circuit breaker. Nameplates shall be as specified in Section 16195, Electrical - Identification.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

B. Enclosed circuit breakers shall be manufactured by Eaton, the General Electric Company, the Square D Company, or Siemens Energy and Automation, Inc.

2.02 ENCLOSED CIRCUIT BREAKERS

A. Circuit breakers shall be molded case type with trip and frame ratings as indicated on the Drawings. Provide electronic trip unit where indicated on the Drawings, with adjustable functions as indicated on the Drawings.

B. Circuit breakers shall have an interrupting rating of 65,000 amperes symmetrical at 480 VAC, unless otherwise indicated on the Drawings.

C. Enclosed circuit breakers in non-hazardous locations shall be UL 489 Listed. Circuit breakers in hazardous locations shall be UL 1203 Listed.

D. In non-hazardous locations, enclosed circuit breakers shall be furnished with the following enclosure type and material of construction, dependent upon the designation of the area in which they are to be installed. Area designations are indicated on the Drawings.

AREA DESIGNATION	ENCLOSURE TYPE AND MATERIAL
Indoor Wet Process Area	NEMA 4X, Type 304 Stainless Steel
Indoor Dry Process Area	NEMA 12, Painted Steel
Indoor Dry Non-process Area	NEMA 1, Painted Steel
Indoor Type 1 Chemical Storage/Transfer Area	NEMA 4X, Fiberglass
Indoor Type 2 Chemical Storage/Transfer Area	NEMA 4X, Type 304 Stainless Steel
All Outdoor Areas	NEMA 4X, Type 304 Stainless Steel

E. In hazardous locations, enclosed circuit breakers shall be furnished with the following enclosure type and material of construction, dependent upon the classification of the area in which they are to be installed. Area classifications are indicated on the Drawings.

AREA CLASSIFICATION	ENCLOSURE TYPE AND MATERIAL
Class 1, Division 1, Group D	NEMA 7, Die Cast Aluminum
Class 1, Division 2, Group D	NEMA 7, Die Cast Aluminum
Class 2, Division 1, Group F	NEMA 9, Die Cast Aluminum
Class 2, Division 2, Group F	NEMA 9, Die Cast Aluminum

F. Enclosed circuit breakers shall be quick-make, quick-break and with an interlocked cover which cannot be opened when the breaker is in the “ON” position and capable of being locked in the “OPEN” position.

G. An Underwriter's Laboratories, Inc. inspection label shall appear on the interior of the enclosure.

H. Enclosed circuit breakers shall be suitable for use as service entrance equipment where indicated on the Drawings and so labeled to suit the application.

I. Where indicated on the Drawings, enclosed circuit breakers shall be 100% rated.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. The enclosed circuit breaker shall be furnished and installed as shown on the Drawings and as recommended by the equipment manufacturer.

B. Enclosed circuit breakers shall be set true and plumb in locations as shown on the Drawings. The top of enclosure shall not exceed six (6) feet above finished floor elevation.

C. Enclosed circuit breakers shall be provided in the enclosure type and material of construction required for the area in which it is installed. Reference the requirements in Part 2 herein, and the area designations indicated on the Drawings.

3.02 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Witnessed Shop Tests

a. None required

2. Field Tests

a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and NETA Acceptance Testing Specifications, latest edition.

- END OF SECTION -

SECTION 16490

MOTORS

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install motors, wiring, conduits, accessories, and appurtenances as specified herein and in conformance with the individual Specifications of driven equipment, to provide a complete and operable installation, all in accordance with the requirements of the Contract Documents.

1.02 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to work of this Section. Other Specification Sections and or drawings may be related to work specified in this Section and shall be followed as required.

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

Manufacture, testing and installation shall be in accordance with the following:

ANSI/NEMA MG 1: Motors and Generators.

ANSI/IEEE 112: Test Procedure for Polyphase Induction Motors and Generators.

NEC: National Electrical Code

1.04 SUBMITTALS

A. Complete motor data shall be submitted with the driven machinery shop Drawings. Motor data shall include:

1. Machine name and Specification number of driven machine.
2. Motor manufacturer.
3. Motor type or model and dimension Drawing.
4. Nominal horsepower.
5. NEMA design.
6. Frame size.
7. Enclosure, type and dimensions.

8. Winding insulation class and treatment.

9. Rated ambient temperature.

10. Service factor.

11. Voltage, phase, and frequency rating.

12. Full load current at rated horsepower for application voltage.

13. Starting code letter, or locked rotor KVA, or current.

14. Special winding configuration such as part-winding, star-delta.

15. Rated full load speed.

16. Power Factor at full load, 75 percent, and 50 percent load.

17. Motor efficiency, nominal and guaranteed values.

18. Motor torque speed curves from zero to full load speed.

19. Test results.

1.05 TESTING

Each motor shall be shop tested to determine compliance with requirements of the IEEE, ANSI and NEMA. Tests shall be as follows:

A. Motors less than 50 horsepower:

Each motor shall be subjected to a standard short commercial test including the following:

1. Running light current
2. Locked rotor current
3. High potential
4. Winding resistance
5. Bearing inspection

B. Motors between 50 and 100 h.p.

Each motor shall be subjected to the above tests and shall be furnished with certified test results.

C. Efficiency (Dry Pit Submersible Pump Motors Excepted)

Motors rated 25 through 100 h.p. shall be individually tested for efficiency.

D. Motors Larger Than 100 Horsepower

Each motor shall be furnished with certified test results. Each motor shall be subjected to a complete test consisting of full load heat run, percent slip, running light current, locked rotor current, breakdown torque (calculated), starting torque, winding resistance, high potential, efficiencies at 100, 75 and 50 percent of full load, power factors at 100, 75 and 50 percent of full load, and bearing inspection. The ENGINEER reserves the right to witness these tests.

E. Test Reports

Six (6) copies of all test results shall be submitted to the ENGINEER for review. Single copies of witnessed test raw data shall be submitted to the ENGINEER immediately upon completion of such tests. No motor shall be shipped prior to the ENGINEER's approval of factory tests.

1.06 TOOLS AND SPARE PARTS

Furnish spare parts for each motor or group of motors in the same ratio as specified in the driven equipment. As a minimum, furnish the following for motors 50 h.p. and above:

A. One (1) spare set of upper and lower ball bearings, including retainers and seals, for each motor size installed (Dry Pit Submersible Pump Motors Excepted).

B. One (1) spare motor shaft key or equivalent for each motor size installed (Dry Pit Submersible Pump Motors Excepted).

C. One (1) spare terminal box gasket for each motor (Dry Pit Submersible Pump Motors Excepted).

D. One (1) spare fill and drain plug and grease nipple for each motor size installed (Dry Pit Submersible Pump Motors Excepted).

E. One (1) complete set of any additional Manufacturer's recommended spare parts.

Spare parts shall be plainly tagged and marked for identification and re-ordering.

Furnish all special tools necessary to disassemble, service, repair and adjust the equipment.

1.07 WARRANTY

All equipment furnished and installed under this Section shall be guaranteed against defects of workmanship, materials, and proper installation for a period of one (1) year from date of acceptance. All such equipment or defective parts, shall be replaced in the machines by the CONTRACTOR at no cost to JEA

Motors supplied for Variable Frequency Drive (VFD) applications shall be guaranteed as stated above, and further warranted for a total period of two (2) years under VFD operation by the motor supplier.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Electric motors driving identical machines shall be identical.

B. The nominal motor horsepower shall be adequate for the driven machine without infringement upon the motor service factor. Motors driving pumps shall not be overloaded at any head or discharge condition of the pump.

C. The motor horsepower shall not be less than the estimated minimum specified for each driven machine. If the estimated minimum horsepower specified is not adequate to satisfy the foregoing restriction or any other requirements of these Specifications, the motor with the next larger horsepower shall be supplied at no additional cost to JEA. In addition, any changes caused by increase in motor horsepower shall be made by the CONTRACTOR at no additional cost to JEA; such changes may involve circuit breakers, magnetic starters, motor feeder conductors and conduit sizes, etc.

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

E. The motors (50) horsepower and larger shall be equipped with 120-volt single-phase-200 watt or larger space heaters (not touching the windings), sized to prevent condensation during period of idleness. Maximum surface temperature of heaters shall not exceed 200 degree (C). Provide motor winding high temperature switches embedded in windings with leads brought out of motor terminal box. Switch contacts shall be normally closed.

F. Provide high efficiency (over 91.5% at full load), dynamically balanced motors with a 1.15 service factor, complying with latest ANSI, IEEE and NEMA Standards. Inrush current shall not exceed 5.6 KVA per rated horsepower, NEC code F. Motors shall not be overloaded by the pump at any operating condition on the pump characteristic curve and shall be designed for repetitive staring with a cycle time of 6.00 minutes. Motors between and including 2 HP through 25 HP shall be dual voltage 240/480, prewired for 480v, 3 phase, as manufactured by General Electric, Westinghouse, Marathon, US, Reliance or equal.

G. JEA reserves the right to have any motor tested by an independent laboratory to determine efficiency, sound level, and shaft composition. Failure to meet established requirements in these categories shall be grounds for rejection.

2.02 CONSTRUCTION

A. All electric motors shall comply with ANSI/NEMA MG 1.

B. Electric motors shall be NEMA Design B, (except as noted in equipment Specifications for motors controlled for variable speed operation and other special motors,) constant speed squirrel-cage induction motors having normal starting torque with low starting current. In no case shall starting torque or breakdown torque be less than the value specified in said ANSI/NEMA MG 1. Motors shall be suitable for starting as indicated on the Drawings. Speed control will be provided with 2-speed starter or by PWM (Pulse Width Modulation) design variable frequency drive. Refer to Drawings for type of starting requirements.

C. Motors shall be rated in accordance with the following, unless otherwise specified:

1. Motors below 1/2 h.p. shall be rated 115 volts, single phase, 60 Hertz. Dual voltage motors rated 115/230 volts, 115/208 volts, or 120-240 volts are acceptable.

2. Motors greater than 1/2 h.p. shall be rated 230/460 volts, three-phase, 60 hertz, as required and as shown. Dual voltage motors rated 208/230/460 volts are acceptable.

D. Unless otherwise specified, service factor shall be a minimum of 1.15.

E. Motor speed shall be as specified with the equipment.

F. All motors which will be installed in Class I, Division 1 areas (exposed to flammable vapors, gases, or dust) shall be explosion-proof. Such motors shall carry Underwriter's Laboratories listing with name plate and serial number. The CONTRACTOR shall be responsible to coordinate with the equipment manufacturer in advising the motor manufacturer of the correct NEC Code required for the application.

G. All motors for driven equipment shall be heavy duty unless otherwise specified. Heavy duty motors shall be furnished with Class F tropicalized insulation system and shall be limited to Class B temperature rise, unless otherwise listed in these Specifications. The motor shall be rated to operate at a maximum ambient temperature of 65 degrees C and at the altitudes where the motors will be installed and operated, without exceeding temperature rise limits stated in ANSI/NEMA MG 1-12.42.

H. Standard duty motors shall be furnished where called for in individual equipment specifications. These motors shall have Class F tropicalized insulation system and shall be limited to Class B temperature rise, unless otherwise listed in these Specifications. The motor shall be rated to operate at a maximum ambient temperature of 40 degrees C and at altitudes where the motor will be installed and operated, without exceeding temperature rise limits stated in ANSI/NEMA MG 1-12.42.

I. All motors 50 h.p. or smaller which will be installed outdoors shall be totally enclosed, fan cooled (TEFC). All motors larger than 50 h.p. and up to 300 h.p. which will be installed outdoors shall be Weather-Protected Type I. Motors larger than 300 h.p. shall be Weather-Protected Type II. All motors larger than 50 h.p. shall have a minimum 2 cycles of solid, baked epoxy vacuum impregnation. In addition, these motors shall be provided with rodent screens. Enclosures shall have stainless steel vent screens.

J. Unless otherwise specified, all motors which will be installed indoors shall be totally enclosed, fan cooled (TEFC). All motors larger than 50 h.p. located in damp environment such as in pump and pipe galleries, tunnels, chemical feed and sludge areas, shall have 2 cycles of solid baked epoxy vacuum impregnation.

K. Efficiency index, nominal efficiency, and minimum efficiency shall be defined in accordance with ANSI/NEMA MG 1-12.53.b; these values shall be stated in the Shop Drawing submittal. Motor nameplate data shall include the nominal efficiency value.

Motors in the range of 1 h.p. to 150 h.p., inclusive, shall be designed specifically for energy efficiency and high power factor. In accordance with NEMA Standard MG 1-12.53b, each motor shall meet the minimum guaranteed efficiency for the specified nameplate efficiency. All motor efficiency tests shall be performed utilizing the NEMA preferred test method IEEE 112 method B, Dynamometer. All tests shall be performed in accordance with the procedures contained in NEMA Standard MG 1-12.53.

Motors larger than 150 h.p. shall have a minimum efficiency, at full load, of 95 percent and a minimum power factor of 85 percent.

L. Condition of Service:

All motors shall meet the following conditions of service, and other conditions as required on the Drawings:

1. Continuous duty.

2. Altitude (below 3300) feet.

3. Ambient temperatures (0) to (40) degrees C.

4. Voltage variation plus or minus 10 percent (unless VFD controlled).

5. Frequency variation plus or minus 5 percent (unless VFD controlled).

6. Combined voltage and frequency variation plus or minus 10 percent. Frequency variation not to exceed plus or minus 5 percent (unless variable speed).

7. Across-the-line starting.

8. Reduced voltage starting, as required.

9. Two-speed control, as required.

10. VFD control, as required.

M. Rated torque shall be at least 20 percent greater than the maximum full load torque requirements of the driven equipment throughout the full operating range of the driven equipment from start to full load. Motors shall have torques in conformance with NEMA MGI-20.41.

N. Stator:

Stator and rotor core pieces shall be machine stamped from low loss non-aging silicon steel. Laminations shall be insulated by a layer of varnish or enamel. Rotor shafts shall be manufactured from carbon steel meeting SAE standard for 1045 steel.

Stator winding shall be copper wiring, with ends secured and braced for full voltage starting. Insulation system shall be rated type "F" or better, suitable for a maximum temperature of 185 degrees (C). Individual turns in the stator coils shall be insulated with Class H enamel covered with two layers of polyester and glass yarn. Motors shall be designed for a maximum of 40 degrees 8 temperature rise by resistance at 1.15 service factor. Windings shall be random or form wound, adequately insulated and securely braced to resist failure due to electrical stress and vibrations.

Any junction in motor insulation, such as coil connections or between slot and end winding sections, shall have protection equivalent to that of the slot sections of coils. The entire winding of all motors when finished, shall be epoxy encapsulated, after subjecting to a process which removes all moisture and insures freedom of air pockets.

Provide winding tropical/fungus protection.

O. Rotor:

The stator rotor shall be a sealed system with at least two complete vacuum pressure impregnation process cycles of 100% solid epoxy resin. Stator windings shall be provided with a polyurethane dispersion to inhibit insulation abrasion by sand, salt, fly ash, or other abrasive materials entrained in the cooling air.

The shaft shall be made of high grade machine steel or steel forging of size and design adequate to withstand the load stresses. The rotor shall be fabricated of high grade electrical sheet steel laminations adequately fastened together and to the shaft. Squirrel cage windings may be cast aluminum or copper alloy bar-type construction with brazed end rings.

Provide winding tropical/fungus protection.

P. Bearings:

Bearings shall be ball or roller antifriction type. Motors up to 1,000 h.p. shall be grease lubricated. Unless specified otherwise, the bearings shall have a B-10 life as follows:

Motor h.p.	B-10 Life (Hrs)
Less than 50	24,000
50 to 200	40,000
Greater than 200	100,000

For vertical motors, thrust bearings shall be Kingsbury Type, ball or roller bearings as required for the design thrust load. Guide bearings shall be radial type ball bearing.

Fractional horsepower through 2 h.p. motors shall be furnished with Lubricated-for-Life ball bearings.

Motors larger than 2 h.p. shall be furnished with relubricatable ball bearings except vertical pump motors.

Vertical pump motors larger than 2 h.p. shall be furnished with relubricatable ball, spherical, roller, or plate type thrust bearings. Lubrication shall be per manufacturer's recommendation for smooth operation and long life of the bearings.

If water cooling is required for the thrust bearings, cooling water lines shall be provided complete with solenoid valve, flow indicator, thermometer, throttling valve and, where subject to freezing, insulation with heat tracing.

Q. Connections:

Leads shall be suitably marked and identified. Terminal housing locations, which are not shown on the Contract Drawings, shall be NEMA Assembly F-1.

The low-voltage terminal box shall provide a terminal strip for the space heater. All necessary external wiring between the low voltage terminal box and connections to the motor shall be factory installed.

Each motor shall have adequate means for attaching a #4/0 (100 h.p. and above) AWG, or a #2/0 (below 100 h.p.) AWG copper grounding conductor to the motor frame near the base. It shall be a mechanical clamp terminal connector located on the same side as the stator lead junction box.

Motors shall be designed and manufactured for operation in a direction as required for driven equipment. The phase sequence at the specified rotation, shall be marked permanently and plainly inside the stator lead junction box.

R. Motors shall be free of objectionable noise and vibration. Motor sound pressure level shall not exceed 85 dbA at five (5) feet under free field, no load conditions in accordance with IEEE Standard 85. All motors shall have a maximum equivalent A-weighted sound level of 80 db A as determined in accordance with IEEE Standard No. 85 under full load and full speed conditions. Vibration level measured on the bearing housing shall be in accordance with values shown in NEMA Standards.

S. All motors shall have breather and drain plugs to allow proper drainage of moisture from inside.

T. The motors shall be weather-protected NEMA Type 1, designed to withstand at 25% overspeed in either direction of rotation, and to produce a maximum noise level of 85 dB or less at a distance of one meter from the surface of the unit.

U. Protect exposed surface with epoxy base paint. Before painting, prepare and prime according to the instruction of the paint manufacturer. Motor vent openings shall have stainless steel guard screens and inlet air filters with stainless steel or aluminum media.

2.03 ADDITIONAL REQUIREMENTS FOR MOTORS USED WITH VFD'S

A. Motors controlled by adjustable frequency drives shall be specifically designed for inverter operation.

B. Insulation shall be sufficient to protect against the adverse effects of non-sinusoidal waveforms. All insulation material shall be non-hygroscopic.

C. Motor service factor shall be 1.15 derated to 1.0 for non-sinusoidal voltage waveforms.

D. Nameplate information shall include both sinusoidal and non-sinusoidal data. The non-sinusoidal data shall include hertz vs. torque rating, hertz vs. horsepower rating, maximum full load amperes and speed ranges.

E. It is extremely important that the motor be completely isolated/disconnected from the drive prior to meggering the motor.

2.04 ACCESSORY REQUIREMENTS

A. Horizontal motors 3 h.p. and larger, and all vertical motors, shall have split-type cast metal conduit boxes. Motors other than open drip-proof shall be gasketed.

B. All motors weighing 265 pounds (120 Kg) or more shall have suitable lifting devices for installation and removal.

C. All motors shall be fitted with a permanent, Stainless Steel-corrosive nameplate indelibly stamped or engraved with NEMA Standard motor data, including bearing description and lubrication instructions. Insulation class, ambient temperature, altitude rating, and power factor at full load, if applicable, shall be included.

2.05 MANUFACTURER

A. The driven equipment Supplier shall have responsibility to select and supply suitable electric motors for the equipment. In the case of variable speed driven equipment, the equipment Supplier shall provide to the VFD Manufacturer motor requirements so that the VFD Manufacturer can select and supply the proper motor for VFD use. The choice of motor manufacturer shall be subject to favorable review by the ENGINEER. Such review will consider future availability of replacement parts and compatibility with driven equipment. In situations where less than all of the driven equipment of a given type will be operated by VFD, the driven equipment supplier shall supply the remaining (non-VFD) motors identical to those supplied by the VFD manufacturer.

B. Suppliers, or approved equal:

1. General Electric

2. Siemens-Allis

3. Toshiba

4. U.S. Motors

5. Marathon.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Motor installation shall be performed in accordance with the motor manufacturer's written recommendations and the written requirements of the manufacturer of the driven equipment. Field installation of the unit shall include final alignment.

Installation shall also include furnishing necessary oil and grease for initial operation and making final adjustments to place the equipment in operable condition.

B. Electrical work involving connections, controls, switches, disconnects, and etc. shall be performed as provided in the applicable Sections of Division 16.

3.02 FIELD TESTS

The following tests shall be performed on all motors after installation but before putting motors into service.

A. The CONTRACTOR shall megger each motor winding before energizing the motor, and, if insulation resistance is found to be low, shall notify the ENGINEER and shall not energize the motor. Satisfactory readings shall be as stated by the motor manufacturer.

B. The CONTRACTOR shall check all motors for correct clearances and alignment and for correct lubrication, and shall lubricate if required in accordance with Manufacturer's instructions. The CONTRACTOR shall check direction of rotation of all motors and reverse connections if necessary.

3.03 PAINTING

The motors shall have a chemical resistant protective coating for corrosion and fungus protection on all interior surfaces.

Motors shall be shipped to the site with shop primer compatible with the field applied exterior finish coating. After installation and before being placed in final operation, the motors shall be painted in accordance with Division 9 of the Specifications.

- END OF SECTION -

SECTION 16495

VARIABLE FREQUENCY DRIVE SYSTEMS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, connect, test and place in satisfactory operating condition all variable frequency drives (VFD's) as specified herein and indicated on the Drawings.

B. Reference Section 16000, Basic Electrical Requirements, Section 16902, Electric Controls and Relays, and Section 17900, Schedules and Control Descriptions, General.

1.02 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Witnessed Shop Tests

a. The VFD's specified in this Section shall be witness shop tested and inspected in accordance with the equipment manufacturer's standard procedures. The testing and inspection procedures shall demonstrate that the equipment tested conforms to the requirements specified and shall be approved by the Engineer. At least 10 days notice shall be given the Engineer prior to such tests and inspection dates.

b. Factory test the complete variable frequency drive system in accordance with IEEE and NEMA standards with these Specifications. In addition, the variable frequency drive system shall be tested for efficiency as defined in this Specification and for operational integrity during output short circuit conditions. Short circuit test shall demonstrate that the equipment will successfully protect against and survive a minimum of three (3) successfully repeated phase-to-phase short circuits at the drive output terminals.

c. Variable frequency drive system components, including power transistors, GTOs, SCRs, IGBT's, diodes shall be 100 percent inspected and tested, including temperature cycling and inspected and tested including temperature cycling and ambient high temperature of 65 degrees Celsius load testing. All integrated circuits shall be inspected, pass/fail tested, temperature cycled and ambient high temperature tested. Small components, including small signal semiconductors, resistors, capacitors, diodes, etc. shall be lot sampled and tested for functionality. Test printed circuit boards under a temperature cycled 20 hour load test and functionally bench test prior to unit installation. Inspect all final assemblies and test at full

load with application of line-to-line and line-to-ground bolted faults. The variable frequency drive system shall electrically trip off line under these conditions without device failure.

d. After the specified inspections and tests have been successfully completed, the variable frequency drive system shall undergo an 8 hour burn-in test. Burn system in at 100 percent inductive or motor load for 40 hours without an unscheduled shutdown.

2. Certified Shop Tests and Reports

a. Submit description of proposed testing methods, procedures, and apparatus.

b. Submit notarized and certified copies of all test reports.

c. Submit factory bench-test data to indicate that the manufacturer's proposed equipment has been tested in the specified arrangement and found to achieve specified accuracy.

3. Field Tests

a. Field tests shall be performed in accordance with requirements specified in the General Conditions, Division 1, and Section 16000, Basic Electrical Requirements.

B. Authorized representatives of JEA shall be allowed free access to the shop at all times while work is in progress for the purpose of inspection, witnessing of tests, and obtaining information on the progress of the work. JEA shall give the Contractor 72 hours prior notice.

C. Acceptance of a shop test does not relieve Contractor from requirements to meet field installation tests under specified operating conditions, nor does the inspection relieve the Contractor of responsibilities.

D. The Contractor shall successfully complete acceptance test procedures on the assembled drive system that demonstrate compliance with the requirements of this Specification. The test plan shall be submitted for acceptance at least 30 days prior to the planned test date.

E. Drive system shall not be shipped from the manufacturing and assembly facility until the acceptance tests are completed and the acceptance tests are completed and the results approved by the test representative.

F. Tests shall be witnessed by a representative of the Engineer. Variable frequency drive manufacturer shall notify the Engineer 2 weeks in advance and shall provide testing procedures to the Engineer 4 weeks prior to actual testing. Failure of a test shall result in rejection of the equipment until performance is in compliance with these Specifications.

G. Certification on materials and records of shop tests necessary for the inspector to verify that the requirements of the Specifications are met, shall be made available to the inspector.

H. Submit signed and dated certification that all of the factory inspection and testing procedures described herein have been successfully performed by the Contractor prior to shipment.

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Harmonic Study Report

3. Programming Guides/Manuals

4. Operation and Maintenance Manuals

5. Spare Parts List

6. Special Tools List

7. Shop Test Plan

8. Reports of Certified Shop and Field Tests

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Drawings submitted by the manufacturer shall be complete and documented to provide JEA with operations and maintenance capabilities.

D. Shop drawings for each VFD shall include but not be limited to:

1. A Compliance, Deviations, and Exceptions (CD&E) letter. If the shop drawings are submitted without this CD&E letter, the submittal will be rejected. The letter shall include all comments, deviations and exceptions taken to the Drawings and Specifications by the Contractor AND Equipment Manufacturer/Supplier. This letter shall include a copy of this specification section. In the left margin beside each and every paragraph/item, a letter "C", "D", or "E" shall be typed or written in. The letter "C" shall be for full compliance with the requirement. The letter "D" shall be for a deviation from the requirement. The letter "E" shall be for taking exception to a requirement. Any requirements with the letter "D" or "E" beside them shall be provided with a full typewritten explanation of the deviation/exception. Handwritten explanation of the deviations/exceptions is not

acceptable. The CD&E letter shall also address deviations, and exceptions taken to each Drawing related to this Specification Section.

2. Layout drawings of the variable frequency drive system that include all cabinet or enclosure dimensions, access details, and weights.

3. Layout drawings of panels or enclosures showing size, arrangement, color, and nameplates. Drawings shall include the physical arrangement of door mounted devices located on the variable frequency drive enclosure. Sufficient detail shall be provided for locating conduit stub-ups. General "catalog data sheet" layout drawings which are not specific to the systems specified herein are not acceptable.

4. Custom schematic and interconnection wiring diagrams of all electrical work, including terminal blocks and identification numbers, wire numbers and wire colors. Standard schematics and wiring diagrams that are not custom created by the manufacturer for the variable frequency drives for this project are not acceptable. These drawings shall be circuit specific for each motor-load combination (e.g. Secondary Clarifier No.5 RAS pumps, etc.). Indicate all devices, regardless of their physical location, on these diagrams. Specific equipment names consistent with the Drawings shall appear on each respective diagram.

5. Complete single line diagrams indicating all devices comprising the variable frequency drive system including, but not limited to, circuit breakers, motor circuit protectors, contactors, instrument transformers, meters, relays, timers, control devices, and other equipment comprising the complete system. Electrical ratings of all equipment and devices shall be clearly indicated on these single line diagrams.

6. Complete Bills of Material and catalog data sheets for all equipment and devices comprising the variable frequency drive system.

7. A complete list of recommended spare parts, including item descriptions, recommended quantities, and unit costs. The recommended list should be based on a maintenance plan where JEA will remove and replace failed items to the lowest replaceable module/component level.

8. Documented data regarding output load reactors or filters as specified herein.

E. The shop drawing information shall be completed and organized in such a way that the Engineer can determine if the requirements of these Specifications are being met. Copies of technical bulletins, technical data sheets from "Soft Cover" catalogs, and similar information which is "highlighted" or somehow identifies the specific equipment items the Contractor intends to provide are to provide are acceptable and shall be submitted.

F. Prior to completion and final acceptance of the project, the Contractor shall furnish and install "as-built" wiring diagrams for each VFD and bypass starter. These final drawings shall be plastic laminated and securely placed inside each VFD and starter door and included in the O&M manuals.

G. Product Data shall include, but not be limited to:

1. Functional diagrams that identify major system functional blocks and interfaces.

2. Special requirements or restrictions of the motor-load combination that may result from operation on the variable frequency drive system.

H. Harmonic Study and Data shall include but not be limited to:

1. Report of Harmonic Study to determine the harmonic distortion present in the voltage and current waveforms on motor terminals and in the electrical distribution system(s) caused by the variable frequency drive system as specified herein.

2. Voltage and current waveforms supplied by variable frequency drive at the motor leads.

3. Necessary descriptions regarding calculation method, assumptions, values and notations, basis for input information, manufacturer's harmonic content data, and calculation results interpretation.

I. Programming Guides and Manuals shall be submitted. If the variable frequency drive systems require computer software or configuration, provide copies of all programming guides/manuals. Flow charts and listings of software developed shall be submitted to the Engineer. Submit final flow charts and program listings no later than 6 weeks prior to factory testing of the system.

1.05 OPERATIONS AND MAINTENANCE MANUALS

A. The Contractor shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in the General Conditions, Section 01300, Submittals and Section 11000, Equipment - General Provisions.

B. Operation and Maintenance Manuals shall also be provided in electronic format on CDROM.

1.06 TOOLS, SUPPLIES, AND SPARE PARTS

A. The VFD's and accessories shall be furnished with all special tools necessary to disassemble, service, repair, and adjust the equipment. All spare parts as recommended by the equipment manufacturer shall be furnished by the Contractor to JEA.

B. The Contractor shall furnish the following spare parts <u>for each VFD</u>:

1. One set of all power and control fuses for each variable frequency drive.

2. One fully functional main control circuit board for each variable frequency drive.

3. One of each inverter power semiconductor for each rating supplied for each variable frequency drive.

4. Spare auxiliary equipment as specified in Article 2.10.

C. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

D. Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the Work, at which time they shall be delivered to JEA.

E. Spare parts lists, included with the shop drawing submittal shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

F. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.07 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall adequately supervise the installation and testing of all equipment furnished under this Contract and instruct the Contractor's personnel and JEA's operating personnel in its maintenance and operation as outlined in the General Conditions, Division 1, and Section 11000, Equipment - General Provisions. The services of the manufacturer's representative shall be provided for a period of not less than as follows:

1. One trip of one (1) working day during installation and start-up/configuration of the equipment.

2. One trip of one (1) working day after acceptance of the equipment.

3. One trip of one (1) working day during the warranty period.

B. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out at the office of the Resident representative on each day he is at the project.

1.08 IDENTIFICATION

A. Each VFD shall be identified by the circuit number and equipment name as indicated on the Drawings. A nameplate shall be securely affixed in a conspicuous place on each VFD. Nameplates shall be as specified in Section 16195, Electrical - Identification.

1.09 TRAINING

A. The Contractor shall provide training for JEA personnel. Training shall be conducted by the manufacturer's factory trained specialists who shall instruct JEA personnel in operation and maintenance of all equipment provided under this Section.

B. Provide the services of an experienced, factory trained technician or service engineer of the variable frequency drive manufacturer at the jobsite for minimum of 2 days for training of JEA personnel, beginning at a date mutually agreeable to the Contractor and JEA. The technician shall be on duty at the site for at least 8 hours per day and shall be available 24 hours per day, when required, to advise concerning special problems with equipment and systems.

C. Include in the bid the training of personnel in the operation and maintenance of each furnished variable frequency drive pump control system. For the purpose of this training section of the Specifications, a system is by definition a group of pumps or equipment which all serve a common function (e.g. RAS pumps, etc.). Training shall include at least one session for 2 designated employees for each system.

1.10 WARRANTY

A. Contractor shall warrant that the material and workmanship of all components and the operation of the variable frequency drive system and auxiliary equipment is in accordance with the latest design practices and meets the requirements of this Specification.

B. Warranty work shall include, but not be limited to, the following:

1. Replace components found to be faulty and make changes in equipment arrangement or adjustments necessary to meet the equipment or functional requirements or this Specification.

2. Warranty shall include system rewiring and substitution and rebuilt or additional equipment required during trial operation or subsequent operation of the unit during the period of this warranty.

3. Warranty shall be in effect for a period of 24 months following final acceptance of the system.

1.11 CONSTRUCTION SEQUENCING

A. The Contractor shall reference Section 01520, Maintenance of Utility Operations During Construction, of these Specifications.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance. Equipment shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

B. It is the intent of these specifications the VFD's to be provided as a standalone unit, in a separately mounted enclosure for the proposed RAS pumps.

C. The VFDs for RAS pumps Nos. 5,6 and 7 (for existing secondary clarifiers No.3 and 4) shall be furnished with air conditioned enclosures. These VFDs shall **not exceed** the dimensions shown on the drawings, i.e. 50" W (including side mounted air conditioning unit) x 24" D x 90" H.

C. The Contractor shall obtain the VFDs from one manufacturer who shall also manufacture the enclosure and major equipment components. The manufacturer shall have a minimum of five years experience in the manufacture of similar units and shall have a general distribution to the electrical trade. Subcontracting of wiring will not be acceptable.

D. The VFDs shall be model ACQ580 as manufactured by ABB, Aqua Drive as manufactured by Danfoss, model G120X as manufactured by Siemens, Altivar Process ATV630 as manufactured by Schneider, or model VF-AS3 as manufactured by Toshiba.

E. Variable frequency drive manufacturer shall be responsible for the successful application and operation of the entire drive and control system serving the motor and driven equipment. This includes the responsibility for obtaining all load, torque, speed and performance requirements from the respective sources and integrating these into a variable frequency drive system that fulfills the requirements of this Specification.

F. The Contractor and variable frequency drive system manufacturer are cautioned regarding the review and compliance with the total Contract Documents. Typical examples are circuit breakers, motor circuit protectors, magnetic starters, relays, timers, control and instrumentation products, pilot devices including pushbuttons, selector switches and pilot lights, enclosures, conduit, disconnect switches, terminal boxes, and other equipment.

2.02 PRODUCT REQUIREMENTS

A. Variable speed drives shall be adjustable frequency, adjustable voltage, pulse width modulated (PWM) design. The units shall be microprocessor controlled, fully digitally programmable, and capable of precise and repeatable speed regulation of three phase 480 volt AC NEMA Design B induction motors. Variable frequency drives for other than NEMA Design B induction motors (e.g. NEMA Design C) shall be coordinated with the requirements of that respective load.

Drive units shall perform continuous self diagnostics as well as load and drive self check on startup.

B. All drives shall have permanently mounted programming and display modules. These modules shall provide programming access to all drive parameters, display all fault codes to assist with diagnostics and provide a display of output speed in percent or load.

C. This specification describes variable speed motor control which includes the design, fabrication, testing, installation and support requirements for variable frequency drive systems for 3-phase, squirrel cage rotor, induction motors driving pumps.

D. Each variable frequency drive to be a complete alternating current electric drive system including hardware, software, technical data, and spare parts necessary to accomplish variable speed operation of an induction motor and load combination in accordance with the requirements as indicated on the Drawings and as described in these Specifications. Contractor shall refer to Section 17900 of the Specifications for a functional control description of each variable frequency drive system.

E. Variable frequency drive system manufacturer shall be responsible for the design and performance of the entire drive system and shall either manufacture all items of equipment or supply them using coordinated specifications furnished to the original equipment manufacturers to insure compatibility and performance in accordance with this Specification. Variable frequency drive manufacturer shall coordinate with suppliers of the drive motors and driven equipment. Motors shall be as specified in Section 15170 and other specific equipment Sections of the Specifications.

F. Variable frequency drive system shall be suitable for operation as part of a 480 VAC, 3-phase, 60 Hertz power distribution system. The complete variable frequency drive system shall withstand the mechanical forces exerted during short circuit conditions when connected directly to a power source having available fault current of 42,000 amperes symmetrical at rated voltage.

G. The variable frequency drive system shall be suitable to operate, at times, on a limited power source engine-generator set. The system shall be provided with equipment and devices to prevent waveform distortion as specified herein.

H. Provide control and sequence logic as specified herein and indicated on the Drawings. Control and sequence logic shall be designed such that the motor-load combination can be operated in the manual mode upon control and sequence logic failure, including all necessary personnel and equipment safety interlocks.

I. Design each variable frequency drive motor drive speed control system so that through simple programming by either factory engineers or JEA's trained operating personnel, specific control and protection functions can be attained.

2.03 DESIGN REQUIREMENTS

A. Each variable frequency drive system shall meet the requirements of this Specification without derating any of the induction motor operating parameters including service factor and nameplate horsepower. The variable frequency drive system manufacturer shall specifically identify special requirements or restrictions of the motor-load combination that may result from operation on the variable frequency drive system.

B. The variable frequency drive shall consist of a 6 pulse diode semiconductor rectifier system, direct current link, and pulse width modulated inverter. The inverter shall invert the direct current voltage into an alternating current voltage at a frequency which shall be proportional to the desired speed. This alternating current voltage and frequency shall both vary simultaneously at a constant "Volts-Per-Hertz" ratio to operate the induction motor at the desired speed.

C. Variable frequency drive shall operate from fixed frequency power supply and convert this input power into variable speed induction motor shaft power as required by this Specification. Provide each variable frequency drive with a motor circuit protector as indicated on the Drawings which shall be padlockable. Provide each variable frequency drive with 5% line reactors at the input. Include the necessary drive controllers and output contactors to accomplish the intended control of the variable frequency drive system.

D. The drive shall operate the motor and produce full rated nameplate horsepower at the motor output shaft without exceeding motor nameplate full load current and with the motor not exceeding rated total temperature not including the additional temperature increment that constitutes the motor service factor. Motor shall retain its service factor when operated by the variable frequency drive.

E. The overall drive system efficiency shall be a minimum of 95 percent when operating the specified motor-load combination at rated voltage, frequency, and current.

This efficiency shall be calculated as follows:

$$\text{Efficiency (\%)} = \frac{\text{Power (Load)}}{\text{Power (Supply)}} \times 100$$

F. Power (Load) is the total 3-phase power delivered to the motor, measured at the output terminals of the drive system, including output filters or transformers. Power (Supply) is the total electrical power delivered to the drive system, measured at the input terminals of the variable frequency drive including input filters, line reactors, isolation transformers, or other harmonic distortion suppression equipment. Include power input required for auxiliary equipment (e.g., controls, fans, air conditioning, pumps) for complete system operating in this Power (Supply) total.

G. Variable frequency drive shall provide smooth, stepless changes in motor speed and acceleration over the entire operating speed range from minimum to maximum speed (revolutions per minute). The variable frequency drive shall be provided with maximum and minimum frequency limits.

H. Variable frequency drive system to maintain a desired output frequency (setpoint) with a steady state accuracy of 0.5 percent of rated frequency of 60 Hertz for a 24 hour period.

I. Variable frequency drive to have an automatic current limit feature to control motor currents during startup and provide a "soft start" torque profile for the motor-load combination. The variable frequency drive shall also limit current due to motor winding or motor lead phase-to-phase short circuit or phase-to-ground short circuit. The current limit protection setting shall be field adjustable.

Variable frequency drive shall be furnished with programmable electronic overload and torque limits.

J. Drive system shall achieve a desired output frequency (setpoint) with a repeatability of 0.1 percent of rated frequency of 60 Hertz.

K. Drive system to be capable of operating the specified load continuously at any speed within the operating speed range of 10 percent to 100 percent of rated speed. The minimum and maximum continuous operating speeds shall each be adjustable within this speed range. The variable frequency drive shall provide for field adjustment of these setpoints.

L. Drive system controls to be microprocessor-based and have controlled linear acceleration capability to ramp up the speed, revolutions per minute, of the motor-load combination from the minimum selected operating speed to the maximum selected operating speed in a minimum of 30 seconds. Provide two (2) field-adjustable speed setpoints for the variable frequency drive to skip equipment resonant frequencies. Provide controlled linear deceleration capability. The acceleration and deceleration time limits shall be field adjustable to values up to 120 seconds.

M. Voltage or current unbalance between phases of the variable frequency drive output voltage shall not exceed 3 percent of the instantaneous values. The variable frequency drive system shall continuously monitor the output voltages and generate an alarm condition when the unbalance exceeds 3 percent. The system shall detect and generate a separate alarm for loss of any output phase voltage (single phasing). Phase unbalance shall be as defined by NEMA Standard MG-1.

N. Variable frequency drive system to operate continuously without interruption of service or damage to equipment during transient input voltage variations of plus or minus 10 percent for a duration of 15 cycles. Unacceptable voltage fluctuations on the supply bus shall cause under or overvoltage protection to trip and remove supply voltage from the drive system. Variable frequency drive output voltage regulation shall be plus or minus 2 percent.

O. The Contractor shall size variable frequency drive system and components to provide, indefinitely, motor load current equal to 125 percent of the motor nameplate full load current.

The Contractor is fully responsible for the review of the mechanical specifications to determine specified motor speed, horsepower and full load amperes. This information is available in the applicable mechanical specifications for each pump, drive, conveyor, blower, etc. Reference the Table of Contents.

P. The audible noise (sound pressure) level of a motor when operated from no load to full load with the variable frequency drive described herein shall not increase more than 5 decibels (dbA), at 5 feet in any direction from the motor, above its noise level when operated from a utility power source without the variable frequency drive.

Q. Variable frequency drives shall be provided with output reactors or filters, if required to prevent elevated voltage levels at the motor terminals.

R. The variable frequency drive system shall be furnished with line surge protection.

2.04 OPERATING CONDITIONS

A. The following operating conditions are applicable for all equipment of this Specification.

1. Humidity: 0-95 percent.

2. Ambient Temperature: Minus 20 degrees Celsius to plus 50 degrees Celsius.

3. Altitude: up to 3,300 feet

4. Power Supply: 480 volts, 3-phase, 60 Hertz.

5. Available Short Circuit Duty: as specified herein.

2.05 SYSTEM FEATURES AND CHARACTERISTICS

A. Controls and indicators to accomplish operation and maintenance shall be located on the variable frequency drive equipment assembly as specified herein and indicated on the Drawings. As a minimum, each VFD shall provide indication of the following:

1. Digital Speed Indicator: Revolutions per minute (input from tachometer).

2. Variable Frequency Drive Mode Indicator: Red; as required.

3. Input Voltage

4. Output Voltage

4. Output Current

7. Output Frequency

8. Output Speed: 0-100%

9. Drive Ready Indicator: White

10. Run Indicator: Red.

12. Running Time Meter.

13. Enclosure Overtemperature.

14. Alarm Indicator: Amber.

B. Each VFD shall provide the following automatic and manual controls:

1. Local-Off-Remote Selector Switch (as required).

2. Start/Stop selector switch (as required).

3. Local - Remote Speed Control Selector Switch (as required).

4. Local Speed Potentiometer.

5. Alarm Reset Pushbutton.

6. Alarm auxiliary contacts and other devices as indicated on the Drawings and as specified.

7. Provision for a run permissive from other equipment when the drive is in "Auto".

Pilot devices shall be as specified in Section 16902, Electrical Controls and Relays.

C. Provide devices for Profinet communication of signals as shown on the Drawings. In addition to the signals shown on the drawings, pumps shall have remote stop/start,

remote speed control, speed feedback, and communication of all VFD internal parameters through the Profibus DP network. Documentation shall include full register mapping and GSD files for the units.

D. Variable frequency drive system shall provide a 4-20 mADC output signal that is proportional to the drive output frequency for use as speed feedback or control and remote speed indication where shown.

E. Variable frequency drive system shall accept a 4-20 mADC input command signal to control the output frequency in the automatic and/or manual control modes as specified herein or indicated on the Drawings. The system shall accept the input increase/decrease command with a resolution that permits incremental changes in speed, revolutions per minute, equal to or less than 0.1 percent of rated speed.

F. When operating in the automatic mode, the variable frequency drive system shall shut down during a power outage. Upon restoration of normal power and after an adjustable time delay (0-2 minutes; motor has coasted to zero speed and there is no backspin), the variable frequency drive system shall automatically restart and then ramp up to speed as required by the control system. The process operator shall not be required to reset the system manually after a shutdown caused by a power outage.

G. Variable frequency drive shall be furnished with a multiple attempt restart feature.

H. Furnish a door mounted selector switch or other pilot device for those variable frequency drives where an additional speed reference signal (e.g., from a remote potentiometer, an analog output from a setpoint (PID) controller, an analog output from a programmable logic controller, or similar analog signal) is to be supplied to the variable frequency drive in addition to the door mounted manual speed control.

I. Provide a motor circuit protector for each variable frequency drive. Provide each variable frequency drive with its respective drive controller and output contactors for each motor.

J. Include in each variable frequency drive system an automatic trip feature which will open the output contactor and remove the drive output from the motor and allow it to decelerate safely. This automatic system shall trip and indicate the fault only upon the following conditions:

1. Output voltage unbalance (trip threshold field set).

2. Open phase.

3. Motor overload.

4. Motor stator winding fault (phase-to-ground, phase-to-phase).

5. Loss of input power to the variable frequency drive or unacceptable voltage variation.

6. High variable frequency drive equipment temperature.

7. Variable frequency drive system failure as determined by the manufacturer.

8. Component failure.

9. Overcurrent.

10. Undercurrent.

K. Provide variable frequency drive system with transmitted and received radio interference protection. In addition, provide protection against starting a rotating motor, both directions (coasting to zero speed and backspin). In the event that a motor automatic restart feature (catch the motor "on-the-fly") is provided in the drive controller as standard, this feature shall be capable of being disabled.

L. Variable frequency drive design shall include on-line diagnostics, with an automatic self-check feature that will detect a variable frequency drive failure which in turn affects motor operation and generates an alarm contact output rated for 125 VDC suitable for interfacing with the control system.

1. Diagnostics shall operate a visual alarm indicator that is visible on the variable frequency drive equipment cabinets without opening the cabinet doors.

2. Diagnostics shall provide an easily readable output that will isolate a failure.

3. Provide an event and diagnostic recorder to printout in narrative English of the specific fault(s) and the sequence in which the faults occurred. An indication of the "First Out" failure is a minimum for fault sequence detection.

4. Provide a normally open dry contact for each alarm function to enable remote indication.

2.07 ENCLOSURES

A. Unless otherwise specified or indicated on the Drawings, the variable frequency drive enclosures shall be NEMA 12, force ventilated, dead-front, with front accessibility. Design enclosures for bottom entry of cables only. Design variable frequency drive system so that rear cabinet access is not required for operations, maintenance, and repair tasks. Other enclosure requirements are:

1. Treat metal surfaces and structural parts by phosphatizing prior to painting.

2. Apply a gun-metal gray undercoat to enclosures which is equal to zinc chromate.

3. Finish exterior of the enclosures in ANSI-61 gray enamel or furnish in a color to match the complete line-up of equipment as indicated on the Drawings and accepted by the Engineer.

4. The doors shall have full length piano type hinges.

5. Brace each door to prevent sag when fully open.

6. Enclosure shall provide 95% non-condensing humidity at 95°F.

The CONTRACTOR shall reference the Drawings for maximum dimensions of the VFDs. This is especially critical for the VFDs for RAS pumps Noi.5, 6 and 7.

B. Furnish each variable frequency drive system with the control switches, alarm lights and indicators as specified herein and as indicated on the Drawings. Furnish main circuit breakers with an external operating handle interlocked with the door so that the door cannot be opened unless the disconnect is in the OFF position. Power supply to the motor from both the variable frequency drive and the bypass starter shall be capable of being positively locked in the OFF position. The disconnect shall be interlocked so that equipment cannot be energized when the door is open.

C. Electrical bus, including ground bus, shall be tin-plated copper. Power and control wiring shall be copper, color coded and identified in accordance with these Specifications.

D. Equipment shall be of modular construction allowing normal maintenance and repair to be done with ordinary hand tools. Design and install power electronic component assemblies so that, where practicable, components can be individually removed and replaced.

E. A single point of connection to a 480VAC, 3-phase, 60Hz power source shall be provided to the VFD enclosure. The VFD manufacturer shall include the necessary provisions to provide power for miscellaneous equipment such as enclosure climate control unit, motor anti condensation heater, etc. as required from the VFD system.

2.08 HARMONIC DISTORTION SUPPRESSION

A. A comprehensive pre-equipment-selection harmonic study shall be prepared by the Contractor. The results of this pre-equipment selection study shall be submitted to the Engineer as part of the submittals specified herein. Should this study indicate the need for tuned filters, line reactors, isolation transformers, or other harmonic distortion suppression equipment, these shall be supplied at no additional cost to JEA. Indicate the location of the harmonic suppression equipment in the submittal data. Location is subject to acceptance by the Engineer.

B. The harmonic distortion values resulting from operation of all or any variable frequency drive-driven motor-load combinations operating at full load shall be as defined in IEEE Standard 519, unless otherwise noted.

1. Maximum allowable total harmonic voltage distortion (THD): 5 percent of the fundamental.

2. Maximum allowable individual frequency harmonic voltage distortion: within the limits of IEEE standard 519.

3. Maximum allowable total demand distortion (TDD): within the limits of IEEE Standard 519-1992, Table 10.3.

4. Maximum allowable individual frequency harmonic demand distortion: within the limits of IEEE Standard 519-1992, Table 10.3.

5. The harmonic distortion levels shall be specific to the "Point of Common Coupling" (PCC).

   a. The PCC for Secondary Clarifier No.5 RAS pump drives (RAS pumps No.8 and 9) shall be at the primary terminals of the step-down transformer serving the existing low voltage distribution equipment that supplies the VFDs.

   b. The PCC for Secondary Clarifier No.3 and 4 RAS pump drives (RAS pumps No. 5, 6 and 7) shall be shall be defined as the drive input terminals.

C. System single line diagrams and field access to the plant site will be provided to the Contractor for the purpose of providing this study. Contractor shall obtain from others other information that may be necessary to perform this study. Input data and other pertinent information used in harmonic study shall be coordinated by the Contractor with the following:

1. Input data/information/results of the short circuit fault analysis specified herein.

2. Electrical system configuration and electrical equipment shop drawing submittal data including, but not being limited to new non-linear loads, new linear loads, and new capacitors.

D. Preparation of this pre-equipment selection study does not relieve the requirement for the Contractor to perform and submit the results of a second, final comprehensive study prepared by a recognized independent authority acceptable to JEA after equipment installation.

E. In addition, the Contractor shall field measure actual harmonic distortion and verify with tests performed by an independent authority acceptable to JEA after satisfactory full-load operation.

F. As part of the specified harmonic studies and other work for this project, identify and correct resonance conditions in the electrical distribution system at no additional cost to JEA. Shop drawings, data, location of the respective equipment and its connection to the electrical distribution system shall be acceptable to the Engineer.

G. Reference Section 16000, Basic Electrical Requirements for information gained from the electric utility company during the design period which could be used for the purpose of the harmonic study. Inclusion of this information, however, does not relieve the Contractor nor his suppliers of the responsibility of obtaining all the necessary information required to perform the harmonic study.

H. The VFD's shall be provided with a 6-pulse semiconductor front end with input 5% line reactor, and 5% DC link reactor, and harmonic mitigation as required.

J. The harmonic mitigation for Secondary Clarifier No.5 RAS pump drives (RAS pumps No.8 and 9) shall be mounted in the VFD enclosure by the VFD manufacturer. Passive harmonic filter or active harmonic filter shall be acceptable, provided that harmonic mitigation is provided for lower speed range as well.

The harmonic mitigation for Secondary Clarifier No.3 and 4 RAS pump drives (RAS pumps No. 5, 6 and 7) shall be an active harmonic filter furnished by the VFD manufacturer. The filter shall be mounted in a standalone enclosure and shall be connected to the MCC bus (MCC-SC) as shown on the MCC single line diagram. The filter shall be sized to mitigate the harmonic contribution by the existing VFDs for RAS pumps No. 1 through 4 (75HP; 2 duty, 2 standby) and the new VFDs for RAS pumps No. 5, 6 and 7 (2 duty, 1 standby).

Harmonic mitigation shall not cause leading power factor to the system at light load conditions.

Harmonic compliance shall be verified with onsite field measurement of both, voltage and current distortion at input terminals of the equipment, using a recording type Fluke 41 or equivalent harmonic analyzer.

2.10 MISCELLANEOUS

A. Encapsulate critical components in ceramic or metal.

B. Auxiliaries, including fans, that are required for rated load operation at maximum ambient temperature, shall be 100 percent redundant. A new and unused spare replacement fan(s) or air conditioning unit(s), shipped in original carton, may be acceptable.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. The VFD's shall be installed as shown on the Drawings and in accordance with the manufacturer's installation instructions.

B. Install VFD's to allow complete door swing required for component removal. This is specifically required where a VFD is set in the corner of a room.

C. Include in the bid an allowance for factory-trained service personnel, other than sales representatives, to supervise field installation, inspect, make final adjustments and operational checks, make functional checks of spare parts, and prepare a final report for record purposes. Adjust control and instrument equipment until this equipment has been field tested by the Contractor and the results of these tests have been accepted by the Engineer.

3.02 PAINTING

A. All metal surfaces of the motor control equipment shall be thoroughly cleaned and given one prime coat of zinc chromate primer. All interior surfaces shall then be given one shop furnished coat of a lacquer of the nitro-cellulose enamel variety. All exterior surfaces shall be given three coats of the same lacquer. The color of finishing coats shall be as approved by the Engineer. Color chips shall be forwarded to the Engineer for color selection and approval prior to finish painting. The interior of the VFD enclosure shall be painted white.

B. Prior to final completion of the work, all metal surfaces of the equipment shall be cleaned thoroughly, and all scratches and abrasions shall be retouched with the same coating as used for factory finishing coats.

3.03 RUBBER MATS

A. A three foot wide rubber mat shall be furnished and installed on the floor and in front of each VFD assembly. The mat shall be long enough to cover the full length of each VFD system. The mat shall be 1/4 inch thick with beveled edges, canvas back, solid type with corrugations running the entire length of the mat. The mat shall be guaranteed extra quality, free from cracks, blow holes or other defects detrimental to their mechanical or electrical strength. The mat shall meet OSHA requirements and the requirements of ANSI/ASTM D-178 J6-7 for Type 2, Class 2 insulating matting.

- END OF SECTION -

SECTION 16500

LIGHTING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all lighting fixtures, labor, and material, in accordance with the preceding Specifications, the requirements of this Section, and as shown on the Drawings.

B. Lighting shall be in accordance with the latest requirements of the Illuminating Engineering Society, and all lighting fixtures shall have the Underwriters Laboratories, Inc. label of approval.

C. All wiring shall be placed in conduit and shall comply with the Specifications for conduit, outlet boxes, pull and junction boxes, wires and cables, grounding, and other Sections as set forth in these Specifications and as noted herein.

D. Reference Section 16000, Basic Electrical Requirements, and Section 16170, Grounding and Bonding.

1.02 CODES AND STANDARDS

A. The equipment specified herein shall comply with the following codes and standards, where applicable.

1. Underwriter's Laboratories, Inc. (UL):

a. UL 924 – Emergency Lighting and Power Equipment

b. UL 935 – Fluorescent Lamp Ballasts

c. UL 844 – Luminaires for Use in Hazardous (Classified) Locations

d. UL 1029 – High Intensity Discharge Lamp Ballasts

e. UL 1598 – Luminaires

2. American National Standards Institute (ANSI):

a. ANSI C82.11 – High Frequency Fluorescent Lamp Ballasts

b. ANSI C62.41 – Guide for Surge Voltages in Low-Voltage AC Power Circuits

3. National Electrical Code (NEC), latest edition.

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Operation and Maintenance Manuals

3. Spare Parts Lists

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete or illegible submittals will be returned to the Contractor for resubmittal without review.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

2. Catalog cuts for each fixture type showing performance and construction details of standard fixtures, and complete working drawings showing all proposed construction details of special or modified standard fixtures.

3. Photometric curves.

4. Lamp and LED data including efficiency (Efficacy lumens/watt) information.

5. Ballast and LED Driver information.

6. Catalog data including applicable coefficients of utilization tables, isolux chart of illumination on a horizontal plane, beam efficiency, horizontal and vertical beam spread, and beam lumens.

7. Custom wiring diagrams for each individual lighting contactor. Standard wiring diagrams that are not custom created by the manufacturer for the individual lighting contactors for this project are not acceptable. One wiring diagram which is typical for all lighting contactors is not acceptable. Each wiring diagram shall include wire identification and terminal numbers. Indicate all devices, regardless of their physical location, on the diagrams. Identify on each respective wiring diagram specific equipment names and equipment numbers consistent with those indicated on the Drawings.

8. System (entire fixture assembly) efficiency data.

9. Pole calculations.

D. Shop drawings shall be submitted to the Engineer for review and acceptance for all fixtures before fixtures and poles are manufactured. Substitutions will be permitted only if acceptable to the Engineer.

E. Manufacturer's catalog number and description in the fixture schedule on the Contract Documents establishes a level of quality, style, finish, etc. The use of a catalog number describing the various types of fixtures shall be used as a guide only, and does not exclude all the required accessories or hardware that may be required for a complete installation.

1.05 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall submit Operation and Maintenance Manuals in accordance with the procedures and requirements set forth in the General Conditions and Division 1.

1.06 SPARE PARTS

A. All spare parts as recommended by the equipment manufacturer shall be furnished to JEA by the Contractor. The following minimum spare parts shall be furnished:

1. A minimum of one (1) ballast for every ten (10) ballasts (of the same model) installed.

2. A minimum of one (1) LED driver for every ten (10) drivers (of the same type) installed.

B. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

C. Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the work, at which time they shall be delivered to JEA.

D. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

E. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.07 LIGHTING CONTROLS

A. The lighting systems shall be controlled as specified herein and indicated on the Drawings.

B. Lighting contactors shall be furnished and installed for specific lighting control applications as specified herein and indicated on the Drawings.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

2.02 FIXTURES

A. Each fixture shall bear the Underwriters Laboratories, Inc. label. All lighting fixtures shall be furnished complete with lamps of the size and type as indicated on the Drawings and all fittings and hardware necessary for a complete installation. Lighting fixtures shall have all parts and fittings necessary to completely and properly install the fixtures.

B. Fixture leads shall be as required by NEC and shall be grounded by the equipment grounding conductor in the conduit.

C. All glassware shall be high quality, homogeneous in texture, uniform in quality, free from defects, of uniform thickness throughout, and properly annealed. Edges shall be well rounded and free from chips or rough edges.

D. HID fixture housings shall be finished with a seven-stage phosphate pretreatment and thermal-set, electrostatically applied polyester paint. Color shall be as indicated in the fixture schedule or as selected by the Engineer.

E. Indoor metal halide fixtures shown in non-hazardous locations shall be furnished with a tungsten/halogen lamp and time delay relay as specified in the fixture schedule or indicated on the Drawings. For hazardous locations where this feature is not available, emergency fixtures shall be provided with a time delay feature.

F. Emergency fixtures shall be UL 924 listed and have a minimum 90 minutes battery back-up.

G. Fixtures for use in hazardous locations shall be UL 844 Listed.

H. Fixtures specified to be damp or wet locations rated shall be UL 1598 listed.

I. Fluorescent fixtures shall be complete with housing, louvers (if required), and accessories of the types and quantities specified herein and indicated on the Drawings.

J. Fixtures shall be as specified in the fixture schedule below:

(continued on next page)

FIXTURE TYPE	LAMP/ FIXTURE WATTAGE	DESCRIPTION	MFR AND MODEL
LC6	62W (max)	Ceiling-mounted, 120-277VAC, LED strip light fixture, color temperature of 4000K, standard diffuse glass lens, code guage cold-rolled steel housing, five-stage iron phosphate pre-treatment, high-gloss, and baked white enamel paint. Provide with 7000 lumen minimum. Furnish with 316 stainless steel mounting hardware.	Holophane LED strip HZL1N, GE Albeo ALC5 Series, or approved equal.
LP3	129W (max)	Pendant-mounted, 120-277 VAC, LED light fixture, color temperature of 4000K, prismatic borosilicate glass lens, IESNA Type 5 low angle distribution, corrosion-resistant gray cast aluminum housing, 12,000lumen minimum, and wet location Listed.	Holophane Petrolux PLED2 Series, Crouse-Hinds PMV Series, or GE H2 Series.
LW5	72W (max)	Wall-mounted, 120-277 LED light fixture, color temperature of 4000K, gray die-cast aluminum housing, flat glass lens, sealed housing and aluminum optic housing, 48 LEDs, IESNA Type III medium distribution Forward Throw distribution , 450mA driver, 5500 lumen minimum, integral photocell, and wet location Listed. Furnish with stainless steel mounting hardware and emergency battery back-up option.	LSI Pariot Wall Sconce XPWS3 or approved equal.
LL3	115W (max)	Pole-mounted, 120-277 VAC, LED light fixture, color temperature of 4000K, 20LEDs, IESNA roadway Type 4 distribution, gray die cast aluminum housing, 1050mAdriver 6250 lumen minimum, full-cutoff optics, integral photocell, wet location Listed. Round Gray, base mounted, tapered, 12ft. anodized aluminum pole.	AEL Autobahn ATB0 Series, GE Evolve LED EASC, or Gardco Radiant RL Series.
LL3A	115W (max)	Pole-mounted, 120-277 VAC, LED light fixture, color temperature of 4000K, 20LEDs, IESNA roadway Type 3 distribution, gray die cast aluminum housing, 1050mAdriver, 6250 lumen minimum, full-cutoff optics, integral photocell, wet location Listed. Round, gray, base mounted, tapered, 20ft. anodized aluminum pole.	AEL Autobahn ATB0 Series, GE Evolve LED EASC, or Gardco Radiant RL Series.
EW1	LED 10W	Wall mounted emergency fixture, 120-277VAC with 12 VDC nickel cadmium battery, gray corrosion and impact resistant molded fiberglass housing, time delay shut-off, surge and brown-out protection and low voltage battery cut-off. Two 5W LED heads. Wet location listed.	Holophane Desoto M90X, Lithonia Indura INDX or equal.

FIXTURE TYPE	LAMP/ FIXTURE WATTAGE	DESCRIPTION	MFR AND MODEL
EW4	3W	Wall mounted, emergency fixture, 277 VAC, with sealed nickel cadmium battery. Impact resistant, white molded polycarbonate housing. Surge and brown-out protection, low voltage battery cutoff. Two 1.5W LED heads. Battery shall be suitable for 90 minutes (including all remote heads as shown on Drawings). Provide self-diagnostics option if available.	Surelites APEL Series, Holophane CZ11 Series, or Lithonia ELM Series.
XW1	1.5W	Wall-mounted, red LED exit sign, 120-277VAC, white faceplate, die cast aluminum housing, single/double face as indicated on the drawings, nickel cadmium battery[with self-diagnostics, brownout and surge protected, damp location Listed.	Holophane Magellan MEX Series, Chloride Symmetry Series, or Duallite Sempra Series.

2.05 LED DRIVERS

A. Drivers shall have a voltage range of (120-277) +/- 10% at a frequency 60Hz.

B. All drivers shall be designed to a power factor >90% with a total harmonic distortion THD <20% at full load.

C. Case temperature shall be rated for -40°C through +80°C.

D. Drivers shall have overheat protection, self-limited short circuit protection and overload protected.

E. Drivers shall be furnished with a fused primary.

F. Drivers shall have an output current ripple <30%

G. Drivers shall have a five year (100,000 hour) warranty.

H. Drivers shall be manufactured by Advance, Universal or equal.

I. Drivers shall be UL Listed for damp location, UL1012, UL935, ROHS.

J. Drivers shall meet FCC 47 Sub Part 15.

K. All drivers shall be provided with ANSI/IEEE C62.41 Category C (10kV/5kA) surge protection.

2.07 LEDs

A. Luminaires provided with LED technology shall utilize high brightness LEDs with a group binning code of P and/or Q.

B. Color Temperature: as specified in fixture schedule.

C. Junction point shall be designed and manufactured to allow adequate heat dissipation.

D. LEDs shall be rated for 100,000 hours of life, minimum (based on IESNA L70).

2.08 POLES

A. Poles shall be designed to withstand calculated wind force based on wind velocity in accordance with the provisions of the Florida Building Code.

B. Pole mounted fixtures shall be mounted on poles as designated in the fixture schedule or as indicated on the Drawings. Poles shall have adequate handholes and weatherproof receptacles where indicated. All anchor bolts and nuts shall be stainless steel.

C. The Contractor shall furnish and install a concrete foundation for the pole mounted fixtures located in the yard (i.e. site lighting) as indicated on the Drawings and as required, and shall provide anchorage to new and existing structures for pole mounted fixtures located on structures.

D. Foundation shall be designed and approved by a professional structural engineer currently registered in the State of Florida. The wind design shall be in accordance with the Florida Building Code and local requirements. Pole structure/foundation shall be designed for the most critical load combinations as defined by the Building Code. Wind speed and exposure category, used for design, shall be as listed under the General Structural Notes on drawing S001. Site lighting foundation bearing pressures shall not exceed those listed under Foundation Notes on Drawing S001.

E. Signed and sealed calculations and drawings of lighting foundations and structural anchorage shall be submitted to the Engineer for the purpose of verifying the design criteria and to verify compatibility of anchorage forces with supporting structures not designed by the Contractor's Engineer.

2.09 LIGHTING CONTROLS

A. Lighting contactors shall be as manufactured by Eaton, the Square D Company, General Electric Company, or Siemens Energy and Automation, Inc. Lighting contactors shall be heavy duty industrial type with 30A minimum rating and shall have the number of contacts required. Contactor ampere rating shall be increased as required to suit the application. Contactor coil voltage shall be as indicated on the Drawings. Contactors shall be the electrically or mechanically held type as indicated on the Drawings. Contactors shall include fused integral control power transformers. Any auxiliary relays, or other devices required for proper operation shall be included.

B. In non-hazardous locations, lighting contactors shall be furnished with the following enclosure type and material of construction, dependent upon the designation of the

area in which they are to be installed. Area designations are indicated on the Drawings.

AREA DESIGNATION	ENCLOSURE TYPE AND MATERIAL
Indoor Wet Process Area	NEMA 4X, Type 316 Stainless Steel
Indoor Dry Process Area	NEMA 12, Painted Steel
Indoor Dry Non-process Area	NEMA 1, Painted Steel
Indoor Type 1 Chemical Storage/Transfer Area	NEMA 4X, Fiberglass
Indoor Type 2 Chemical Storage/Transfer Area	NEMA 4X, Type 316 Stainless Steel
All Outdoor Areas	NEMA 4X, Type 316 Stainless Steel

C. In hazardous locations, lighting contactors shall be furnished with the following enclosure type and material of construction, dependent upon the classification of the area in which they are to be installed. Area classifications are indicated on the Drawings.

AREA CLASSIFICATION	ENCLOSURE TYPE AND MATERIAL
Class 1, Division 1, Group D	NEMA 7, Die Cast Aluminum
Class 1, Division 2, Group D	NEMA 7, Die Cast Aluminum
Class 2, Division 1, Group F	NEMA 9, Die Cast Aluminum
Class 2, Division 2, Group F	NEMA 9, Die Cast Aluminum

D. Photocells shown on the Drawings that are not integral to a fixture provided by the (lighting manufacturer) shall be provided by the Contractor. Photocells VAC shall be rated for 120 VAC, 1800W, and be provided with 1/2” or 3/4” threads for box mounting. Photocells shall be Model K4121C by Intermatic, or equal.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Lighting fixtures shall be located symmetrically with building lines as shown on the Drawings. The Contractor shall furnish and install the lighting fixtures to allow "convenient" access for maintenance such as cleaning, relamping, and other activities. The fixtures shall be installed to be accessed by a 12 ft. (max.) ladder. Where fixtures are shown in locations on the Drawings where maintenance would be difficult, the Contractor shall notify the Engineer for direction.

B. The Contractor shall provide and install all inserts, conduit, structural supports as required, lamps, ballasts, poles, wiring, and any other items required for a complete system. Contractor shall properly adjust and test, to the satisfaction of the Engineer, the entire lighting system. The Contractor shall provide pigtails and flexible conduit

connected to an outlet box where necessary or required resulting in a neat and complete installation.

C. The Contractor shall protect all fixtures at all times from damage, dirt, dust, and the like. Before final acceptance, all fixtures and devices shall be cleaned of all dust, dirt or other material, be fully re-lamped (except LED fixtures) and in operating condition to the satisfaction of the Engineer.

D. Circuiting shall be as shown on the Drawings and as follows:

1. Bus loads in all panelboards shall be balanced between phases to within a tolerance of one (1) KVA. Convenience receptacles shall be distributed evenly among all phase buses as much as practical.

2. Voltage drop to the most remote lighting fixture shall be limited to 2 percent.

E. The Contractor shall furnish and install all pendant trapezes and pendant stem hangers with durable swivel or equivalent trapeze hanger permitting normal fixture motion and self-alignment. Fixture pendants shall be Appleton Type UNJ ball type flexible hanger at the fixture and supports from an Appleton JBLX junction box with JBLX hub cover, or equal. Pendant lengths shall be adequate and adjusted to provide uniformity of installation heights above the reference datum. Stems shall be one-piece, with matching canopies and fittings.

F. Fixtures located on the exterior of the building shall be provided with neoprene gasket and non-ferrous metal screws finished to match the fixtures.

G. The finish or exposed metal parts of lighting fixtures and finish trims of all recessed lighting fixtures shall be as directed by the Engineer.

H. The Contractor shall furnish and install recessed fixtures with a separate junction box concealed and located as to be accessible when fixture is removed.

I. The Contractor shall furnish and install all boxes for lighting fixtures such that the box is not the sole support of the fixture. The boxes shall be offset to allow maintenance such that access to wiring within the box can be attained without having to consider supporting (holding) the fixture.

J. All lighting units, when installed, shall be set true and be free of light leaks, warps, dents, and other irregularities. All hangers, cables, supports, channels, and brackets of all kinds for safely erecting this equipment in place, shall be furnished and erected in place by the Contractor.

K. The Contractor shall install fixtures at mounting heights indicated on the Drawings or as instructed by the Engineer. In areas with exposed ducts and/or piping, installation of lighting fixtures shall be adapted to field conditions as determined by the Engineer.

L. The Contractor shall support each fixture securely. Each fluorescent fixture shall be secured to the building structure. The Contractor shall not secure fixtures to the work of other trades, unless specified or noted otherwise, and shall not support fixtures from

plaster. The Contractor shall furnish and install all steel members and supports as required to fasten and suspend fixtures from the structure.

M. In all mechanical equipment areas, the Contractor shall install lighting fixtures on the ceiling after all piping and equipment therein has been installed. Exact locations for such fixtures may be determined by the Engineer on the site during the course of the work.

N. Upon completion of work, and after the building area is broom clean, all fixtures shall be made clean and free of dust and all other foreign matter both on visible surfaces, and on surfaces that affect the lighting performance of the fixture including diffusers, lenses, louvers, reflectors, and lamps.

O. All fixtures that require physical adjustment shall be so adjusted in accordance with the directions of the Engineer. The Contractor shall also adjust angular direction of fixtures and/or lamps, as directed.

P. Relamping access of fixtures including LED fixtures shall require no special tools. All optical control surfaces such as lenses and reflectors shall be safely and securely attached to fixtures and shall be easily and quickly removed and replaced for cleaning without the use of special tools. No fixture part that may be removed, for maintenance, shall be held in place by metal tabs that must be bent to remove said part.

Q. The Contractor shall furnish and install time switches and photocells as specified herein or indicated on the Drawings. Time switches shall be provided with a manual bypass switch controlling the lights locally and remotely. Time switches shall control contactors, relays, or direct controlling of one, two, or three lighting circuits, as indicated. The Contractor shall furnish and install photocells as specified herein or indicated on the Drawings for automatic "ON/OFF" switching of outdoor lighting.

R. Lighting contactors shall be provided in the enclosure type and material of construction required for the area in which it is installed. Reference the requirements in Part 2 herein, and the area designations indicated on the Drawings.

S. The Contractor shall furnish and install a concrete foundation for the pole mounted fixtures as indicated on the Drawings and as required. This applies to foundations for pole mounted fixtures located in the yard (i.e. site lighting) and foundations that are part of a structure (e.g. filters). Foundation shall be designed and approved by a professional structural engineer currently registered in the State of Florida. The wind design shall be in accordance with ASCE 7 and the Florida Building Code. Pole structure/foundation shall be able to handle fixture/pole weight and withstand wind velocity of up to 110 MPH with a 1.3 gust factor. Provide calculations signed and sealed by a Professional Structural Engineer for review.

T. One (1), ¾" diameter, 10'-0" long ground rod, furnish in accordance with Section 16170, shall be driven adjacent to each pole. The pole, anchor bolts, steel reinforcement bar in the base, and equipment grounding conductor shall all be bonded to the ground rod as indicated in the standard details.

3.02 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Certified Shop Tests

    a. The lighting fixtures shall be given routine factory tests in accordance with the requirement of ANSI, NEMA and Underwriters Laboratories standards.

2. Field Tests

    a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and NETA Acceptance Testing Specifications, latest edition.

- END OF SECTION -

SECTION 16670

LIGHTNING PROTECTION SYSTEMS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, test, and place in satisfactory operation a complete lightning protection system as specified herein. Install lightning protection on the new pump station building, the generator enclosure, and the new ground storage tank. This is a performance specification. The Drawings do not show a complete lightning protection system design. The Contractor shall retain the services of a firm specializing in the design, installation, and testing of lightning protection systems.

1.02 CODES AND STANDARDS

A. The system shall comply with the following codes and standards:

1. Underwriters Laboratories, Inc. (U.L.):

    a. U.L. 96 - Lightning System Components

    b. U.L. 96A - Installation Requirements for Lightning Protection Systems

    c. U.L. 467 – Grounding and Bonding Equipment

2. National Fire Protection Association (NFPA):

    a. ANSI/NFPA 780 - Lightning Protection Code

3. Lightning Protection Institute (LPI):

    a. LPI-175 - Standard of Practice

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Operation and Maintenance Manuals

3. Spare Parts List

4. Test Reports

5. UL Master Label Certification

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings for each lightning protection system shall include, but not be limited to:

1. Product data sheets.

2. Complete U.L. approved, full size layout and installation drawings/details with clearly marked dimensions. Drawings shall indicate the exact location of all system components. Drawings shall be signed by a full-time employee of the lightning protection system manufacturer who is in responsible charge of this project and has been engaged in the business for at least ten (10) years.

3. Weights of major all components.

4. Bill of material list for each lightning protection system.

5. Manufacturer's installation instructions.

6. Manufacturer's and installer's standard warranty.

7. Evidence of the designer/installers UL listing.

D. The shop drawing information shall be complete and organized in such a way that the Engineer can determine if the requirements of these specifications are being met. Copies of technical bulletins, technical data sheets from "soft-cover" catalogs, and similar information which is "highlighted" or somehow identifies the specific equipment items the Contractor intends to provide are acceptable and shall be submitted.

1.05 OPERATIONS AND MAINTENANCE MANUALS

A. The Contractor shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in the General Conditions and Division 1. The manuals shall include:

1. Instruction books and/or leaflets.

2. Recommended spare parts list.

3. Final as-built construction drawings included in the shop drawings incorporating all changes made during the installation.

4. All other information that was included in the shop drawing submittal.

1.06 SPARE PARTS

A. The lightning protection system shall be furnished with all spare parts as recommended by the equipment manufacturer.

In addition to the manufacturer recommended spare parts, the Contractor shall furnish the following minimum spare parts for each structure provided with a lightning protection system under this Contract:

No. Required	Descriptions
2	Air Terminals
2	Point Tip Protectors

B. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

C. Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the Work, at which time they shall be delivered to JEA.

D. Spare parts lists, included with the shop drawing submittal shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

E. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same part number.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The lightning protection systems covered by this Specification shall be furnished using standard components of proven performance as manufactured by reputable concerns. The systems shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed.

B. The lightning protection systems shall be furnished and installed by A-C Lightning Security, Inc., Thompson Lightning Protection, Inc, Lightning Elimination and Consultants, Modern Lightning Protection Company, Inc. or approved equal.

C. System designer/supplier qualifications shall be as follows:

1. System components shall be manufactured by a company specializing in lightning protection equipment with a minimum of 5 years documented experience. Company shall be listed in the Section entitled "Lightning Conductor, Air Terminals and Fittings" of the U.L. "Electrical Construction Materials Directory" for at least 5 years previous to this Contract's bid opening date.

2. The system designer/installer shall be an authorized installer of manufacturer with a minimum of 5 years of documented experience. Designer/Installer shall be listed in the section entitled "Lightning Protection Installation" of the U.L. "Electrical Construction Materials Directory" for at least 5 years previous to this Contract's bid opening date.

2.02 LIGHTNING PROTECTION SYSTEMS

A. General

1. All components and parts of the lightning protection system shall be as specified herein. The materials used shall meet or exceed the material specification requirements of the Underwriters Laboratories, Inc. All materials shall be marked with a UL label or stamp.

2. The complete lightning protection system shall be inspected and included in the Master Label certification.

B. Conductors

1. Conductors shall be aluminum cable, consisting of a minimum of 24 strands of No. 14 AWG aluminum wire. Copper conductors shall be furnished and installed only where required and when in contact with the earth. Where termination of copper conductors is required to aluminum parts, suitable bi-metallic connectors approved for the purpose shall be furnished and installed.

C. Fittings

1. Fittings shall be the bolted type with stainless steel bolts, nuts, and washers. Fittings shall be of cast metal construction specifically designed for the application. Crimp-type fittings are not acceptable. Bi-metallic type fittings shall be furnished where required.

D. Fasteners

1. Fasteners shall be manufactured from non-corrosive material of ample strength and rigidity for the application.

E. Bases

1. Bases shall be bolted style provided with the model to suit the application (i.e. parapet, standing seam, etc.). Bolts, nuts, and washers shall be made of stainless steel. Bases shall be of aluminum or bronze construction, compatible

with the material of the surface to which it is attached. Crimp-type bases are not acceptable.

F. Ground Rods

1. Ground rods shall be 3/4-inch by 10-foot 0-inch sectional type copper-clad steel rods; as specified in Section 16170, Grounding and Bonding; quantity as required. Ground rods and all associated hardware shall be UL 467 listed.

G. Air Terminals

1. Air terminals shall be solid aluminum. Air terminals shall be tapered or blunt tip type to suit the application and furnished with air terminal bases and safety tips (ball or bullet type) for impalement protection.

H. Thru-Roof Hardware

1. Thru-roof penetrations shall have stainless steel nuts, bolts, and washers. Sealing washers and sealing boots shall be provided as required and shall be compatible with the roofing material. Conductor connections to this roof hardware shall be by bolted connection. Crimp type connections are not acceptable.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. The lightning protection system shall be furnished and installed in accordance with the manufacturer's installation instructions. One (1) copy of these instructions shall be included with the system components at time of shipment. The system components shall be suitably protected until accepted by JEA.

B. The equipment shall be installed in accordance with the manufacturer's recommendations. This shall include, but not be limited to the following:

1. Course all main down conductors to maintain a downward or horizontal run free of pockets or sags. Maintain an eight-inch (8") minimum radius and make no bend greater than 90 degrees. Follow the most direct route with inductance bonding conductors maintaining the horizontal or downward course of the main conductor. Interconnect roof conductors to provide at least two paths to ground from each terminal and to form closed loops. Follow the most direct path possible with down conductors between roof conductors and ground terminals. All down conductors for new occupiable buildings shall be placed in a concealed manner. Down conductors for existing occupiable structures, tanks, basins, and other non-occupiable structures may be installed exposed.

2. Install ground connections at no less than 60-foot intervals and at each down conductor on perimeter. If the structure has a ground grid, the ground rods from that grid may be used for connection to the down conductors. At each ground

connection, determine the extent of the grounding arrangement according to the volume and type of soil encountered and the lowest expected moisture content. Have JEA's representative observe each ground connection. Bond together all electrical service, telephone service, and lightning protection grounds to all underground metallic piping systems as required by Article 250 of the NEC.

3. The structural steel frame (where provided) may substitute for main down conductors provided the frame is electrically continuous and of adequate cross-section. Where the steel frame is utilized, connect the roof conductor to steel at least as often and at the same column as the ground connections. Make connections to steel with exothermic welds wherever possible. Provide bonding as required to make the entire metal frame continuous.

4. Bond all sizable metal objects within 6-feet of down, roof, or grounding conductors to the system. Use only approved fittings and conductors.

5. Wherever possible problems with corrosion are encountered, use substitute approved materials and/or provide corrosion protection. Use bimetallic or other specially designed and approved connectors where dissimilar metals are to be joined.

6. Install air terminals within 2-feet of the edge of structure and at intervals not greater than 20-feet along perimeter and peak. Provide additional terminals to limit spacing across roof to 50-feet maximum. Bond any exposed metallic object or surface to the roof conductor. Flash all terminal or conductor penetrations in the roof to conform to the roofer's requirements.

7. Record each ground connection location and mark up a reproducible copy of the approved shop drawings with their location. Also, indicate any substantial field modifications on these drawings. These drawings shall be included in the O&M manual.

8. Log all continuity tests of metal framing, ground grid connections, bonding, and similar connections. Indicate the location of tests or plans. Include test results in the O&M manual.

9. Retain U.L. to make an inspection of the completed installation and issue a Master Label Certification. Furnish a copy of the Certification to JEA upon receipt.

3.02 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Certified Shop Tests and Reports

a. None Required.

2. Field Tests

a. After installation, the lightning protection system shall be tested for continuity to the ground grid. The tests shall be made by the lightning protection system installer. Test shall be as follows:

i. Record the resistance between each down conductor and the ground grid to ensure a suitable low-resistance connection. All resistance values shall be 1 ohm or less. Test shall be made after the ground grid has been installed and tested per the requirements of Section 16170, Grounding and Bonding.

-END OF SECTION-

SECTION 16902

ELECTRIC CONTROLS AND RELAYS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, test, and place in satisfactory operation all electric controls and relays as specified herein and indicated on the Drawings.

B. Electrical control and relay systems shall be assembled using NEMA rated components. Components designed and built to International Electrotechnical Commission (IEC) standards are not recognized. Equipment designed, manufactured and labeled in compliance with IEC standards is not acceptable.

C. Reference Section 16000, Basic Electrical Requirements and Section 16195, Electrical Identification.

1.02 CODES AND STANDARDS

A. Products specified herein shall be in conformance with or listed to the following standards as applicable:

1. NEMA 250 – Enclosures for Electrical Equipment

2. UL 508A – Standard for Industrial Control Panels

3. UL-1203 – Standard for Explosion-proof and Dust-ignition-proof Electrical Equipment for use in Hazardous (Classified) Locations.

4. ANSI/ISA 12.12.01-2013 – Nonincendive Electrical Equipment for use in Class I and II, Division II Hazardous (Classified) locations.

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Spare Parts List

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

D. The shop drawing information shall be complete and organized in such a way that the Engineer can determine if the requirements of these Specifications are being met. Copies of technical bulletins, technical data sheets from "soft-cover" catalogs, and similar information which is "highlighted" or somehow identifies the specific equipment items the Contractor intends to provide are acceptable and shall be submitted.

1.05 SPARE PARTS

A. All spare parts as recommended by the equipment manufacturer shall be furnished to JEA by the Contractor. In addition to the manufacturer recommended spare parts, the following spare parts shall be provided for the local control stations:

1. One (1) contact block of each type furnished on the project

2. One (1) indicating light lens of each color furnished on the project

3. One (1) LED lamp of each color furnished on the project

B. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

C. Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the work, at which time they shall be delivered to JEA.

D. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

E. Parts shall be completely identified with a numerical system to facilitate parts control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same part number.

PART 2 -- PRODUCTS

2.01 CONTROL COMPONENTS

A. Manufacturers

1. Control components shall be manufactured by Eaton, The Square D Company, General Electric, Allen-Bradley, Siemens Energy and Automation, or Engineer approved equal.

B. Pilot Devices

1. General

a. All pilot devices shall be provided with a legend plate. Legend plates shall have a white background and black lettering and indicate the function of the respective pilot device. The text shown on the Drawings or indicated in the specifications shall be used as the basis for legend plate engraving (i.e. HAND-OFF-REMOTE, RUN, EMERGENCY STOP, etc).

b. All pilot devices shall be selected and properly installed to maintain the NEMA 250 rating of the enclosure in which they are installed. All pilot devices shall be UL 508 Listed.

c. All pilot devices shall be 30.5mm in diameter, unless otherwise indicated. 22mm devices are not acceptable.

d. Pilot devices for all electrical equipment under this Contract shall be of the same type and manufacturer unless otherwise specified herein or indicated on the Drawings.

e. In Class 1 Division 2 hazardous locations, pilot devices shall be the hermetically-sealed type, constructed in accordance with ANSI/ISA 12.12.01.

2. Pushbuttons

a. Pushbuttons shall be non-illuminated, black in color, and have momentary style operation unless otherwise indicated on the Drawings.

b. Pushbuttons shall have the quantity of normally closed and/or normally open contacts as indicated on the Drawings and as required. In addition to the required contacts, one (1) spare normally open and one (1) spare normally closed contact shall be installed at each pushbutton. Contacts shall be rated for 5A at 250VAC/DC (minimum), but no less than required for the application.

c. Pushbuttons shall be provided with a full guard around the perimeter of the button. Where a lockout style pushbutton is specified or indicated on the Drawings, provide a padlockable guard.

3. Selector Switches

   a. Selector switches shall be non-illuminated, black in color, and have the number of maintained positions as indicated on the Drawings and as required. Handles shall be the extended type that provide a greater surface area for operation.

   b. Selector switches shall have the quantity of normally closed and/or normally open contacts as indicated on the Drawings and as required. In addition to the required contacts, one (1) spare normally open and one (1) spare normally closed contact shall be installed at each selector switch. Contacts shall be rated for 5A at 250VAC/DC (minimum), but no less than required for the application.

   c. Where indicated in the Drawings or Specifications, provide spring return positions.

   d. Selector switches shall be provided with an indexing component that fits into the keyed portion of the cutout for the device and prevents the switch from spinning when operated.

4. Indicating Lights

   a. Indicating lights shall LED type, with the proper voltage rating to suit the application, and push-to-test feature.

   b. Indicating light lens colors shall be as required in equipment specifications and/or as indicated on the Drawings. If lens colors are not indicated, the following colors shall be used:

      i. Red - "Run", "On", “Open”

      ii. Green - "Off", “Closed”

      iii. Amber - "Alarm", "Fail"

      iv. White - “Control Power On”

5. Emergency Stop and Tagline Switches

   a. Emergency stop switches shall be non-illuminated, red in color, with a minimum 35mm diameter mushroom head. Once activated, switch shall maintain its position and require a manual pull to release/reset.

   b. Tagline switches shall have a plunger that activates upon tension from the associated safety cable. Once activated, switch shall maintain its position and require a manual release/reset.

   c. Emergency stop and tagline switches shall have the quantity of normally closed and/or normally open contacts as indicated on the Drawings and as

required. In addition to the required contacts, one (1) spare normally open and one (1) spare normally closed contact shall be installed at each switch. Contacts shall be rated for 5A at 250VAC/DC (minimum), but no less than required for the application.

C. Relays and Timers

1. General

a. Relays and timers shall be furnished with an integral pilot light for positive indication of coil energization.

b. Relays and timers shall have tubular pin style terminals with matching 11-pin DIN rail mount socket. Spade or blade style terminals are not acceptable.

c. Relays and timers for all electrical equipment under this Contract shall be of the same type and manufacturer unless otherwise specified herein or indicated on the Drawings.

2. Control and Pilot Relays

a. Miniature or “ice-cube” type relays are not acceptable.

b. Relays shall have coil voltage as required to suit the application and/or as indicated on the Drawings.

c. Relays shall be provided with contacts rated for 10A (resistive), minimum, at 120/240 VAC and 28 VDC. Relays shall have 3-pole, double-throw (3PDT) contact arrangement.

3. Time Delay Relays

a. Timers delay relays shall utilize electronic timing technology. Mechanical timing devices are not acceptable.

b. Relays shall have coil voltage as required to suit the application and/or as indicated on the Drawings.

c. Relays shall be provided with contacts rated for 10A (resistive), minimum, at 120/240 VAC and 28 VDC. Relays shall have double-pole double-throw (DPDT) contact arrangement.

d. Time delay ranges shall be as indicated on the Drawings and/or as required to suit the application. Timing range shall be adjustable from the front of the relay. On delay and off delay timer configurations shall be provided as indicated on the Drawings and/or as required to suit the application.

4. Elapsed Time Meters

a. Elapsed time meters shall be non-resettable type with no less than a 4 digit display. Coil voltage shall be as required to suit the application and/or as indicated on the Drawings.

D. Control Terminal Blocks

1. Control terminal blocks shall be assembled on non-current carrying galvanized steel DIN mounting rails securely bolted to the enclosure or subpanel. Terminals shall be tubular screw type with pressure plate that will accommodate wire size range of #22 - #8 AWG.

2. Control terminal blocks shall be single tier with a minimum rating of 600 volts and 20A. Separate terminal strips shall be provided for each type of control used (i.e. 120VAC vs. 24VDC). Quantity of terminals shall be provided as required to suit the application. In addition, there shall be a sufficient quantity of terminals for the termination of all spare conductors.

3. Terminals shall be marked with a permanent, continuous marking strip, with each terminal numbered. One side of each terminal shall be reserved exclusively for incoming field conductors. Common connections and jumpers required for internal wiring shall not be made on the field side of the terminal.

2.02 LOCAL CONTROL STATIONS

A. Local control stations shall be furnished and installed complete with pushbuttons, selector switches, indicating lights, and other devices as indicated on the Drawings.

B. Specific devices installed in local control stations shall be provided in accordance with the requirements specified elsewhere in this Section.

C. In non-hazardous locations, local control stations shall be furnished with the following enclosure type and material of construction, dependent upon the designation of the area in which they are to be installed. Area designations are indicated on the Drawings.

AREA DESIGNATION	**ENCLOSURE TYPE AND MATERIAL**
Indoor Wet Process Area	NEMA 4X, Type 304 Stainless Steel
Indoor Dry Process Area	NEMA 12, Die Cast Zinc
Indoor Dry Non-process Area	NEMA 12, Die Cast Zinc
Indoor Type 1 Chemical Storage/Transfer Area	NEMA 4X, Fiberglass or Thermoplastic Polyester
Indoor Type 2 Chemical Storage/Transfer Area	NEMA 4X, Type 304 Stainless Steel
All Outdoor Areas	NEMA 4X, Type 304 Stainless Steel

D. In hazardous locations, local control stations shall be furnished with the following enclosure type and material of construction, dependent upon the classification of the area in which they are to be installed. Area classifications are indicated on the Drawings.

AREA CLASSIFICATION	ENCLOSURE TYPE AND MATERIAL
Class 1, Division 1, Group D	NEMA 7, Die Cast Aluminum
Class 1, Division 2, Group D	NEMA 4X, Type 304 Stainless Steel
Class 2, Division 1, Group F	NEMA 9, Die Cast Aluminum
Class 2, Division 2, Group F	NEMA 9, Die Cast Aluminum

E. Non-metallic enclosures, NEMA 7 enclosures, and NEMA 9 enclosures shall be provided with threaded integral conduit hubs. Conduit hubs shall be external to the enclosure.

F. Local control stations for use in non-hazardous locations shall be UL-508 Listed. Local control stations for use in Class 1 Division 1 and Class 2 Divisions 1/2 hazardous locations shall be UL-1203 Listed. Local control stations for use in Class 1 Division 2 hazardous locations shall be in accordance with ANSI/ISA 12.12.01-2013.

G. Provide a nameplate on each local control station in accordance with Section 16195, Electrical Identification. The name and/or number of the equipment associated with each control station shall be engraved on the nameplate, followed by the words “LOCAL CONTROL STATION”.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Local control stations shall be provided in the enclosure type and material of construction required for the area in which it is installed. Reference the requirements in Part 2 herein, and the area designations indicated on the Drawings.

B. All control components shall be mounted in a manner that will permit servicing, adjustment, testing, and removal without disconnecting, moving, or removing any other component. Components mounted on the inside of panels shall be mounted on removable plates and not directly to the enclosure. Mounting shall be rigid and stable unless shock mounting is required otherwise by the manufacturer to protect equipment from vibration. Component's mounting shall be oriented in accordance with the component manufacturer's and industries' standard practices.

C. Pilot devices shall be properly bonded to the equipment enclosure door where they are installed. If proper bonding cannot be achieved through the locknuts that affix the device in place, a green colored bonding screw shall be provided on the pilot device. The bonding screw shall be bonded to the equipment enclosure through the use of an insulated green bonding conductor.

D. Local control station covers shall be bonded to the local control station enclosure through the use of an insulated green bonding conductor.

E. Wiring to devices at each local control station shall be provided with enough slack to permit the local control station cover to be removed and pulled at least 6 inches away from the enclosure.

F. Terminal strips, relays, timers, and similar devices shall not be installed on the rear of the panel/cabinet doors. Terminal strips, relays, timers, and similar devices shall not be installed on the side walls of panel/cabinet interiors without written permission from the Engineer.

- END OF SECTION -

SECTION 16950

ELECTRICAL SYSTEM TESTING AND COMMISSIONING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. This Section specifies the work necessary to test, commission and demonstrate that the electrical work satisfies the criteria of these Specifications and functions as required by the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Technical Sections include requirements for factory testing, test standards, and test report submittals when such requirements are applicable.

1.03 GENERAL

A. The work of this Section includes furnishing the labor, equipment and power required to support the testing specified in other Divisions of these Specifications. Electrical testing specified herein, and functional testing of all power and controls shall be completed before commencement of the 7-day test specified in Section 01650, "Equipment Testing and Plant Startup." This scope may require the CONTRACTOR to activate circuits, shutdown circuits, and run equipment, make electrical measurements, replace blown fuses, install temporary jumpers, etc.

B. All testing shall be conducted in the presence of the ENGINEER.

1.04 TESTING

A. The following test requirements are intended to supplement test and acceptance criteria that may be stated elsewhere in the specifications.

1. Lighting: Switching, including remote control, as shown. Circuitry is in accordance with panel schedules. Lighting fixtures located to minimize obstruction of illumination by mechanical equipment, piping, or building structural elements.

2. Power Instrumentation: Demonstrate that voltmeter and ammeter switches are functional. Demonstrate that meters are within catalog accuracy as installed with specific reference to kilowatt meters.

3. Demonstrate mechanical and/or electrical interlocking by attempting to subvert the intended sequence.

4. Activate ground fault tripping by operating test features provided with ground current protective systems and by injecting a known, and reasonable, current in the ground current sensor circuit. In general, ground fault tripping should occur

at a ground current equivalent to 20 percent of phase current. Current injection is not required of circuit 400 amperes or less.

5. Test ground fault circuit interrupting (GFCI) receptacles and circuit breakers for proper operation.

6. A functional test and check of all electrical components is required prior to performing subsystem testing and commissioning. Compartments and equipment shall be cleaned as required by other provisions of these Specifications before commencement of functional testing. Functional testing shall include:

   a. Visual and physical check of cables, buss work, circuit breakers, transformers, and connections associated with all new and modified equipment.

   b. Setting of protective relays in conformance with results of the Short Circuit Study and testing of relays to assure that relays will trip at the current value and time required by the Study.

   c. Circuit breakers which are specified with adjustable time or pick-up settings for ground current, instantaneous overcurrent, short-time overcurrent, or long-time overcurrent, shall be field adjusted by a representative of the circuit breaker Manufacturer. Time and pickup setting shall correspond to the recommendations of the Short Circuit Study. Setting shall be tabulated and proven for each circuit breaker in its installed position; test results shall be certified by the tester and transmitted to the ENGINEER (7 copies).

B. Subsystem testing shall occur after the proper operation of alarm and status contacts has been demonstrated or otherwise accepted by the ENGINEER and after process control devices have been adjusted as accurately as possible. It is intended that the CONTRACTOR will adjust limit switches and level switches to their operating points prior to testing and will set pressure switches, flow switches, and timing relays as dictated by operating results. Subsystems, in the context discussed here, shall mean individual and groups of pumps, conveyor systems, chemical feeders, air conditioning units, ventilation fans, air compressors, etc.

   1. After initial settings have been completed, each subsystem shall be operated in the manual mode and it shall be demonstrated that operation is in compliance with the Contract Documents. Once the manual mode of operation has been proven, automatic operation shall be demonstrated to verify such items as proper start and stop sequence of pumps, proper operation of valves, proper speed control, etc.

   2. Motor operated valves shall be tested after having been phased and tested for correct motor rotation and after travel and torque limit switches have been adjusted by a representative of the valve Manufacturer. Tests shall verify status indication, proper valve travel, and correct command control from local and remote devices.

1.05 COMMISSIONING

A. Commissioning during the 7-day test as specified in Section 01650, "Equipment Testing and Plant Startup," shall not be attempted until all subsystems have been found to operate satisfactorily; commissioning shall only be attempted as a function of normal plant operation in which plant process flows and levels are routine and equipment operates automatically in response to flow and level parameters or computer command, as applicable. Simulation of process parameters shall be considered only upon receipt of a written request by the CONTRACTOR.

B. The indications of all switchgear and MCC ammeters and kilowatt meters shall be recorded every half-hour during commissioning.

- END OF SECTION -

SECTION 17000 - CONTROLAND INFORMATION SYSTEM, GENERAL

PART 1 – GENERAL

1.01 SCOPE

A. The Contractor shall provide, through the services of the instrumentation and controls subcontractor, all components, system installation services, as well as all required and specified ancillary services in connection with the Instrumentation, Control and Information System. The System includes all materials, labor, tools, fees, charges and documentation required to furnish, install, test and place in operation a complete and operable instrumentation, control and information system as shown and/or specified. The system shall include all measuring elements, signal converters, transmitters, control panels, cabinets, digital hardware, signal and data transmission systems, interconnecting wiring, brackets, supports, piping, tubing, valves, mounting hardware, and such accessories as shown, specified, and/or required to provide the functions indicated.

B. The Contractor shall take note that the Section entitled “Summary of Work’” includes specific construction sequencing restrictions that impact the performance of the Work as specified in Division 17. The Contractor shall coordinate sequence requirements between its various Project subcontractors as necessary to meet all requirements as specified in the contract documents.

C. The general scope of work to be performed under this Division includes, but is not limited to, the following:

1. The Contractor shall retain overall responsibility for the instrumentation and control system as specified herein.

2. The Contractor shall include an additional 40 manhours in the Contractor’s final bid price for programming assistance performed by the instrumentation and controls subcontractor, as directed by the Owner or Engineer during the FAT or in the field. This will only be used as directed by the Owner or Engineer.

3. The Contractor, through the services of shall furnish and install control equipment, operator interfaces, field panels and associated cabinets and control panels as shown on the Drawings, specified in this Division and shall include but is not limited to the following:

    a. Pump Station Main Control Panel, MCP-1, equipped with a Siemens PLC, PLC-1, and Siemens Operator Interface Unit, OIU-MCP-1.

b. Sodium Hypochlorite Local Control Panel, LCP-1, equipped with a Siemens Remote I/O, RIO-1, and Siemens Operator Interface Unit, OIU-LCP-1.

c. Standby Generator Remote I/O Panel, RIO-4, equipped with a Siemens Remote I/O unit.

d. Discharge Flow and Pressure Remote I/O Panel, RIO-3, equipped with a Siemens Remote I/O unit.

e. Ground Storage Tank Remote I/O Panel, RIO-2, equipped with a Siemens Remote I/O unit.

f. Sodium Hypochlorite Truck Fill Panel, TFP-5001.

g. Network cabinet with the following rack mounted equipment: corporate cisco switch, redundant uninterruptible power supplies, network surge protection devices, power strips, fiber patch panels, copper patch panels, CCTV/security equipment specified in Division 16 and all accessories required for a complete, fully operational network cabinet.

4. The Contractor, through the services of instrumentation and controls subcontractor, shall:

a. Provide basic software configuration, network equipment configuration, factory testing and field testing for all control panels and remote I/O panels furnished by instrumentation and controls subcontractor under this contract. Basic configuration of the PLCs and RIOs shall consist of assigning PLC tags to the physical IOs, setting up Profinet and other communications links, as required, and assigning IP addresses in accordance the Owners standards.

b. Coordinate with Owners operations and IT departments and provide assistance to the Owner in the configuration and field testing of the corporate network switch, shown on Drawing I-02, to establish a secure fiber optic communications link between the Owners existing offsite SCADA system and the Pump Station.

c. Coordinate with the standby generator system supplier to ensure that the generator remote I/O panel, RIO-4, is properly mounted and wired inside the generator enclosure by the generator system supplier.

d. Furnish and install process instrumentation, and associated taps, nipples, valves, tubing, pipe stands, sunshields and supports as scheduled or shown on the Drawings, unless otherwise noted or supplied by equipment vendors.

e. Furnish and install copper and fiber optic networks and appurtenances.

f. Perform termination and testing of all Instrumentation and Control System signal wiring and power supply wiring at equipment furnished under this Division.

g. Final termination and testing of all Instrumentation and Control System signal wiring and power supply wiring at equipment furnished under this Division.

h. Furnish and install transient voltage surge suppression systems for all digital equipment, data communications equipment, local control panels, and field instruments provided under this Division, including connections to grounding system(s) provided under Division 16.

i. Coordinate grounding requirements with the electrical subcontractor for all digital equipment, local control panels, and field instrumentation provided under this Division. Terminate grounding system cables at all equipment provided under this Division.

j. Provide system factory acceptance testing, field testing, calibration, operator/maintenance personnel training and startup services as specified herein and as required to make all systems fully operational.

5. The Contractor shall and install embedded supports, instrument stands, brackets, mounting hardware, piping, tubing, isolation valves and related items required for instrumentation and equipment furnished under Division 17.

6. The Contractor shall coordinate all work specified herein with related work specified in other Divisions, and shall schedule the work to minimize downtime of plant equipment and controls as described in the Section entitled “Maintenance of Utility Operations During Construction”. The Contractor shall provide temporary equipment and interconnecting cables as described herein and as shown on the Drawings.

D. It is the intent of the Contract Documents to construct a complete and working installation. Items of equipment or materials that may reasonably be assumed as necessary to accomplish this end shall be supplied whether or not they are specifically stated herein.

1.02 RELATED ITEMS

A. Field mounted switches, limit switches, valve and gate operator position transmitters, sump pump controls and other instrumentation and controls furnished with mechanical or electrical equipment not listed in the instrument schedule shall be furnished, installed, tested and calibrated as specified under other Divisions.

B. Additional and related work performed under Division 16 includes the following:

1. Conduit and raceways for all instrumentation and control system signal wiring, grounding systems, copper and fiber optic communication cables and special cables.

2. Instrumentation and control system signal wiring. See termination requirements below.

3. Install (pull in conduit system) copper and fiber optic data communications cables.

4. Furnish and install grounding systems for all digital equipment, local control panels, and field instrumentation provided under Division 17. Grounding systems shall be complete to the equipment provided under Division 17, ready for termination by the instrumentation and controls subcontractor.

5. Termination of all instrumentation and control system grounding, signal and data communications cables, wiring and surge suppression devices at the equipment end of all equipment furnished under other Divisions of the Specifications. Wiring systems shall be installed complete to the equipment provided under Division 17, ready for termination by the instrumentation and controls subcontractor.

1.03 GENERAL INFORMATION AND DESCRIPTION

A. Where manufacturers are named for a particular item of equipment, it is intended as a guide to acceptable quality and performance and does not exempt such equipment from the requirements of these Specifications or Drawings.

B. In order to centralize responsibility, it is required that all equipment (including field instrumentation and control system hardware) offered under this Division shall be furnished and installed by the instrumentation and controls subcontractor, or under the supervision of the instrumentation and controls subcontractor, who shall assume complete responsibility for proper operation of the instrumentation and control system equipment, including that of coordinating all signals, and furnishing all appurtenant equipment.

C. The Contractor shall retain total responsibility for the proper detailed design, fabrication, inspection, test, delivery, assembly, installation, activation, checkout, adjustment and operation of the entire instrumentation and control system as well as equipment and controls furnished under other Divisions of the Specifications. The Contractor shall be responsible for the delivery of all detailed drawings, manuals and other documentation required for the complete coordination, installation, activation and operation of mechanical equipment, equipment control panels, local control panels, field instrumentation, control systems and related equipment and/or systems and shall provide for the services of a qualified installation engineer to supervise all activities required to place the completed facility in stable operation under full digital control.

D. The instrumentation and control system shall be capable of simultaneously implementing all real-time control and information system functions, and servicing all operator service requests as specified, without degrading the data handling and processing capability of any system component.

E. Control system inputs and outputs are listed in the Input/Output Schedule. This information, together with the process and instrumentation diagrams, and electrical control schematics, describes the real-time monitoring and control functions to be performed.

F. The mechanical, process, and electrical drawings indicate the approximate locations of field instruments, control panels, systems and equipment as well as field-mounted equipment provided by others. The instrumentation subcontractor shall examine the mechanical, process and electrical drawings to determine actual size and locations of process connections and wiring requirements for instrumentation and controls furnished under this Contract. The instrumentation and controls subcontractor shall inspect all equipment, panels, instrumentation, controls and appurtenances either existing or furnished under other Divisions of the Specifications to determine all requirements to interface same with the control and information system. The Contractor shall coordinate the completion of any required modifications with the associated supplier of the item furnished.

G. The instrumentation and controls subcontractor shall review and approve the size and routing of all instrumentation and control cable and conduit systems furnished by the electrical subcontractor for suitability for use with the associated cable system.

H. The Contractor shall coordinate the efforts of each supplier to aid in interfacing all systems. This effort shall include, but shall not be limited to, the distribution of approved shop drawings to the electrical subcontractor and to the instrumentation and controls subcontractor furnishing the equipment under this Division.

I. The Contractor shall be responsible for providing a signal transmission system free from electrical interference that would be detrimental to the proper functioning of the instrumentation and control system equipment.

J. The Owner shall have the right of access to the instrumentation and controls subcontractor's facility and the facilities of its equipment suppliers to inspect materials and parts; witness inspections, tests and work in progress; and examine applicable design documents, records and certifications during any stage of design, fabrication and tests. The instrumentation subcontractor and its equipment suppliers shall furnish office space, supplies and services required for these surveillance activities.

K. The terms "Instrumentation", "Instrumentation and Control System", and "Instrumentation, Control and Information System" shall hereinafter be defined as all equipment, labor, services and documents necessary to meet the intent of the Specifications.

1.04 COORDINATION

A. Owner shall develop all system programming for the Division 17 furnished PLCs, RIOs, OIUs, and Owners existing SCADA system.

B. Owner shall attend preliminary and final coordination meetings as scheduled by the instrumentation and controls subcontractor.

C. Owner shall work closely with instrumentation and controls subcontractor to ensure PLC firmware versions are consistent with current JEA standards for programming development.

D. Owner shall deliver final programming to instrumentation and controls subcontractor a minimum of 2 weeks prior to instrumentation and controls subcontractor scheduled factory acceptance testing of the control panels and functional programming.

E. Instrumentation and controls subcontractor shall plan and lead two coordination meetings including the following entities; electrician, instrumentation supplier, control system integrator, control panel fabricator, Engineer, and the Owner. The purpose of the meetings is to fully understand the scope of work, sequencing of construction activities, and functional programming requirements of each facility.

F. A preliminary coordination meeting shall be scheduled during development of the construction schedule and prior to shop drawing submittals.

G. A final coordination meeting shall be scheduled a minimum of 2 weeks after final approved pump factory acceptance test curves have been supplied to the Engineer. Meeting shall also take place prior to final control panel and programming factory acceptance testing, to allow time for final revisions to the function programming.

1.05 INSTRUMENTATION AND CONTROL SYSTEM SUBCONTRACTORS

A. Instrumentation and control system subcontractors shall be regularly engaged in the detailed design, fabrication, installation, and startup of instrumentation and control systems for municipal water treatment facilities. Instrumentation and controls subcontractor shall have a minimum of five years of such experience, and shall have completed a minimum of three projects of similar type and size as that specified herein. Instrumentation and controls subcontractor shall have completed at least one project within the past five years that included the installation and programming of Siemens S400 Series PLCs, S200 Series RIOs and Trihedral VTSCADA HMI software for automated process controls. As used herein, the term “completed” shall mean that a project has been brought to final completion and final payment has been made.

B. Instrumentation Subcontractors shall be listed in the Water and Wastewater Approved Materials Section WWT-202: SCADA System Integration section; no substitutions:

C. The instrumentation and controls subcontractors staff shall meet the following requirements:

1. Programmers:

a. Lead Programmers shall be graduate engineers or computer science majors with a 4-year college degree.

b. Team programmers shall have a minimum of a 2-year associate degree in a field related to computers or electrical maintenance.

c. As a minimum, all programmers shall have a minimum of 5 years of experience in industrial PLC and HMI programming.

2. Field Service Technicians:

a. All service technicians shall have a minimum of a 2-year associates degree in a field related to computers or electrical maintenance.

b. All service technicians shall have a minimum of five years of experience in PLC systems and HMIs.

c. All service technicians shall be capable of programming minor edits in the project PLC's and uploading or downloading PLC applications.

d. All service technicians shall have experience troubleshooting: motor starters, PLC's, computers, HMI systems, and basic electrical controls.

e. Service technicians shall show proficiency in using the following equipment: volt meters, PLC programming software, HMI configuration tools.

1.06 DEFINITIONS

A. Solid State: Wherever the term solid state is used to describe circuitry or components in the Specifications, it is intended that the circuitry or components shall be of the type that convey electrons by means of solid materials such as crystals or that work on magnetic principles such as ferrite cores. Vacuum tubes, gas tubes, slide wires, mechanical relays, stepping motors or other devices will not be considered as satisfying the requirements for solid state components of circuitry.

B. Bit or Data Bit: Whenever the terms bit or data bit are used in the Specification, it is intended that one bit shall be equivalent to one binary digit of information. In specifying data transmission rate, the bit rate or data bit rate shall be the number of binary digits transmitted per second and shall not necessarily be equal to either the maximum pulse rate or average pulse rate.

C. Integrated Circuit: Integrated circuit shall mean the physical realization of a number of circuit elements inseparably associated on or within a continuous body to perform the function of a circuit.

D. Mean Time Between Failures (MTBF): The MTBF shall be calculated by taking the number of system operating hours logged during an arbitrary period of not less than six months and dividing by the number of failures experienced during this period plus one.

E. Mean Time to Repair (MTTR): The MTTR shall be calculated by taking the total system down time for repair over an arbitrary period of not less than six months coinciding with that used for calculation of MTBF and dividing by the number of failures causing down time during the period.

F. Availability: The availability of a non-redundant device or system shall be related to its MTBF and MTTR by the following formula:

A=100 x (MTBF/(MTBF + MTTR)) Percent

The availability of a device or system provided with an automatically switched backup device or system shall be determined by the following formula:

A=A2 + 1 ((1 A1) x (1 A1))

where:

A1=availability of non-redundant device or system

A2=availability of device or system provided with an automatically switched backup device or system

G. Abbreviations: Specification abbreviations include the following:

A	Availability
ADC	Analog to Digital Converter
AVAIL	Available
ATA	Advanced Technology Attachment
BCD	Binary Coded Decimal
CSMA/CD	Carrier Sense Multiple Access/Collision Detect
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CRT	Cathode Ray Tube
CS	Control Strategy
DAC	Digital to Analog Converter
DBMS	Data Base Management System
DDR	Double Data Rate
DIMM	Dual In-line Memory Module
DMA	Direct Memory Access
DPDT	Double Pole, Double Throw

DVD	Digital Video Disc
DVE	Digital to Video Electronics
ECC	Error Correction Coding
EPROM	Erasable Programmable Read Only Memory
FDM	Frequency Division Multiplexing
FSK	Frequency Shift Keyed
GB	Gigabyte
Gbps	Gigabits per second
HMI	Human Machine Interface
I/O	Input/Output
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MB	Megabyte
Mbps	Megabits per second
MCC	Motor Control Center
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
OS	Operating System
OIT	Operator Interface Terminal
PCB	Printed Circuit Board
PLC	Programmable Logic Controller
RAID	Redundant Array of Inexpensive Discs
PROM	Programmable Read Only Memory
RAM	Random Access Memory
RMSS	Root Mean Square Summation
ROM	Read Only Memory
RTU	Remote Telemetry Unit
SATA	Serial ATA

SCADA	Supervisory Control and Data Acquisition
SDRAM	Synchronous Dynamic Random-Access Memory
SIMM	Single In-line Memory Module
SPDT	Single Pole, Double Throw
TB	Terabyte
TDM	Time Division Multiplexing
TFT	Thin Film Transistor
USB	Universal Serial Bus
UPS	Uninterruptible Power Supply
WAN	Wide Area Network

H. To minimize the number of characters in words used in textual descriptions on displays, printouts and nameplates, abbreviations may be used subject to Engineer approval. If a specified abbreviation does not exist for a particular word, an abbreviation may be generated using the principles of masking and or vowel deletion. Masking involves retaining the first and last letters in a word and deleting one or more characters (usually vowels) from the interior of the word.

1.07 ENVIRONMENTAL CONDITIONS

A. Instrumentation equipment and enclosures shall be suitable for ambient conditions specified. All system elements shall operate properly in the presence of telephone lines, power lines, and electrical equipment.

B. Inside control rooms and climate-controlled electrical rooms, the temperature will normally be 20 to 25 degrees Celsius; relative humidity 40 to 80 percent without condensation and the air will be essentially free of corrosive contaminants and moisture. Appropriate air filtering shall be provided to meet environmental conditions (i.e., for dust).

C. Other indoor areas may not be air conditioned/heated; temperatures may range between 0 and 40 degrees Celsius with relative humidity between 40 and 95 percent.

D. Outdoor equipment including instrumentation and panels may be subjected to wind, rain, lightning, and corrosives in the environment, with ambient temperatures from 0 to 48 degrees Celsius and relative humidity from 10 to 100 percent. All supports, brackets and interconnecting hardware shall be aluminum or Type 316 stainless steel as shown on the installation detail drawings.

PART 2 – PRODUCTS

2.01 NAMEPLATES

A. All items of equipment listed in the instrument schedule, control panels, and all items of digital hardware shall be identified with nameplates. Each nameplate shall be located so that it is readable from the normal observation position and is clearly associated with the device or devices it identifies. Nameplates shall be positioned so that removal of the device for maintenance and repair shall not disturb the nameplate. Nameplates shall include the equipment identification number and description. Abbreviations of the description shall be subject to Engineer approval.

B. Nameplates shall be made of 1/16-inch thick machine engraved laminated phenolic plastic having white numbers and letters not less than 3/16-inch high on a black background.

C. Nameplates shall be attached to metal equipment by stainless steel screws and to other surfaces by an epoxy-based adhesive that is resistant to oil and moisture. In cases where the label cannot be attached by the above methods, it shall be drilled and attached to the associated device by means of stainless steel wire.

PART 3 – EXECUTION

3.01 SCHEDULE OF PAYMENT

A. Payment to the Contractor for Control and Information System materials, equipment, and labor shall be in accordance with the General and Supplementary Conditions. The schedule of values submitted as required by the General and Supplementary Conditions shall reflect a breakdown of the work required for completion of the Control and Information System. The breakdown shall include sufficient detail to permit the Engineer to administer payment for the Control and Information System as outlined below.

B. The following payment schedule defines project milestones that will be used for establishing maximum partial payment amounts for the Control and Information System. Payment for field instruments, field wiring, fiber optic network cable and similar items will be made in addition to the payment for the scopes of services incorporated into the schedule below.

Task Completed	**Maximum Cumulative % Request for Payment**
Mobilization	3%

Approved Submittals	20%
Hardware Purchase (excludes field instruments)	40%
Loop Checkout	60%
Control System Start-up and Test	80%
Plant Start-up	90%
Final System Acceptance Test	95%
Final Acceptance	100%

C. Requests for payment for materials and equipment that are not installed on site, but are required for shop fabrication and testing (e.g., PLC hardware), or are properly stored as described in the Contract Documents and herein, shall be accompanied by invoices from the original supplier to the Contractor or instrumentation and controls subcontractor substantiating the cost of the materials or equipment.

3.02 CLEANING

A. The Contractor shall thoroughly clean all soiled surfaces of installed equipment and materials.

B. Upon completion of the instrumentation and control work, the Contractor shall remove all surplus materials, rubbish, and debris that has accumulated during the construction work. The entire area shall be left neat, clean, and acceptable to the Owner.

3.03 FINAL ACCEPTANCE

A. Final acceptance of the Instrumentation, Control and Information System will be determined as complete by the Engineer, and shall be based upon the following:

1. Receipt and acceptance of all process area control panels and control room start up completion reports, control panel test reports, and other documentation as required by the Contract Documents.

2. Completion of the Final Acceptance Test (FAT). Final sign off of the FAT shall include endorsement of test results from Owner.

3. Completion of all punch-list items that are significant in the opinion of the Engineer.

4. Completion of all specified control system training requirements.

B. Final acceptance of the Control and Information System in its entirety shall be required to achieve Substantial Completion. Substantial Completion establishes the commencement date of the warranty period and all warranty period services.

C. All equipment in service, operational and in use by the Owner prior to the commencement of the one (1) year warranty period shall be warranted and maintained by the Contractor at no additional cost to the Owner.

D. Refer to the Section entitled “Project Closeout” for additional requirements.

- - - END OF SECTION - - -

SECTION 17030 - CONTROL AND INFORMATION SYSTEM SUBMITTALS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall submit for review complete Shop Drawings for all equipment in accordance with the General Conditions and Division 1 of the Specifications. All submittal material shall be complete, legible, and reproducible, and shall apply specifically to this project.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 – Submittals

B. Section 17000 – Control and Information System Scope and General Requirements

1.03 DIGITAL HARDWARE SUBMITTALS

A. Submit system block diagram(s) showing:

1. All equipment to be provided.
2. All interconnecting cable.
3. Equipment names, manufacturer, and model numbers.
4. Equipment locations.

B. Submit information for all digital equipment including, but not limited to, the following:

1. Bill of materials with equipment names, manufacturers, complete model numbers and locations.
2. Catalog cuts, including complete part number breakdown information.
3. Complete technical, material and environmental specifications.
4. Assembly drawings.
5. Mounting requirements.
6. Color samples.
7. Nameplates.

8. Environmental requirements during storage and operation.

1.04 CONTROL PANEL SUBMITTALS

A. Submittals shall be provided for all control panels, and shall include:

1. Exterior panel drawings with front and side views, to scale.

2. Interior layout drawings showing the locations and sizes of all equipment and wiring mounted within the cabinet, to scale.

3. Panel area reserved for cable access and conduit entry.

4. Location plans showing each panel in its assigned location.

B. Submit information for all exterior and interior panel mounted equipment including, but not limited to, the following:

1. Bill of materials with equipment names, manufacturers, complete model numbers and locations.

2. Catalog cuts, including complete part number breakdown information.

3. Complete technical, material and environmental specifications.

4. Assembly drawings.

5. Mounting requirements.

6. Color samples.

7. Nameplates.

8. Environmental requirements during storage and operation.

C. Submit panel wiring diagrams showing power, signal, and control wiring, including surge protection, relays, courtesy receptacles, lighting, wire size and color coding, etc.

1.05 INSTRUMENT SUBMITTALS

A. Submit information on all field instruments, including but not limited to the following:

1. Product (item) name and tag number used herein and on the Contract Drawings.

2. Catalog cuts, including complete part number breakdown information.

3. Manufacturer's complete model number.

4. Location of the device.

5. Input - output characteristics.

6. Range, size, and graduations.

7. Physical size with dimensions, NEMA enclosure classification and mounting details.

8. Materials of construction of all enclosures, wetted parts and major components.

9. Instrument or control device sizing calculations where applicable.

10. Certified calibration data on all flow metering devices.

11. Environmental requirements during storage and operation.

12. Associated surge protection devices.

B. Where multiple instruments are included in the same submittal, instrument data sheets shall be included in the same binder section as the backup information (cut sheets, etc.).

1.06 WIRING AND LOOP DIAGRAMS

A. Submit interconnection wiring and loop diagrams for all panels and signals in the Control and Information System.

B. Electrical interconnection diagrams shall show all terminations of equipment, including terminations to equipment and controls furnished under other Divisions, complete with equipment and cable designations. Where applicable, interconnection wiring diagrams shall be organized by input/output card. Interconnecting diagrams shall be prepared in a neat and legible manner on 11 X 17-inch reproducible prints.

C. Loop drawings shall conform to the latest version of ISA Standards and Recommended Practices for Instrumentation and Control. Loop Drawings shall conform to ISA S5.4, Figures 1-3, Minimum Required Items.

D. Loop drawings shall not be required as a separate document provided that the interconnecting wiring diagrams required in Paragraph B., above, contain all information required by ISA 5.4.

1.07 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall deliver equipment operation and maintenance manuals in compliance with Section 01300 - Submittals. Operation and maintenance (O&M) manuals shall consist of two basic parts:

1. Manufacturer standard O&M manuals for all equipment and software furnished under this Division.

2. Custom O&M information describing the specific configuration of equipment and the operation and maintenance requirements for this particular project.

B. The manuals shall contain all illustrations, detailed drawings, wiring diagrams, and instructions necessary for installing, operating, and maintaining the equipment. The illustrated parts shall be numbered for identification. All modifications to manufacturer standard equipment and/or components shall be clearly identified and shown on the drawings and schematics. All information contained therein shall apply specifically to the equipment furnished and shall only include instructions that are applicable. All such illustrations shall be incorporated within the printing of the page to form a durable and permanent reference book.

C. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment. The maintenance instructions shall include troubleshooting data and full preventive maintenance schedules. The instructions shall be bound in locking 3-D-ring binders with bindings no larger than 3.5 inches. The manuals shall include 15% spare space for the addition of future material. The instructions shall include drawings reduced or folded and shall provide the following as a minimum.

1. A comprehensive index.

2. A functional description of the entire system, with references to drawings and instructions.

3. A complete "as-built" set of all approved shop drawings, which shall reflect all work required to achieve final system acceptance.

4. A complete list of the equipment supplied, including serial numbers, ranges, and pertinent data.

5. Full specifications on each item.

6. Detailed service, maintenance, and operation instructions for each item supplied.

7. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.

8. Complete parts lists with stock numbers and name, address, and telephone number of the local supplier.

9. References to manufacturers' standard literature where applicable.

10. Warning notes shall be located throughout the manual where such notes are required to prevent accidents or inadvertent misuse of equipment.

D. The maintenance instructions shall describe the detailed preventive and corrective procedures required, including environmental requirements during equipment storage and system operation, to keep the System in good operating condition. All hardware maintenance documentation shall make reference to appropriate diagnostics, where applicable, and all necessary wiring diagrams, component drawings and PCB schematic drawings shall be included.

E. The hardware maintenance documentation shall include, as a minimum, the following information:

1. Operation Information - This information shall include a detailed description of how the equipment operates and a block diagram illustrating each major assembly in the equipment.

2. Preventive-Maintenance Instructions - These instructions shall include all applicable visual examinations, hardware testing and diagnostic routines, and the adjustments necessary for periodic preventive maintenance of the System.

3. Corrective-Maintenance Instructions - These instructions shall include guides for locating malfunctions down to the card-replacement level. These guides shall include adequate details for quickly and efficiently locating the cause of an equipment malfunction and shall state the probable source(s) of trouble, the symptoms, probable cause, and instructions for remedying the malfunction.

4. Parts Information - This information shall include the identification of each replaceable or field-repairable component. All parts shall be identified on a list in a drawing; the identification shall be of a level of detail sufficient for procuring any repairable or replaceable part. Cross-references between equipment numbers and manufacturer's part numbers shall be provided.

1.09 FINAL SYSTEM DOCUMENTATION

A. All documentation shall be delivered to the Owner prior to final system acceptance in accordance with the Contract Documents. As a minimum, final documentation shall contain all information originally part of the control system submittals.

B. If any documentation or other technical information submitted is considered proprietary, such information shall be designated. Documentation or technical information which is designated as being proprietary will be used only for the construction, operation, or maintenance of the System and, to the extent permitted by law, will not be published or otherwise disclosed.

C. Provide a complete set of detailed electrical interconnection diagrams required to define the complete instrumentation and control system. All diagrams shall be 11 X 17-inch

original reproducible prints. All diagrams shall be corrected so as to describe final "as-built" hardware configurations and to reflect the system configuration and control methodology adopted to achieve final system acceptance.

D. The Owner recognizes the fact that not all possible problems related to real-time events and hardware maintenance and utilization can be discovered during the Acceptance Tests. Therefore, the instrumentation subcontractor through the Contractor shall investigate, diagnose, repair, update, and distribute all pertaining documentation of the deficiencies that become evident during the warranty period. All such documentation shall be submitted in writing to the Owner within 30 days of identifying and solving the problem.

1.10 SUBMITTAL/DOCUMENTATION FORMAT

A. All drawing-type submittals and documentation shall be rendered and submitted in the latest version of AutoCAD.

B. All textual-type submittals and documentation shall be rendered and submitted in the latest version of Searchable Adobe Portable Document Format (.pdf).

1.11 ELECTRONIC O&M MANUALS

A. Subject to acceptance by the Owner and Engineer, the O&M information may be submitted in part or in whole in an electronic format on optical media.

B. Electronic O&M manuals shall contain information in Searchable Adobe PDF for documents and AutoCAD for drawings and shall be easily accessible through the use of standard, “off-the-shelf” software.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 17040 - CONTROL AND INFORMATION SYSTEM TRAINING REQUIREMENTS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. To familiarize the Owner's personnel with the process control system and field instrumentation, training shall be provided as detailed hereunder.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

1.03 SUBMITTALS

A. A minimum of 60 days prior to beginning training, submit a detailed training plan describing the following:

1. A listing of all courses to be conducted.

2. Course content.

3. Applicability of each course to management, operations, maintenance, laboratory, etc., personnel.

4. Course schedules.

5. Qualifications and experience of individual(s) providing training.

B. A minimum of 14 days prior to beginning each training course, submit documentation for use by the Owner's personnel during training. The training documentation shall be specific to the particular course, and shall include the following:

1. A listing of all subjects to be covered.

2. Course schedule.

3. Documentation/lesson plans covering all subjects to be covered during the course instruction. Information shall be in a "how to" format, with sufficient background documentation and references to manufacturer literature to provide a thorough and clear understanding of the materials to be covered.

1.04 GENERAL REQUIREMENTS

A. All costs of providing the training courses shall be borne by the Contractor.

B. As used herein, the term "day" shall mean an eight-hour day, and the term "week" shall mean a five-day, 40-hour week.

C. Training courses, especially those for operator training, may be required to be scheduled during non-standard business hours (i.e., not between the hours of 8:00 am and 5:00 pm) to accommodate the working schedule of the Owner's personnel. No additional compensation will be awarded to the Contractor for training at non-standard hours.

D. All training courses shall complement the experience and skill levels of the Owner's personnel.

E. Training courses shall be structured in order of increasing capability or security levels. The purpose of this requirement is to allow personnel with lesser training requirements or security password levels to drop out of the training at certain times while the training continues for personnel with greater requirements or higher security levels.

F. All training courses shall include lecture as well as "hands on" experience for each of the attending personnel. The Contractor shall provide sufficient equipment for this to be accomplished. For example, training in which the instructor uses the computer and the Owner's personnel passively observe as the instructor demonstrates system functions shall not be acceptable.

G. Unless otherwise specified, all training courses shall be conducted in the Owner's facilities.

H. All training shall be completed prior to system acceptance.

I. Standard manufacturer training courses are acceptable pending approval by the Engineer and Owner.

1.05 OPERATOR TRAINING

A. Two 8-hour courses for up to six persons each shall be conducted to provide instruction in the use of the Control and Information System to monitor and control the Transfer Pumps and associated systems installed under this contract.

B. Operator training shall include familiarization training covering the Control and Information System. Operators shall be instructed in the names, locations, functions, and basic operation of all items of digital equipment and associated software.

C. Operator training shall cover process and equipment operation both individually and collectively as an operating system. Normal as well as abnormal operating conditions shall be covered, including the response to failure occurrences and system alarms. All operator/system interactions shall be described.

D. Operators shall be trained to instruct other operators and shall be provided with all course materials.

1.06 MAINTENANCE TRAINING

A. A 8-hour course shall be conducted for at least six persons prior to the start-up of digital equipment at the Owner's plant. Instruction shall be provided in the following:

1. Operating all digital equipment, including system start-up and shutdown procedures.

2. The use of hardware diagnostic routines, test equipment and test procedures as required to enable the Owner's personnel to detect and isolate system faults to the circuit board or module level and to implement repairs by replacing failed circuit boards or modules.

3. Calibration and routine maintenance procedures for all analog and digital equipment.

B. Step by step written procedures shall be provided for all preventive maintenance tasks and for identifying hardware faults to the circuit board or module level for all items of digital equipment.

C. All digital equipment preventive and corrective maintenance training activities shall be limited to the use of commercially available off-the-shelf test equipment and to the use of diagnostic routines and hardware items which are the same as those to be provided as part of the system.

1.07 INSTRUMENT TRAINING

A. One 8-hour course shall be provided at the Owner's facilities no more than three months prior to system start-up to instruct a minimum of five persons each in the calibration and preventive maintenance of the field instruments provided under this Contract.

B. Training shall include a demonstration of the radar level transmitters Bluetooth wireless mobile phone application.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 17050 - TOOLS, SUPPLIES AND SPARE PARTS - GENERAL

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide tools, supplies, and spare parts as specified herein for the operation and maintenance of the Control and Information System.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Submittals

B. Control and Information System, General

PART 2 – PRODUCTS

2.01 TOOLS

A. Provide any product specific tools required to test, diagnose, calibrate, install, wire, connect, disconnect, assemble and disassemble any digital equipment, instrument, panel, rack, cabinet or console mounted equipment for service and maintenance. This shall include, but not be limited to, the following: connector pin insertion and removal tools, wire crimping tools, special wrenches, special instrument calibrators, indicator lamp insertion and removal tools, etc.

B. Provide tools and test equipment together with items such as instruction manuals, carrying/storage cases, unit battery charger where applicable, special tools, calibration fixtures, cord extenders, patch cords and test leads, which are not specified but are necessary for checking field operation of equipment supplied under this Division.

C. The Contractor shall provide supplies as specifically required in other Sections of Division 17.

2.02 SPARE PARTS

A. Provide spare parts for items of control and instrumentation equipment as recommended by the manufacturer and in accordance with the Contract Documents.

B. Furnish all spares in moisture proof boxes designed to provide ample protection for their contents. Label all boxes to clearly identify contents and purpose.

C. The Contractor shall replace all spare parts consumed during installation, testing, start-up, the system availability demonstration, and the guarantee period.

D. Refer to individual digital hardware and instrument sections for additional requirements specific to those devices.

PART 3 – EXECUTION (NOT USED)

- - END OF SECTION - -

SECTION 17060 - SIGNAL COORDINATION REQUIREMENTS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall conform to the signal coordination requirements specified herein.

B. The Contractor shall be responsible for coordinating signal types and transmission requirements between the various parties providing equipment under this Contract. This shall include, but not be limited to, distribution of appropriate shop drawings among the equipment suppliers, the electrical subcontractor, and the instrumentation and controls subcontractor.

C. In this Section the term “PLC” includes both programmable logic controller (PLC) and remote Input/Output (RIO) units.

D. Analog signals shall be signals for transmitting process variables, etc. from instruments and to and from panels, equipment PLC's and Control System PLC's.

E. Discrete signals shall consist of contact closures or powered signals for transmitting status/alarm information and control commands between starters, panels, equipment PLC's, the Control System, etc.

1.02 ANALOG SIGNAL TRANSMISSION

A. Signal transmission between electric or electronic instruments, controllers, and all equipment and control devices shall be individually isolated, linear 4-20 milliamperes and shall operate at 24 volts D.C.

B. Signal output from all transmitters and controllers shall be current regulated and shall not be affected by changes in load resistance within the unit's rating.

C. All cable shields shall be grounded at one end only, at the control panel, with terminals bonded to the panel ground bus.

D. Analog signal isolation and/or conversion shall be provided where necessary to interface with instrumentation, equipment controls, panels, and appurtenances.

E. Non-standard transmission systems such as pulse duration, pulse rate, and voltage regulated shall not be permitted except where specifically noted in the Contract Documents. Where transmitters with nonstandard outputs do occur, their outputs shall be converted to an isolated, linear, 4-20 milliampere signal.

F. The Contractor shall provide 24 V power supplies for analog signals and instruments where applicable and as required inside panels, controls, etc.

G. Where two-wire instruments transmit directly to the Control and Information System, the instrumentation subcontractor shall provide power supplies at the PLC-equipped control panels for those instruments.

H. Where four-wire instruments with on-board loop power supplies transmit directly to the Control and Information System, the instrumentation subcontractor shall provide necessary signal isolators or shall otherwise isolate the input from the Control and Information System loop power supply. Similar provisions shall be made when a third element such as a recorder, indicator, or single loop controller with integral loop power supply is included in the loop.

1.03 DISCRETE INPUTS

A. All discrete inputs to equipment and Control and Information System PLC's, from field devices, starters, panels, etc., shall be unpowered (dry) contacts in the field device or equipment, powered from the PLC's, unless specified otherwise.

B. Sensing power (wetting voltage) supplied by the PLC shall be 24 VDC.

1.04 DISCRETE OUTPUTS

A. All discrete outputs from local control panels and Control and Information System PLC's to field devices, starters, panels, etc., shall be 24 VDC powered (sourced) from PLC's.

B. PLC powered discrete outputs shall energize 24 VDC pilot relay coils in the field devices, starters, panels, etc. which in turn open or close contacts in the associated control circuit. The 24 VDC relay coil, contacts, and associated control circuitry shall be furnished integral with the field device, starter, panel, etc. by the supplier and contractor furnishing the field device, starter, or panel.

C. Where required or specified herein, discrete outputs from equipment and Control and Information System PLC's to field devices, starters, panels, motor operated valves, etc., shall be dry contact or relay outputs.

D. Outputs to solenoid valves shall be 120 VAC, powered from the PLC or control panel unless specified or shown otherwise.

1.05 OTHER DISCRETE SIGNALS

A. Discrete signals between starters, panels, etc. where no 24 VDC power supply is available may be 120 VAC, as long as such contacts are clearly identified in the starter, panel, etc. as being powered from a different power supply than other starter/panel components.

B. Where applicable, warning signs shall be affixed inside the starter, panel, etc. stating that the panel is energized from multiple sources.

C. Output contacts in the starter, panel, etc., that are powered from other locations shall be provided with special tags and/or color-coding. Disconnecting terminal strips shall be provided for such contacts.

D. The above requirements shall apply to all starters and panels, regardless of supplier.

PART 2 -- PRODUCTS

2.01 PILOT RELAYS

A. Pilot relays shall be supplied with the following:

1. 24 VDC or 120 VAC coils, as required.

2. At a minimum, DPDT contacts rated at 5 A, 120 VAC or 28 VDC.

3. Sockets for 24 VDC and 120 VAC relays shall be of different configurations.

4. Clips for attachment to sockets.

5. Indicator lights that glow when the relay coil is powered.

B. Pilot relays shall be as manufactured by Square D, Allen Bradley, Potter & Brumfield, or equal.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 17070 - CONTROL AND INFORMATION SYSTEM TESTING - GENERAL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall test the Control and Information System as specified herein to demonstrate compliance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17072 – Field Testing

C. Section 17073 – Final Acceptance Test

1.03 SUBMITTALS

A. For each of the specified tests, submit a test plan to the Engineer at least one month in advance of commencement of the tests. The test plan shall contain the following at a minimum:

1. A schedule of all testing to be conducted.

2. A brief description of the testing to be performed

3. Test objectives.

4. Testing criteria per the Specifications.

5. Check lists and procedures for performing each of the specified tests.

6. Sample test result documentation.

7. Requirements for other parties.

1.04 GENERAL REQUIREMENTS

A. All system start-up and test activities shall follow detailed test procedures; check lists, etc., previously approved by the Engineer. The Engineer shall be notified at least 30 days in advance of any system tests and reserves the right to have his and/or the Owner's representatives in attendance.

B. The Contractor shall provide the services of experienced factory trained technicians, tools and equipment to field calibrate, test, inspect, and adjust all equipment in accordance with manufacturer's specifications and instructions.

C. The Contractor (or designee) shall maintain master logbooks for each phase of installation, startup and testing activities specified herein. Each logbook shall include signal, loop or control strategy tag number, equipment identification, description and space for sign-off dates, Contractor signature and Engineer signature. Example test documentation specific to each phase of testing shall be approved prior to initiation of that testing, as specified hereinabove.

D. All test data shall be recorded on test forms, previously approved by the Engineer. When each test has been successfully completed, a certified copy of all test results shall be furnished to the Engineer together with a clear and unequivocal statement that all specified test requirements have been met and that the system is operating in accordance with the Contract Documents.

E. The Engineer will review test documentation in accordance with the Contract Documents and will give written notice of the acceptability of the tests within 10 days of receipt of the test results.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 17071 - FACTORY ACCEPTANCE TEST (FAT)

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall perform a Factory Acceptance Test (FAT) on the Control and Information System as specified herein to demonstrate compliance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17070 – Control and Information System Testing, General

C. Section 17072 – Field Testing

D. Section 17073 – Final Acceptance Test

1.03 FACTORY ACCEPTANCE TEST

A. The Control and Information System equipment shall not be shipped until the Contractor receives notice of acceptability of the factory tests.

B. Each item of equipment shall be fully factory inspected, calibrated and tested for function, operation and continuity of circuits. Exceptions shall be approved in writing by the Engineer.

C. Each subsystem shall be fully factory tested for function and operation.

D. System performance shall be tested using a fully integrated system, including all software and hardware. To achieve this, the entire control system, including all peripheral devices and all interconnecting cables (field instruments are not included in this requirement), shall be assembled on the factory test floor and the complete operational program loaded and simulated inputs applied.

E. All hardware and software required to perform the specified testing shall be furnished by the Contractor at no additional cost to the Owner.

F. The overall system as well as individual component hardware shall be tested under conditions of power failure to ensure proper response as specified herein.

G. The Contractor shall be responsible for coordinating the FAT of the proposed control system with all involved parties including Owner, Engineer, instrumentation and controls subcontractor and other equipment vendors as applicable.

H. OIU graphics and PLC Logic shall be furnished by Owner. A basic PLC program (no control strategies) shall be furnished by the instrumentation and controls subcontractor for demonstrating PLC and RIO I/O operation. The test program shall PLC be loaded into the PLC-1 and tested prior to the Factory Acceptance Test. Basic OIU graphic screens for PLC and RIO I/O and network communication demonstration purposes shall be furnished by instrumentation and controls subcontractor. The test graphic screens shall be loaded intro OIU-PLC-1 and the OIU-LCP-1 and tested by the instrumentation and controls subcontractor prior to performing the FAT.

I. The instrumentation and controls subcontractor shall provide detailed FAT protocol documents prior to the commencement of FAT. FAT protocol documents shall include test plan, schedule, and document to record punch list items.

J. FAT testing shall include all equipment and control panels fabricated in accordance with the project requirements.

K. Protocol documents for testing equipment and functionality shall include but not be limited to:

1. All pumping system control equipment

2. All sodium hypochlorite system control equipment

3. PLC interface with other systems

4. Communication equipment configuration and operation.

5. OIU graphic displays

6. All generator control system equipment

1.04 NOTED RESTRICTIONS

A. The factory test shall not begin until all related control system and shop drawings have been submitted and approved.

B. All systems, panels, and equipment required for factory acceptance testing are specified in this section.

1.05 QUALITY CONTROL

A. Instrumentation and controls subcontractor shall generate the FAT protocol document.

B. The FAT protocol shall be submitted and approved by the ENGINEER in accordance with the requirements described in this Section and in Section 17070.

C. The Integrator shall certify to the ENGINEER that the entire control system is ready for testing prior to the initiation of the FAT.

D. The factory test shall be declared a failure and a retest shall be required if any of the following were to occur:

1. Failure to meet the requirements of the operational testing of the system as specified in this Section.

2. Failure to meet the acceptance criteria as established in the approved Factory Acceptance Test Procedures.

1.06 STAFFING REQUIREMENTS

A. The CSI shall provide the following minimum staffing available during the FAT:

1. Control Systems Integrator – Project Manager or Lead Engineer/Programmer 2.
2. PLC/HMI Programmer

1.07 FAT SUBMITTALS

A. The control system integrator shall submit Factory Acceptance Test (FAT) Protocols for each item listed in paragraph 1.03K of this document.

B. The approved testing protocols shall be used for recording the test results during the FAT.

C. The Factory Acceptance Test protocol documents shall include but not necessarily be limited to the following:

1. Overall scope of testing and acceptance criteria for:

a. Control Panels

i. Visual inspection, dimension, access for maintenance

ii. Bill of material verification

iii. Manufacturer’s documentation

iv. Recommended spare parts list and spares

v. Tagging of components

vi. Warning labels, if applicable

b. Wiring

i. Visual inspection for cable entry, routing, support

ii. Termination,

iii. Segregation by voltages/type

c. Review of vendor's reports of tests and checks, if applicable

d. Software Licenses and Version including firmware

e. Discrete I/O

f. Analog I/O

g. Hard-wired Interlocks

h. Alarms

i. Graphics – Operator interface unit (OIU) capability

j. Tag numbers and database

k. Communication equipment and configuration

l. Communication performance

m. Control system Interface with other systems

n. Non-standard operating conditions

i. Loss of power for each component

ii. Communications failure

iii. Removal of each PLC card

iv. PLC failure

2. FAT Schedule

a. The instrumentation and controls subcontractor and Owner shall mutually agree upon the test schedule based on project schedule and when the system should be delivered to the site.

b. The Engineer and Owner shall be present for the FAT. A minimum of 2 weeks' notice shall be provided to allow them to attend.

c. The instrumentation and controls subcontractor shall include a minimum of five working days in the schedule for FAT.

3. FAT Punch List

a. Any incomplete work or non-conformances detected during FAT shall be recorded on FAT punch list. Punch list items shall be categorized as follows:

i. Immediate: FAT shall be paused for rectification and FAT shall continue after rectification.

ii. On-going: Rectification during FAT and will be completely rectified at the end of FAT. This category is used typically for multiple instances of the same issue which will be rectified during FAT as the issues are encountered.

iii. Repeat: FAT should be repeated after rectification and before completion of FAT.

iv. Before Ship: Issue to be rectified after FAT but before item is shipped to site. Re-test, if required should be documented and conducted during SAT.

v. At Site: Remaining work to be rectified after shipment. Re-test.If required to be conducted during SAT.

vi. Future: Issues that are beyond the scope of the project but something that should be addressed in the future.

4. FAT punch list at a minimum shall include:

a. Reference to applicable FAT test plan requirement

b. Description of the issue

c. Person responsible for resolution

d. Description of the resolution and date completed

5. Corrections and retest

a. Any changes made during FAT that may affect previously completed tests require that those tests be re-performed and documented.

6. Correction after FAT

a. All problem corrections and subsequent recheck should be executed during the FAT. If this is not possible then rectification can be undertaken after the FAT, if mutually agreed to by the Owner and Contractor.

b. Problem correction after the FAT should include the following

:

i. Identification of re-work needed

ii. Action plan/time schedule

iii. Person responsible for completing task

iv. Execution of re-work

v. Re-test of anything affected by the re-work. Need for Owner witness of re-test to be agreed upon with Contractor

vi. Notification of completion

vii. Acceptance of re-check

7. Documentation of FAT

a. FAT report including:

i. Attendees

ii. Tests performed

iii. Open issues and agreements for their resolution

iv. Owner approval to ship or other disposition of the system

b. FAT documentation including:

i. Signed copies of test function plans

ii. Date and sign all documents generated during FAT

iii. FAT punch list with status of each item

iv. Document the actual hardware and software (including versions) tested

v. Document all configurable parameters used for testing

vi. Backup copies of the final complete system and software

vii. Color copies of all applicable graphic displays

viii. Update of all system related documentation to reflect the FAT complete status of the system

D. The instrumentation and controls subcontractor shall submit completed and signed FAT report and documentation to the Engineer within 5 days of completion of the FAT. The protocols, reports and documentation shall be submitted electronically in PDF format.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

3.01 CONTROL SYSTEM TESTING

A. Operator Interface Unit (OIU) Operation - This demonstration shall provide proof of system operation on an individual subsystem basis first, and then in the expected operating environment. Both normal and abnormal operating modes shall be demonstrated. OIU testing shall include the following:

1. Demonstrate proper operation, under both normal and abnormal conditions of the OIU application software. This shall include demonstration of system on-line diagnostics, fail-over features, reconfiguration operations, system initialization and restart, software fault tolerance, error detection and recovery, communications, and all additional features necessary to assure the successful operation of the system.

2. Demonstrate the standard features of the system. This shall include proof of operation of the process control database generator, the display generator, data storage and retrieval functions, data acquisition and control.

3. Demonstrate the configuration of the system to verify conformance with the Contract Documents. This shall include graphic displays and vectoring, operator interface functions, alarm management, user account configuration, etc.

4. The system shall be operated with data input/output with the PLC’s and RIO’s and associated panels to prove operation of all OIU functions.

5. The testing in Items 2 and 3 above may be performed concurrently (i.e., the standard and configured features of the system may be demonstrated simultaneously).

B. PLC and RIO Operation - All functions comparable to those demonstrated for the operator workstations shall be demonstrated on the PLC's and RIO’s. This shall include the following:

1. On-line and off-line diagnostics.

2. System initialization and restart.

3. Network communications, including Ethernet and Profinet communications where required.

4. Non-volatility of memory.

C. Process I/O Simulation - Process input/output simulation for PLC's shall be performed with a manual simulation control panel, a separate programmable logic controller, network-based simulation software, analog signal generators, and/or jumpering of discrete signals between outputs and associated inputs, or some combination of these. Alternate process I/O systems such as plug-in circuit cards or I/O test modules may be utilized subject to approval by the Engineer to provide the specified simulation functions. The simulation system shall provide analog and discrete I/O hardware devices in sufficient quantity to allow complete and thorough testing of the control strategies and functions of the system. The process I/O simulation system shall be used in several ways as follows:

1. To provide a means of communications checkout from the OIU through the various levels of software in the PLC's and to the process. Likewise, a discrete or analog input shall be initiated and the result monitored at the OIU.

2. Alarm response to discrete status changes or analog value limits shall be verified. Database entries or attributes such as engineering units and conversion equations shall be verified by varying analog inputs.

3. To provide data for use at all levels of the control system at the time of system integration.

- END OF SECTION -

SECTION 17072 - FIELD TESTING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall perform field testing on the Control and Information System as specified herein to demonstrate compliance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17070 – Control and Information System Testing, General

C. Section 17073 – Final Acceptance Test

1.03 GENERAL REQUIREMENTS

A. Control system start-up and testing shall be performed to ensure that all plant processes shall be systematically and safely placed under digital control in the following order:

1. Primary elements such as transmitters and switch devices shall be calibrated and tested as specified in Sections 17600, 17700, and 17800.

2. Each final control element shall be individually tested as specified hereinafter.

3. Each control loop shall be tested as specified hereinafter.

4. Each of the Owner Furnished PLC control strategies shall be tested under automatic digital control in coordiantion with the Owner.

5. The entire control system shall be tested for overall monitoring, control, communication, and information management functions, and demonstrated for system availability as specified hereinafter.

B. System start-up and test activities shall include the use of water, if necessary, to establish service conditions that simulate, to the greatest extent possible, normal operating conditions in terms of applied process loads, operating ranges and environmental conditions.

C. Each phase of testing shall be fully and successfully completed, and all associated documentation submitted and approved prior to the next phase being started. Specific exceptions are allowed if written approval has been obtained in advance from the Engineer.

1.04 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall ensure that all mechanical equipment, equipment control panels, local control panels, field instrumentation, control system equipment and related equipment and/or systems are tested for proper installation, adjusted and calibrated on a loop-by-loop basis prior to control system startup to verify that each is ready to function as specified. Each test shall be witnessed, dated and signed off by both the Contractor (or designee) and the Engineer upon satisfactory completion.

B. The Contractor shall be responsible for coordination of meetings with all affected trades. A meeting shall be held each morning to review the day's test schedule with all affected trades. Similarly, a meeting shall be held each evening to review the day's test results and to review or revise the next day's test schedule as appropriate.

C. The Contractor shall ensure that the electrical subcontractor conforms to the start-up, test and sign-off procedures specified herein to assure proper function and coordination of all motor control center control and interlock circuitry and the transmission of all discrete and/or analog signals between equipment furnished by the electrical subcontractor and the control system specified herein.

1.05 FINAL CONTROL ELEMENT TESTING

A. The proper control of all final control elements shall be verified by tests conducted in accordance with the requirements specified herein.

B. All modulating final control elements shall be tested for appropriate speed or position response by applying power and input demand signals and observing the equipment for proper direction and level of reaction. Each final control element shall be tested at 0, 25, 50, 75, and 100 percent of signal input level and the results checked against specified accuracy tolerances. Final control elements, such as VFD’s, that require turndown limits shall be initially set during this test.

C. All non-modulating final control elements shall be tested for appropriate position response by applying and simulating control signals and observing the equipment for proper reaction.

1.06 LOOP CHECKOUT

A. Prior to control system startup and testing, each monitoring and control loop shall be tested on an individual basis from the primary element to the final element, including the operator workstation or loop controller level, for continuity and for proper operation and calibration.

B. Signals from transducers, sensors, and transmitters shall be utilized to verify control responses. Simulated input data signals may be used subject to prior written approval by the Engineer. All modes of control shall be exercised and checked for proper operation.

C. The accuracy of all DAC's shall be verified by manually entering engineering unit data values at the operator workstation and then reading and recording the resulting analog output data.

D. The accuracy of all ADC's shall be verified using field inputs or by manually applying input signals at the final controller, and then reading and recording the resulting analog input data at the operator workstation.

E. Each loop tested shall be witnessed, dated and signed off by both the Contractor (or designee) and the Engineer upon satisfactory completion.

1.07 CONTROL SYSTEM STARTUP AND TESTING

A. Control system startup and testing shall be performed to demonstrate complete compliance with all specified functional and operational requirements. Testing activities shall include the simulation of both normal and abnormal operating conditions.

B. All digital hardware shall be fully inspected and tested for function, operation and continuity of circuits. All diagnostic programs shall be run to verify the proper operation of all digital equipment.

C. Final control elements and ancillary equipment shall be tested under start-up and steady-state operating conditions to verify that proper and stable control is achieved using local area control panels, motor control center circuits, and local field mounted control circuits. All hardwired control circuit interlocks and alarms shall be operational. The control to final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits.

D. Signals from transducers, sensors, and transmitters shall be utilized to verify control responses for final control elements. Simulated input data signals may be used subject to prior written approval by the Engineer.

E. Each Owner Furnished control strategy shall be tested in coordination with Owner to verify the proper operation of all required functions.

F. The control system start-up and test activities shall include running tests to prove that the Instrumentation, Control and Information System is capable of continuously, safely and reliably regulating processes, as required by the Contract, under service conditions that simulate, to the greatest extent possible, normal plant operating ranges and environmental conditions.

G. A witnessed functional acceptance test shall be performed to demonstrate satisfactory performance of individual monitoring and control loops and control strategies. At least one test shall be performed to verify that the control and instrumentation system is capable of simultaneously implementing all specified operations.

H. Each loop and control strategy test shall be witnessed and signed off by both the Contractor (or designee) and the Engineer upon satisfactory completion.

1.08 FACILITY STARTUP COORDINATION

A. Facility start-up shall comply with requirements specified in the Contract Documents and those requirements specified herein. Facility start-up shall commence after all previously described start-up and test activities have been successfully completed and shall demonstrate that the Instrumentation, Control and Information System can meet all Contract requirements with equipment operating over full operating ranges under actual operating conditions.

B. The control system start-up period shall be coordinated with process startup activities and shall be extended as required until all plant processes are fully operational and to satisfy the Engineer that all control system Contract requirements have been fulfilled in accordance with the Contract Documents.

C. The instrumentation subcontractor's personnel shall be resident at the facility to provide both full time (eight hours/day, five days/week) and 24 hours on call (seven days/week) support of operating and maintenance activities for the duration of the start-up period.

D. At least one qualified control systems technician shall be provided for control system startup and test activities (at least two when loop checkout is being performed).

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 17073 - FINAL ACCEPTANCE TEST

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall perform the Final Acceptance Test on the Control and Information System as specified herein to demonstrate compliance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17070 – Control and Information System Testing, General

C. Section 17072 – Field Testing

1.03 AVAILABILITY DEMONSTRATION AND FINAL SYSTEM ACCEPTANCE

A. Upon completion of all control system startup activities and prior to final system acceptance, the Contractor shall demonstrate that the availability of the entire control system, including operation under conditions of digital equipment fail-over, initiated either automatically or manually, shall be not less than 99.8 percent during a 30-day availability test period. The Owner shall be given two (2) weeks notice of the starting date of the 30-day availability test.

B. For purposes of determining availability figures, downtime of each system or portions of each system resulting from the causes specified hereunder will not be considered system failures.

1. Downtime of any network-connected device that is automatically backed-up upon failure shall not be considered a system failure provided that the downtime of the failed component does not exceed 24 hours.

2. Downtime of a PLC that is not automatically backed-up shall be considered a system failure if the downtime of the failed controller exceeds one (1) hour.

3. Downtime of a portion of the system resulting from failure of any field sensor shall not be considered a system failure provided that the system operates as specified under this condition.

4. Downtime of the following devices shall not be considered a system failure provided the failed device is repaired within the specified time:

    a. Operator Interface Units (24 hours)
    b. Programmable Logic Controllers (8 hours)
    c. Remote Input/Output units (8 hours)

d. Communication interfaces (eight hours)
e. Process control system networks (eight hours)
f. UPS unit (24 hours)

5. Total shutdown of a single PLC or RIO resulting from a software fault shall be considered a system failure.

6. An erroneous command to the process that can be specifically related to a software fault shall be considered as one (1) hour of downtime.

7. The inoperability of any subsystem resulting from a software fault shall be considered a system failure.

8. The failure of the same component more than one time during the 30-day test shall be considered a system failure.

C. If the system fails the 30-day availability test, the 30-day test period shall be restarted after the failed component or software is repaired/replaced and full operation is restored. The system shall be demonstrated for the full 30-day period following the restart.

D. The Contractor shall submit an availability demonstration report that shall state that all system availability requirements have been met.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 17080 - QUALITY ASSURANCE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. It is the intent of these Specifications and Drawings to secure high quality in all materials, equipment and workmanship in order to facilitate operations and maintenance of the facility. The Contractor shall provide equipment and services to meet this intent.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. All work shall be installed in accordance with the National Electric Code, National Electric Safety Code, OSHA, State, local and other applicable codes.

1.03 QUALITY ASSURANCE - GENERAL

A. All equipment and materials shall be new and the products of reputable recognized suppliers having adequate experience in the manufacture of these particular items.

B. For uniformity, only one manufacturer will be accepted for each type of product.

C. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses that may occur during fabrication, transportation, and erection as well as during continuous or intermittent operation. They shall be adequately stayed, braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details.

D. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, which shall be of sturdy and durable construction and be suitable for long, trouble-free service.

E. Electronic components shall be de-rated to assure dependability and long-term stability.

F. Printed circuit boards in field mounted equipment shall be suitable for the specified environmental conditions.

G. Alignment and adjustments shall be non-critical, stable with temperature changes or aging and accomplished with premium grade potentiometers.

H. Components of specially selected values shall not be inserted into standard electronic assemblies in order to meet the performance requirements of this specification.

1.05 OPTIONAL EQUIPMENT

A. Optional or substituted equipment or both requiring changes in details or dimensions required to maintain all structural, mechanical, electrical, control, operating, maintenance or design features incorporated in these Specifications and Drawings shall be made at no additional cost to the Owner. In the event that the changes are necessary, calculations and drawings showing the proposed revisions shall be submitted for approval. The Contractor shall coordinate all changes with other affected trades and contracts and pay all additional charges incurred.

1.06 GUARANTEE

A. The instrumentation subcontractor through the Contractor shall install, maintain and guarantee the Instrumentation, Control and Information System as specified under the General Conditions and Division 1 of the Specifications. Maintenance personnel provided by the instrumentation subcontractor shall instruct the Owner's personnel in the operation, adjustment, calibration and repair of the equipment being serviced. All preventive and corrective activities shall be documented with service reports, which shall identify the equipment being serviced, state the condition of the equipment, describe all work performed and list materials used. A copy of all service reports shall be delivered to the Owner on the day the work is performed.

B. The instrumentation subcontractor shall provide the services of factory-trained service technician(s) at least twice during the guarantee period, for the purpose of performing preventive hardware maintenance.

C. Corrective hardware and software maintenance during the guarantee period shall be performed in accordance with the requirements of Division 1 and, in addition, shall meet the following requirements:

1. Corrective hardware maintenance shall be performed by factory-trained service technician(s) specifically trained to service the digital equipment provided. Technicians possessing suitable training and experience shall be provided to perform corrective maintenance on all other equipment. The hardware service technician(s) shall be available on-site within 24 working hours after notification by the Owner.

2. Corrective software maintenance shall be performed for software provided by the instrumentation subcontractor and incorporated into the system prior to the completion of system commissioning. Software service programmer(s) shall be available for consultation within four business hours and, if required, on-site within 16 business hours after notification by the Owner. Corrective software maintenance shall include the supply, installation and startup of all application software upgrades released during the guarantee period.

3. Corrective hardware and software maintenance performed during the guarantee period shall be performed at no cost to the Owner.

4. As used herein, the term "working hours" shall be defined as those of the treatment facility (seven days per week, 24 hours per day). The term "business hours" shall be defined as the hours between 8:00 a.m. and 5:00 p.m., local time, Monday through Friday; excluding holidays.

5. The guarantee period shall commence upon final acceptance of the completed treatment facility in accordance with the provisions of the Contract Documents.

D. The instrumentation subcontractor shall submit to the Owner a proposed maintenance agreement incorporating the following features:

1. Extension of preventive hardware maintenance services as described above for a period of up to five years from the expiration of the warranty period.

2. Provisions for corrective hardware and/or software maintenance work on a will-call basis for a period of up to five years from the expiration of the warranty period. Corrective maintenance work shall be performed by properly trained personnel as described above.

E. The proposed agreement shall include provisions for payment based upon an annual fee for preventive maintenance and cost plus expenses for corrective maintenance work. The portion dealing with corrective maintenance shall be written to include corrective maintenance caused by actions of the Owner during the warranty period and shall contain clauses for re-negotiation of contract prices based upon changes in recognized economic indicators published by the United States Department of Commerce.

1.07 SHIPPING HANDLING AND STORAGE

A. In addition to shipping, handling and storage requirements specified elsewhere in the Contract Documents, air conditioning/heating shall be provided for storage of all field instrumentation, panels, digital equipment and ancillary devices to maintain temperatures between 20 and 25 degrees C and relative humidity 40 to 60 percent without condensation. The air shall be filtered and free of corrosive contaminants and moisture.

1.08 FABRICATION

A. Fabrication of all equipment shall conform to the codes and standards outlined in this Section, and other portions of the Contract Documents.

B. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. The Contractor shall provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory. Inspection of the equipment at the factory by the Engineer will be made after the manufacturer has performed satisfactory checks, adjustments, tests and operations.

C. Equipment approval at the factory only allows the equipment to be shipped to the project site. The Contractor shall provide for the proper storage, installation and satisfactory

start-up and operation of the equipment to the satisfaction of the equipment manufacturer, the instrumentation subcontractor, and the Engineer.

1.09 INSTALLATION

A. All instrumentation and control system installation work, whether new construction or modifications to existing equipment/panels/structures, shall conform to the codes and standards outlined in this Section, and other portions of the Contract Documents.

B. The instrumentation subcontractor shall assign a competent representative who shall provide full time coordination and supervision of all on-site instrumentation and control system construction work from commencement of construction through completion and final acceptance.

C. All labor shall be performed by qualified craftsmen in accordance with the standards of workmanship in their profession and shall have had a minimum of three years of documented experience on similar projects.

D. All equipment and materials shall fit properly in their installations. Any required work to correct improperly fit installations shall be performed at no additional expense to the Owner.

E. All work shall be performed in a neat and workmanlike manner. All hardware and instrumentation shall be installed in accordance with requirements specified herein, in accordance with industry best practices, in accordance with manufacturers' recommendations, and in a manner suitable for ease of operation, inspection, and maintenance. All wiring shall be neatly bundled, run in wireway, and terminated. All spare wiring shall be neatly coiled and clearly labeled at both ends for future use by the Owner. Any work not meeting these requirements shall be corrected at no expense to the Owner.

F. Sufficient common-mode and differential-mode noise rejection shall be provided to insure operation of the plant process control system to meet all specification requirements. General practice shall include:

1. Maintaining crossings between noisy wires and signal wires at right angles.

2. Maintaining separation between noisy wires and signal wires as wide as practical.

3. Grounding all signals, shields and power supplies at the process control unit or local control panel.

4. Providing passive filters on signals with time constant compatible with scan intervals and overvoltage protection.

5. Eliminating cable splices. All splices in instrumentation and control system signal and network cables shall be approved in advance by the Engineer.

6. Providing a floating output for transmitters that have their own power sources.

G. DC and AC power grounding shall be performed in accordance with the digital hardware manufacturer's recommendations as well as all applicable code requirements.

H. The case of each field instrument and control panel shall be grounded in compliance with the National Electric Code.

I. Power wires shall be separated from parallel-running signal wires by the following minimum spacing:

CIRCUIT VOLTAGE (VAC)	MINIMUM SPACING (IN.)
120	12
240	18
480	18
2000 and above	24

J. The Contractor shall provide all required cutting, drilling, inserts, supports, bolts, and anchors, and shall securely attach all equipment and materials to their supports. Embedded supports for equipment furnished under this Division shall be provided and installed as shown specified herein and shown on the Drawings.

K. Following acceptance of the factory tests by the Engineer, and in accordance with the construction schedule, the Contractor shall commence installation of the digital control system hardware. Digital system equipment items shall not be installed, however, until all architectural, mechanical, HVAC and electrical work has been completed in the equipment rooms, MCC's, control rooms and all structural and/or mechanical work has been completed within 50 feet of equipment locations.

L. Upon completion of the above construction work, the Contractor shall request an inspection of the above-named areas. The Engineer will issue a written approval to proceed with delivery and installation only after being satisfied that all work described above has been properly performed. Digital equipment shall remain at the factory site or storage prior to approval for delivery to the project site. Partial shipments may be required to meet construction schedule requirements.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 17120 – PROGRAMMABLE LOGIC CONTROLLERS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation all programmable logic controllers, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17060 – Signal Coordination Requirements

C. Section 17125 – PLC Operator Interface Units

D. Section 17185 – Data Highway Network

E. Section 17190 – Uninterruptible Power Systems

F. Section 17500 – Enclosures, General

1.03 TOOLS, SUPPLIES AND SPARE PARTS

A. Tools, supplies and spare parts shall be provided as specified in Section 17050 - Tools, Supplies, and Spare Parts. In addition, the following specific spare parts items shall be provided:

B. Spare parts shall be furnished for the pump station, including but not limited to the following:

1. One (1) spare PLC CPU for each type provided

2. One (1) spare HMI for each type provided

3. One (1) spare remote I/O controller with active bus module for each type provided

4. One (1) spare SD memory card for each type provided

5. One (1) spare power supply and selectivity module for each type provided

6. One (1) spare I/O modules for each type provided

7. 10% spare fuses of each type provided but not less than two of each type.

PART 2 – PRODUCTS

2.01 PROGRAMMABLE LOGIC CONTROLLERS - GENERAL

A. The Contractor shall furnish programmable controllers (PLC's) as specified herein and as shown on the Drawings. PLC's shall be provided complete with power supplies, I/O modules, communications modules, special function modules, instructions, memory, input/output capacity, and appurtenances to provide all features and functions as described herein.

B. All components of the PLC system shall be of the same manufacturer; who shall have fully tested units similar to those being furnished in an industrial environment with associated electrical noise. The PLC system shall have been tested to meet the requirements of NEMA Standard ICS 2-230 (Arc Test) and IEEE C37.90.1 (SWC). The processing unit shall perform the operations functionally described herein based on the program stored in memory and the status of the inputs and outputs.

C. The programmable controller shall be designed to operate in an industrial environment. The PLC shall operate in an ambient temperature range of 0 – 60 degrees Celsius and a relative humidity of 5-95 percent, non-condensing. The PLC shall operate on supply voltages of 90-132 VAC at 47-63 Hz. An integral fuse shall be provided on the power supply for short circuit protection and shall be front panel accessible. Integral overcurrent and under-voltage protection shall be provided on the power supply.

E. System configuration shall be as shown on the SCADA Network Diagram (Drawing I-2). PLC memory, communications, I/O modules, and processor shall be adequately sized for all control functions specified.

F. The PLC-1 central processing unit (CPU) shall be S7-400 series as manufactured by Siemens.

2.03 COMMUNICATIONS

A. Provide all Siemens S7-400 Series PLC communications modules, cables and accessories required to provide a Profinet communications link between PLC-1 and the pump VFDs and an Ethernet communications network between PLC-1 and the SCADA system as shown on SCADA Network Diagram, Drawing I-2.

B. The Contractor shall provide all Ethernet switches, adapters, connectors, and interconnection cables necessary to connect the PLCs to the network

2.04 INPUT/OUTPUT SUBSYSTEMS

A. Input/output hardware shall handle the required number of process inputs and outputs plus a minimum of 20 percent active prewired spares for each I/O type furnished.

B. Discrete inputs shall be 24 VDC signal (integral to PLC) from dry field contacts. Discrete outputs shall be 24 VDC outputs from the PLC or dry relay contacts (2A minimum) as required. The PLC shall provide momentary and latched outputs as required to interface with motor controls and external devices. Interposing relays shall be provided where required to interface with field equipment. Interposing relays shall be as specified in Section 17550. Lightning/surge protection shall be provided as specified in the Section 17560 entitled “Transient Voltage Surge Suppression Devices”. Electrical isolation shall be provided where required.

C. Lightning/surge protection shall be provided as specified in Section 17560 - Transient Voltage Surge Suppression Devices.

D. Signal and control circuitry to individual input/output modules shall be arranged such that module failure shall not disable more than one half of the control loops within any group of controlled equipment (e.g., one pump out of a group of three pumps, two pumps out of four, etc.). Where possible, individual control loops and equipment shall be assigned to individual modules such that failure of the module will disable only one loop or piece of equipment.

2.05 POWER SUPPLIES

A. Loop power and panel equipment power supplies shall be provided with the PLC as required to meet 150% of the specified installed I/O power requirements plus spares under full load conditions. Power supplies shall be modular units, shall be fully redundant and shall alarm the PLC upon failure. Power supplies shall have a line regulation of 0.05% and meet the environmental and power requirements specified herein for the PLC. Power supplies shall be furnished with isolated lightning/surge protection systems as specified in the Section entitled “Transient Voltage Surge Suppression Devices”.

B. Each Loop and Equipment 24V DC Power Supply shall meet the following requirements:

1. DC Output: 24-28V DC, 10-8.6A, 240W
2. AC Input: 100-240V AC (-15%/+10%)
3. Dimensions: (WxHxD) 39 x 124 x 117mm
4. Efficiency up to 95.2%
5. Excellent partial load efficiency
6. 20% Output power reserves
7. Safe HiccupPLUS overload mode
8. Easy fuse breaking due to high overload peak current
9. Active power factor correction (PFC)

10. Minimal inrush current surge

11. Full power between -25°C and +60°C

12. DC-OK relay contact

13. conformal coated

C. Loop and Equipment 24V DC Power supplies shall be model CP10.241-C1 as manufactured by PULS or Engineer Approved Equal by Phoenix Contact.

2.06 FUSED SIGNAL TERMINAL BLOCKS AND CIRCUIT PROTECTION SYSTEMS

A. Internal I/O Terminal Block System: All discrete and analog input / output (I/O) terminal blocks shall be DIN rail mounted, modular, multifunction, fused terminal blocks with individual LED blown fuse indicators for overcurrent protection of each discrete and analog I/O loop; each complete with lever disconnect, fuse holder, removable fuse and fuse cover for integral short circuit protection. Terminal block systems shall be as manufactured by Phoenix Contact, or Engineer approved equal.

B. Field wiring terminal blocks for circuits requiring interposing relays for “dry contact” PLC control outputs shall be provided with removable, modular type relays, 24 VDC rated coils, 240VAC, 10 amp rated, form C dry contact outputs, and coil side LED indicator.

C. Field wiring terminal blocks for circuits requiring interposing relays for “dry contact” PLC monitoring inputs shall be provided with removable, modular type relays, 120 VAC rated coils (or other voltage as required), 24VDC, 5 amp rated, form C dry contact outputs, and coil side LED indicator.

D. All loops shall be individually isolated. All terminal block wiring connections shall be push-in or screw type and shall accept 24-14 AWG wire; rated for the signals carried and shall be labeled.

E. All panel wiring between all internal and field wiring terminal blocks shall be color coded in accordance with ISA standards and individually labeled by loop tag name. All internal and field wiring terminal block wiring connections shall be individually labeled.

PART 3 – BILL OF MATERIALS

3.01 REQUIREMENTS

B. General

1. The Bill of Materials (BOM) listed below represent the minimum required devices to be provided and installed as part of each PLC and RIO panel. Each BOM list provides the main components and equipment to be furnished, but it is not all

inclusive. The instrumentation and controls subcontractor shall furnish additional components or equipment as required to meet the control intent of the contract documents.

C. Hypochlorite Control Panel LCP-1 (RIO-1)

1. LCP-1 shall be located in the Electrical Room.

2. Hypochlorite distributed I/O panel shall have a thermostatically controlled space heater / anti condensation heater installed.

3. Approved Panel Bill of Materials (modify as required to meet specific facility design intention).

Manufacturer	Part Number	Description
Siemens	6AG1124-0GC13-2AX0	TP700 Comfort Outdoor w/ Conformal Coating
Siemens	6AV2181-8XP00-0AX0	SIMATIC HMI SD memory card, 2 GB
Siemens	6ES5710-8MA11	DIN rail 35 mm, length: 483 mm, for 19" cabinets
Siemens	6ES7153-4BA00-0XB0	IM 153-4 High Feature for ET 200M, PROFINET
Siemens	6ES7193-6AR00-0AA0	Bus Adapter 2xRJ45
Siemens	6ES7195-1GA00-0XA0	DIN rail for active bus modules, 482 mm (19")
Siemens	6ES7195-7HA00-0XA0	Active bus module for power supply and interface module 153
Siemens	6ES7195-7HB00-0XA0	Active bus module for 2 modules 40 mm wide
Siemens	6ES7321-1BH02-0AA0	Digital input, 16 DI, 24V DC; isolated
Siemens	6ES7321-1FH00-0AA0	Digital input 16 DI, 120/230 V AC; isolated
Siemens	6ES7322-1FH00-0AA0	Digital output 16DO, 120/230V AC, 0.5A; isolated
Siemens	6ES7331-7KF02-0AB0	Analog input 8AI; 14-bit; 20ms; isolated
Siemens	6ES7332-5HD01-0AB0	Analog output 4 AO; 12-bit; isolated
Siemens	6ES7392-1AJ00-0AA0	Front connector, 20-pin, with screw contacts
Siemens	6ES7392-1AM00-0AA0	Front connector, 40-pin, with screw contacts
Siemens	6ES7307-1KA02-0AA0	PS; AC 120/230V, DC 24V, 10A
Siemens	6GK5205-3BB00-2AB2	SCALANCE XB205-3 (PN pre-config. + EIP, MM ST)
Corning	SPH-12OTS-12H3H	Integrated 12MMF ST Wall Mount Patch Panel
Square D	PK5GTA	Equipment Ground Bar Kit
Siemens	6XV1 840-2AH10	PROFINET Cable, Fast Connect
Siemens	6AG1901-1BB10-7AA0	PROFINET Connector, Siplus

D. Main Control Panel MCP-1(PLC-1)

1. The Bill of Material below is the list of the devices to be provided and installed as part of the main station control panel. The list provides the main components and equipment to be furnished, but it is not all inclusive. The control panel fabricator

shall furnish additional components or equipment as required to meet the control intent of the contract documents.

2. MCP-1 shall be located in the Electrical Room of the pump building.

3. A 120Vac UPS in MCP-1 shall supply power if AC main is out of service. See Section 17190 for UPS requirements.

4. The main station control panel MCP-1 shall feed 24VDC power to the station automatic transfer switch ATS-1.

5. Approved Panel Bill of Materials (modify as required to meet specific facility design intention).

Manufacturer	Part Number	Description
Siemens	6AV2124-0QC02-0AX1	TP1500 Comfort
Siemens	6AV2181-8XP00-0AX0	SIMATIC HMI SD memory card, 2 GB
Orion	OPS-Relay	Orion UPS Relay Card
Orion	RT1 Unity 3k	3000VA/2850 Online UPS w/ Unity Power Factor
Siemens	6ES7407-0RA02-0AA0	Power supply PS407 20A; 120/230V AC -> 5V/24V DC
Siemens	6ES7414-2XL07-0AB0	CPU 414-2; 2x256KB RAM; 1 MPI/DP, 1 DP
Siemens	6ES7421-1FH20-0AA0	Digital input 16 DI; 120/230V UC
Siemens	6ES7421-7DH00-0AB0	Digital input 16 DI; 24-60V UC; alarm; diagnostics
Siemens	6ES7422-1FH00-0AA0	Digital output 16 DO; 120/230V AC;2A
Siemens	6ES7431-1KF10-0AB0	Analog input 8AI, 14-bit, with linearization
Siemens	6ES7432-1HF00-0AB0	Analog output 8AO, 13-bit, isolated
Siemens	6ES7492-1AL00-0AA0	Front connector for signal modules; screw contacts
Siemens	6ES7952-1KK00-0AA0	Flash memory card, long; 1 MB
Siemens	6ES7971-0BA00	Buffer battery 3.6 V/1.9 Ah for PS 405/PS 407
Siemens	6ES7400-1TA01-0AA0	UR1, central controller/expansion device; 18 slots, K bus
Siemens	6GK5213-3BB00-2AB2	SCALANCE XB213-3 (PN pre-config. + EIP, MM ST)
Siemens	6GK7443-1GX30-0XE0	CP 443-1 Advanced, Communication Processor, S7-400
Corning	SPH-12OTS-12H3H	Integrated 12MMF ST Wall Mount Patch Panel
Square D	PK5GTA	Equipment Ground Bar Kit
Siemens	6XV1 840-2AH10	PROFINET Cable, Fast Connect
Siemens	6AG1901-1BB10-7AA0	PROFINET Connector, Siplus

V. Generator Remote I/O Panel (RIO-4)

1. Refer to Division 16 specifications for additional requirements.

2. RIO-4 shall be located adjacent to or inside the generator enclosure as shown on

the Drawings.

3. RIO-4 shall be powered from the generator 24V DC batteries.

4. RIO-4 shall have a thermostatically controlled space heater / anti condensation heater installed.

5. Approved Panel Bill of Materials (modify as required to meet specific facility design intention).

Manufacturer	Part Number	Description
Siemens	6ES5710-8MA11	DIN rail 35 mm, length: 483 mm, for 19" cabinets
Siemens	6ES7153-4BA00-0XB0	IM 153-4 High Feature for ET 200M, PROFINET
Siemens	6ES7193-6AR00-0AA0	Bus Adapter 2xRJ45
Siemens	6ES7195-1GA00-0XA0	DIN rail for active bus modules, 482 mm (19")
Siemens	6ES7195-7HA00-0XA0	Active bus module for power supply and interface module 153
Siemens	6ES7195-7HB00-0XA0	Active bus module for 2 modules 40 mm wide
Siemens	6ES7321-1FH00-0AA0	Digital input 16 DI, 120/230 V AC; isolated
Siemens	6ES7331-7KF02-0AB0	Analog input 8AI; 14-bit; 20ms; isolated
Siemens	6ES7392-1AJ00-0AA0	Front connector, 20-pin, with screw contacts
Siemens	6ES7392-1AM00-0AA0	Front connector, 40-pin, with screw contacts
Siemens	6ES7400-1TA01-0AA0	UR1, central controller/expansion device; 18 slots, K bus
Siemens	6ES7307-1EA80-0AA0	PS 307; AC 120/230V, DC 24V, 5A Outdoor Rated
Siemens	6ES7952-1KK00-0AA0	Flash memory card, long; 1 MB

W. Ground Storage Tank Remote I/O Panel (RIO-2)

1. RIO-2 shall be located near ground storage tank GST-1 as show on the Drawings.

2. RIO-2 shall have a thermostatically controlled space heater / anti condensation heater installed.

3. Approved Panel Bill of Materials (modify as required to meet specific facility design intention).

Manufacturer	Part Number	Description
Siemens	6ES5710-8MA11	DIN rail 35 mm, length: 483 mm, for 19" cabinets
Siemens	6ES7153-4BA00-0XB0	IM 153-4 High Feature for ET 200M, PROFINET
Siemens	6ES7193-6AR00-0AA0	Bus Adapter 2xRJ45
Siemens	6ES7195-1GA00-0XA0	DIN rail for active bus modules, 482 mm (19")
Siemens	6ES7195-7HA00-0XA0	Active bus module for power supply and interface module 153
Siemens	6ES7195-7HB00-0XA0	Active bus module for 2 modules 40 mm wide

Siemens	6ES7321-1FH00-0AA0	Digital input 16 DI, 120/230 V AC; isolated
Siemens	6ES7331-7KF02-0AB0	Analog input 8AI; 14-bit; 20ms; isolated
Siemens	6ES7392-1AJ00-0AA0	Front connector, 20-pin, with screw contacts
Siemens	6ES7392-1AM00-0AA0	Front connector, 40-pin, with screw contacts
Siemens	6ES7400-1TA01-0AA0	UR1, central controller/expansion device; 18 slots, K bus
Siemens	6ES7307-1EA80-0AA0	PS 307; AC 120/230V, DC 24V, 5A Outdoor Rated
Siemens	6ES7952-1KK00-0AA0	Flash memory card, long; 1 MB

W. Discharge Flow and Pressure Remote I/O Panel (RIO-3)

1. RIO-3 shall be located adjacent to the discharge flow metering area as show on the Drawings.

2. RIO-3 shall have a thermostatically controlled space heater / anti condensation heater installed.

3. Approved Panel Bill of Materials (modify as required to meet specific facility design intention).

Manufacturer	Part Number	Description
Siemens	6ES5710-8MA11	DIN rail 35 mm, length: 483 mm, for 19" cabinets
Siemens	6ES7153-4BA00-0XB0	IM 153-4 High Feature for ET 200M, PROFINET
Siemens	6ES7193-6AR00-0AA0	Bus Adapter 2xRJ45
Siemens	6ES7195-1GA00-0XA0	DIN rail for active bus modules, 482 mm (19")
Siemens	6ES7195-7HA00-0XA0	Active bus module for power supply and interface module 153
Siemens	6ES7195-7HB00-0XA0	Active bus module for 2 modules 40 mm wide
Siemens	6ES7321-1FH00-0AA0	Digital input 16 DI, 120/230 V AC; isolated
Siemens	6ES7331-7KF02-0AB0	Analog input 8AI; 14-bit; 20ms; isolated
Siemens	6ES7392-1AJ00-0AA0	Front connector, 20-pin, with screw contacts
Siemens	6ES7392-1AM00-0AA0	Front connector, 40-pin, with screw contacts
Siemens	6ES7400-1TA01-0AA0	UR1, central controller/expansion device; 18 slots, K bus
Siemens	6ES7307-1EA80-0AA0	PS 307; AC 120/230V, DC 24V, 5A Outdoor Rated
Siemens	6ES7952-1KK00-0AA0	Flash memory card, long; 1 MB

- END OF SECTION -

SECTION 17125 - OPERATOR INTERFACE UNITS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation all operator interface units, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17120 – Programmable Logic Controllers

PART 2 -- PRODUCTS

2.01 OPERATOR INTERFACE UNITS – COLORGRAPHIC TOUCH SCREEN

A. Operator Interface Units (OIU)s shall be provided for MCP-1 and LCP-1 to view and change PLC monitoring and control parameters and to display alarm messages using a graphical user interface.

1. The operator interface unit for MCP-1 shall be SIMATIC HMI TP1500 Comfort (part no. 6AV2124-0QC02-0AX1) by Siemens; No substitutions.

2. The operator interface unit for LCP-1 shall be SIMATIC HMI TP700 Comfort Outdoor with Conformal Coating (part no. 6AG1124-0GC13-2AX0) by Siemens; No substitutions.

PART 3 – EXECUTION - NOT USED

- END OF SECTION -

SECTION 17185 – NETWORKS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation one data highway network, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17100 – Digital System Hardware Configuration

C. Section 17120 – Programmable Logic Controllers

1.03 TOOLS, SUPPLIES AND SPARE PARTS

A. Tools, supplies and spare parts shall be provided as specified in Section 17050 - Tools and Supplies. In addition, the following specific spare parts items shall be provided:

1. Provide one (1) spare LAN switch of the make and model specified for the RIO panels.

2. Provide one (1) spare LAN switch of the make and model specified for MCP-1.

PART 2 -- PRODUCTS

2.01 ETHERNET NETWORKS - GENERAL

A. The network topology shall be as shown on SCADA Network Diagram (Drawing I-02), consisting of a combination of twisted pair copper and multiple strand multi-mode fiber optic cable to accomplish the data transmission requirements specified herein. Each connected device shall be equipped with its own network interface units.

B. Bi-directional communications between the network and network connected equipment shall be provided by network interface units. The network interface units shall be common to all equipment and shall include all required modems, communications processors and memories to provide a transparent interface between the network(s) and the connected devices.

C. A multilayered peer-to-peer communications protocol shall be employed. Protocol shall be Profinet.

D. Power to all networking equipment shall be via uninterruptible power supply (UPS) systems specified in Section 17190.

2.02 PROFINET NETWORK REQUIREMENTS

A. All Ethernet installation must comply with the PROFINET User Organization. More information can be found at “WWW.Profinet.com”.

1. Reference “PROFINET Installation Guideline for Cabling and Assembly” order number 8.072.

2. ALL recommendations from the ProfiNet User Organization must be followed such as using Fiber Optic when leaving a building as well as network isolators.

3. Ethernet connector connectors shall be made of metal housing. Connectors shall be Siemens 6GK1901-1BB10-2AA0 type or equal.

4. CAT6 cable surge suppressors are required at each end of each Profinet cable run. See Section 17560 for surge suppressor requirements.

2.03 LAN SWITCHES

A. Furnish, install and configure a managed, industrial grade LAN (local area network) switches in each RIO and PLC cabinet as shown on Drawing I-02. Cisco Corporate switch shall be furnished and configured by JEA.

B. All switches shall have the capability to be managed.

C. Each switch shall be equipped with sufficient RJ45 ports such that each switch will have a minimum of two spare RJ45 ports after a successful Final Acceptance Test.

D. Switches shall be Siemens SCALANCE X200 or X300 Series.

2.04 PROFINET COMMUNICATION CABLES

A. Manufacturers:

1. Belden

2. Siemens

3. Or approved equal

B. Cable shall be rated for PROFINET, Type A cable.

1. Core Diameter: 22AWG

2.05 ETHERNET COMMUNICATION CABLES

A. Manufacturers:

1. Belden

2. Or approved equal

B. Description: CAT 6, 22awg, UTP (unshielded twisted pair) manufactured in accordance ANSI/TIA/EIA-568-B.2 and ANSI/ICEA S-80-576

C. Ethernet network isolators are required on all ethernet networks where they originate from field devices outside of the main pump building.

2.06 OPTICAL FIBER CABLES

A. Manufacturers:

1. Belden

2. Corning

3. Approved Equal

B. Description: Multimode, 62.5/125 micrometer, 6 count minimum, nonconductive, tight buffer, optical fiber cable or as noted on the Drawings.

1. Comply with ICEA S-83-596 for mechanical properties.

2. Comply with TIA/EIA-568-B.3 for performance specifications.

3. Comply with TIA-492AAAA-A for detailed specifications.

4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

a. General Purpose, Nonconductive: Type OFN or OFNG

b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.

c. Riser Rated, Nonconductive: Type OFNR or OFNP, complying with UL 1666.

5. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.

6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color:

a. Orange for 62.5/125-micrometer cable.

2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA- 598-C.

3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

D. Upon entering a cabinet, panel or console, loose tube fiber optic cable shall be broken out using fan-out kits and terminated in a fiber optic patch panel. Tight buffered cable shall then be routed to the individual destinations as needed (or loose tube cable for runs to other buildings).

E. Fiber optic cable for installation within buildings shall comply with all applicable fire and building safety codes for such applications.

F. Fiber optic cable shall utilize mechanically spliced, field installable, ST compatible connectors. Connections shall have a typical loss of 0.35 dB or better and shall provide stable optical performance after numerous rematings. Connections shall utilize physical contact terminations utilizing UV or heat cured adhesive. Field terminations shall use a simple procedure requiring minimal training.

G. Fiber Optic Cables shall be furnished and installed as follows:

1. The instrumentation and controls subcontractor shall furnish all fiber optic cables and reel test all fiber optic cable strands prior to installation by the CONTRACTOR.

2. The CONTRACTOR shall install (pull) all fiber optic cables.

3. The instrumentation and controls subcontractor shall terminate and retest all installed fiber optic cable fibers; both active and spare fibers.

4. The instrumentation and controls subcontractor shall measure the dB loss of each fiber over the cable length using handheld light source and power meter and provide reports of the test results to the Engineer for approval. The fiber optic tests shall be witnessed by the CONTRACTOR and Engineer.

5. The instrumentation and controls subcontractor shall replace any cable or connector that exceeds its specified loss limits. The total attenuation (dB/km) shall not exceed the sum of the fiber strand specified loss and connector specified loss. 100% of the fiber strands shall meet this requirement or the fiber cable shall be completely replaced. No exceptions.

2.07 FIBER OPTIC CABINETS, PATCH PANELS

A. Fiber optic patch panels shall be provided as shown on the SCADA Network Diagram, Drawing I-02.

B. Terminate all incoming fiber optic tubing pairs (both active and spares) inside all patch panels. Provide all connectors and equipment required for each termination.

C. Patch cables between the patch panel and the fiber optic device shall be multi-mode, fiber optic cable with ST connectors, Black Box, DINSpace or Engineer approved equal.

D. Patch panels for LCP-1 (RIO-1), RIO-2, RIO-3, RIO-4 shall be SNAP-12ST-MM Compact Fiber Optic Patch Panel by DINSpace or Engineer approved equal.

E. Patch Panel for MCP-1 shall be model Corning SPH-12OTS-12H3H Integrated 12MMF ST Wall Mount Patch Panel or Engineer approved equal.

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Fiber optic cable and appurtenances shall be installed in strict accordance with the manufacturer's requirements.

B. Refer to Section 17000 for further information.

- END OF SECTION -

SECTION 17190 - UNINTERRUPTIBLE POWER SYSTEMS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish, test, install and place in satisfactory operation all uninterruptible power systems, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

B. All UPS's shall be mounted within consoles or control panels containing the associated digital equipment unless otherwise specified or shown on the Drawings.

C. Provide one 120V AC Control Panel UPS unit for the Master Control Panel, MCP-1.

D. Provide one 24V Remote I/O DC type UPS unit for each remote I/O panel furnished under this contract, including, but not limited to, the following panels: LCP-1 (RIO-1), RIO-2, RIO-3, RIO-4.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 - Control and Information System Scope and General Requirements

1.03 SUBMITTALS

A. The CONTRACTOR shall submit UPS sizing calculations for all UPS's furnished under this Contract in accordance with Section 17030 - Control and Information System Submittals.

PART 2 -- EQUIPMENT

2.01 120V AC Control Panel UPS

A. Each 120V AC Control Panel UPS shall consist of a tower or rack style UPS module and battery modules as required to meet backup run time requirements for the connected equipment. Each UPS shall be sized for 150% of the connected loads, but not less than 3000 VA.

B. UPS's shall be the true on-line, double conversion type. Under normal operation, the AC power shall be converted to DC. The DC power from the battery charger shall supply an inverter and maintain the battery module at full charge. The AC output from the inverter shall be fed to the associated digital equipment power supply unit and/or other equipment power supplies as appropriate. Upon loss of the AC supply, the inverter shall continue to supply normal power to the device, drawing DC from the batteries.

C. An automatic bypass switch shall be provided. The transfer switch shall be of the solid state, make-before-break type and shall automatically transfer load from the inverter to the AC line in the event of an inverter malfunction. The total transfer time shall be 5 milliseconds or less. The transfer switch shall be provided with a manual override.

D. The 120V AC Control Panel UPS shall meet the following requirements:

1. Input voltage shall be 117 VAC, single phase, 60 Hz.

2. Voltage regulation shall be +/-2 percent for line and load changes with less than 3% THD.

3. The output frequency shall be phase-locked to the input AC line on AC operation and shall be 60 hertz +/-0.5 percent when on battery operation.

4. The batteries shall be of the sealed, lead acid or lead calcium gelled electrolyte type. The battery modules shall have a minimum full load backup time of 30 minutes.

5. A status monitoring and control panel shall be provided and shall include the following:

   a. Status indicating lights for both normal and abnormal conditions.

   b. Individual alarm dry contacts shall close upon UPS fault, low battery level, and operation of the static transfer switch. See Section 17920 for all required UPS status signals. All required interface software and hardware shall be provided.

   c. Battery and AC output volt meters.

   d. Circuit breakers for the charger AC input and the inverter input.

6. Sound absorbing enclosure.

7. EMI/RF noise filtering.

8. Surge protection shall be provided on the AC input circuit, which shall have a UL TVSS clamping voltage rating of 400 V with a <5 ns response time.

E. UPS systems shall be Online RT1 3000VA by Orion Power Systems, 9SX3000 by Eaton or Engineer Approved Equal.

2.02 24V DC Remote I/O Panel UPS

A. Each 24V DC Remote I/O Panel UPS shall consist of a din rail mounted UPS module as required to meet backup run time requirements for the connected equipment. Each UPS shall be sized for 150% of the connected loads, but not less than 250 VA.

B. 24VDC UPS batteries shall be lithium-ion or LiFePO4 (Lithium Iron Phosphate) battery with a minimum 5 year lifespan.

C. The UPS shall be powered by a 120V AC to 24V DC power supply, as specified in Section 17120.

D. Each 24V DC Remote I/O Panel UPS shall meet the following requirements

1. Output: 24V DC, 10A
2. Input: 24V DC
3. Size (WxHxD): 123 x 124 x 119mm
4. Stable output voltage in buffer mode
5. Battery management
6. Temperature compensated battery charging
7. Comprehensive diagnostics and monitoring functions
8. “Replace battery” and “Ready” signal shall be wired to a RIO input and configured as an alarm in MCP-1 (PLC-1)
9. Electronically overload and short circuit protected
10. 50% power reserves
11. Selectable buffer time limiter

E. 24V DC Remote I/O Panel UPS shall be model UBC10.241 as manufactured by PULS or Engineer Approved Equal by Phoenix Contact.

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Refer to Section 17000, Part 3 of the specifications.

- END OF SECTION -

SECTION 17500 - ENCLOSURES, GENERAL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the control enclosures, with all spare parts, accessories, and appurtenances as specified herein and as shown on the Drawings.

B. Control enclosures shall be assembled, wired, and tested in the instrumentation subcontractor's own facilities, unless specified otherwise. All components and all necessary accessories such as power supplies, conditioning equipment, mounting hardware, signal input and output terminal blocks, and plug strips that may be required to complete the system shall be provided.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17510 – Cabinets and Panels

C. Section 17520 – Field Panels

D. Section 17550 – Panel Instruments and Accessories

E. Section 17560 – Transient Voltage Surge Suppression Devices

F. Section 17600 – Unpowered Instruments, General

G. Section 17700 – Powered Instruments, General

H. Section 17800 – Analytical Instruments, General

I. Section 17900 – Schedules and Control Descriptions, General

J. Refer to Division 16 for additional requirements for cable, circuit breakers, disconnect switches, etc.

1.03 GENERAL INFORMATION AND DESCRIPTION

A. The cabinet itself and all interior and exterior equipment shall be identified with nameplates. The equipment shall be mounted such that service can occur without removal of other equipment. Face mounted equipment shall be flush or semi-flush mounted with flat black escutcheons. All equipment shall be accessible such that adjustments can be made while the equipment is in service and operating. All enclosures shall fit within the allocated space as shown on the Drawings.

B. Either manufacturer-standard or custom cabinetry may be furnished subject to the requirements of the Contract Documents and favorable review by the Owner.

C. Due consideration shall be given to installation requirements for enclosures in new and existing structures. The Contractor shall examine plans and/or field inspect new and existing structures as required to determine installation requirements, and shall coordinate the installation of all enclosures with the Owner and all affected contractors. The Contractor shall be responsible for all costs associated with installation of enclosures, including repair of damage to structures (incidental, accidental or unavoidable).

1.04 TOOLS, SUPPLIES AND SPARE PARTS

A. Tools, supplies and spare parts shall be provided as specified in Section 17050 - Tools, Supplies and Spare Parts.

B. Provide 10 percent spare fuses of each type furnished, but not less than two of each type.

C. Provide 10 percent spare terminal blocks (preinstalled).

PART 2 -- PRODUCTS

2.01 TERMINAL BLOCKS

A. Terminal blocks shall be assembled on non-current carrying galvanized steel DIN mounting rails securely bolted to the cabinet subpanel.

B. The minimum size shall be 4mm.

C. Terminals colors are to match UL508A voltage color code

D. All field wiring shall land on din-rail mounted terminal blocks near the bottom of the control panel prior to distribution within the control panel.

E. All spare I/O shall be brought out to terminal blocks for future use.

F. Like devices, equipment, or signals shall be grouped together on terminal blocks. Terminal block layout shall provide for future expansion without the need for renumbering.

G. All terminal blocks shall be rated for 600 volts AC and shall be identified with a permanent machine printed marking.

H. A maximum of two (2) wires shall be provided per terminal block.

I. Field signal terminal blocks:

1. 24Vdc Fuse modular terminal block - UKK 5-HESILED 24 (5X20) – 3026654

2. 120Vac Fuse modular terminal block - UKK 5-HESILA 250 (5X20) – 0711629

J. For multiplex signal terminal blocks:

1. 120v Four-conductor universal terminal block - UT 4-QUATTRO RD – 3074460

2. 24v Feed-through terminal block - UT 4-QUATTRO BU – 3044584

K. Feed through terminal blocks:

1. UT 4-QUATTRO – 3044571

L. For Isolation or disconnect terminal blocks:

1. Single level knife disconnect terminal blocks - UT 4-QUATTRO-MT- 3064043

2. Double level knife disconnect terminal blocks - UTTB 4-MT – 3044775

M. Analog signal (Input and Output) terminal blocks:

3. Fuse modular terminal block - UT 4-PE/L/HESILED 24 (5X20) – 3214321

N. Products: Terminal Blocks shall be manufactured by Phoenix Contact or Engineer approved equivalent.

PART 3 -- EXECUTION

3.01 FABRICATION

A. Enclosures shall provide mounting for power supplies, control equipment, input/output subsystems, panel mounted equipment and appurtenances. Ample space shall be provided between equipment to facilitate servicing and cooling.

B. Enclosures shall be sized to adequately dissipate heat generated by equipment mounted inside the panel. If required, one or more of the following shall be provided to facilitate cooling:

1. Louvered openings near the bottom and top (NEMA 12 cabinets only).

2. Thermostatically controlled, low noise internal air blowers (initial setpoint 75°F) to circulate air within the enclosure, maintaining a uniform internal temperature.

3. Thermostatically controlled, low-noise cooling fans to circulate outside air into the enclosure, exhausting through louvers near the top of the cabinet (NEMA 12 cabinets only). Air velocities through the enclosure shall be minimized to assure quiet operation.

4. All openings in cabinets and panels shall be fitted with dust filters.

C. Enclosures shall be constructed so that no screws or bolt heads are visible when viewed from the front. Punch cutouts for instruments and other devices shall be cut, punched, or drilled and smoothly finished with rounded edges.

D. The temperature inside each enclosure containing digital hardware (i.e., cabinet, panel or console) shall be continuously monitored and shall generate an alarm to the nearest PLC if the temperature rises to an adjustable, preset high temperature.

E. Terminals shall be marked with a permanent, continuous marking strip. One side of each terminal shall be reserved exclusively for field incoming conductors. Common connections and jumpers required for internal wiring shall not be made on the field side of the terminal. Subject to the approval of the Engineer, a vendor's pre-engineered and prefabricated wiring termination system will be acceptable.

F. Wiring shall comply with accepted standard instrumentation and electrical practices. Power, control and signal wiring shall comply with Division 16 of the specifications. For each pair of parallel terminal blocks, the field wiring shall be between the blocks.

G. Separate terminal strips shall be provided for each type of power and signal used within each cabinet.

H. All wiring shall be bundled and run open or enclosed in vented plastic wireway as required. Wireways shall be oversized by a minimum of 10%; overfilled wireways shall not be acceptable. All conductors run open shall be bundled and bound at regular intervals, not exceeding 12 inches, with nylon cable ties. Care shall be taken to separate electronic signal, discrete signal, and power wiring.

I. A copper 120 VAC ground bus shall be installed in each cabinet, and shall be connected to the building power ground. A separate, isolated copper ground bus shall be installed in each cabinet for the logic (24 VDC) ground. Both ground buses shall be clearly labeled as to voltage and function.

J. Interior panel wiring and field wiring shall be tagged at all terminations with machine-printed plastic sleeves. The wire numbering system and identification tags shall be as specified in Section 16123 - Building Wire and Cable. Where applicable, the wire number shall be the ID number listed in the input/output schedules.

K. Wires shall be color coded as follows:

Equipment Ground - GREEN

120 VAC Power - BLACK
120 VAC Power Neutral - WHITE

120 VAC Control (Internally Powered) - RED
120 VAC Control (Externally Powered) - YELLOW

24 VAC Control - ORANGE

DC Power (+) - RED
DC Power (-) - BLACK
DC Control - BLUE

Analog Signal – BLACK/WHITE or BLACK/RED

L. Enclosures shall be provided with a main circuit breaker and a circuit breaker on each individual branch circuit distributed from the panel. Main breaker and branch breaker sizes shall be coordinated such that an overload in a branch circuit will trip only the branch breaker but not the main breaker.

M. Enclosures with any dimension larger than 36 inches shall be provided with 120-volt duplex receptacles for service equipment and fluorescent service lights.

N. Convenience Outlet – General Enclosures

1. GFCI convenience outlets shall be UL labeled, industrial grade, and DIN rail mounted. GFCI outlets shall be rated for 120 VAC, 15 A.

2. GFCI convenience outlets shall be labeled with the tag number indicated in the Contract Drawings and shall clearly indicate the maximum current available.

3. Power to these devices shall be independent from the PLC power supply and its associated uninterruptible power system.

O. Convenience Outlet – MCP-1

1. UPS Duplex Receptacle – Outlets shall be UL labeled, industrial grade, and DIN rail mounted. Outlets shall be rated for 120 VAC, 30 A and mounted in lower left corner dedicated for the 120V AC UPS.

2. GFCI Convenience Quadraplex Receptacle – Outlets shall be UL labeled, industrial grade, and DIN rail mounted. GFCI outlets shall be rated for 120 VAC, 15 A.

P. Where applicable, enclosures shall be furnished with red laminated plastic warning signs in each section. The sign shall be inscribed "WARNING - This Device Is Connected to Multiple Sources of Power". Letters in the word "WARNING" shall be 0.75 inch high, white.

Q. The interconnection between equipment and panel shall be by means of flexible cables provided to permit withdrawal of the equipment from the cabinet without disconnecting the plugs.

3.02 PAINTING

A. All steel enclosures shall be free from dirt, grease, and burrs and shall be treated with a phosphatizing metal conditioner before painting. All surfaces shall be filled, sanded, and finish coated by spraying a 1-2 mil epoxy prime coat and smooth, level, high grade textured finish between flat and semi-gloss shine. The colors shall be selected by the Owner from a minimum of six color samples provided. Refer to Division 9 for additional requirements.

B. Materials and techniques shall be of types specifically designed to produce a finish of superior quality with respect to adherence, as well as impact and corrosion resistance.

C. Panels fabricated from stainless steel shall not be painted.

3.03 INSTALLATION

A. Refer to Section 17000 for additional requirements.

- END OF SECTION -

SECTION 17510 - CABINETS AND PANELS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the cabinets and panels, with all spare parts, accessories, and appurtenances as specified herein and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17500 – Enclosures, General

C. Section 17900 – Schedules and Control Descriptions, General

PART 2 -- PRODUCTS

2.01 CABINETS AND PANELS

A. Cabinets and panels shall be formed or welded construction, reinforced with Unistrut, Powerstrut, or equal to facilitate mounting of internal components or equipment. Sufficient access plates and doors shall be provided to facilitate maintenance and testing of the cabinet's equipment. Doors shall be removable. Cabinets and panels with any dimension 36 inches or greater shall be provided with removable lifting lugs designed to facilitate safe moving and lifting of the panel during installation. All doors shall be fitted with common-keyed locks.

B. Cabinets and panels shall be minimum 14 USS gauge. Cabinets and panels with any dimension greater than 36 inches shall be 12 USS gauge.

C. Cabinets and panels located inside buildings, but located in areas other than climate controlled (heated and air conditioned) electrical or control rooms, shall be as a minimum 316 stainless steel NEMA 4X construction, or as specified or shown on the Drawings for hazardous area classification (Class, Division, Group), or submersible (NEMA 6) applications. Epoxy coated cast copper-free aluminum construction shall also be acceptable for NEMA 4, 6 and 7 applications. Cabinets located in chlorine storage/feed areas shall be of non-metallic, FRP construction, rated NEMA 4X.

D. Cabinets and panels within climate controlled (heated and air-conditioned) electrical or control rooms shall be all steel fully enclosed NEMA 12 units with gasketed doors.

E. Cabinets and panels shall have doors on the front and shall be designed for front access. NEMA 12 cabinets shall be fitted with three-point door latches. Door latches for NEMA 4X cabinets shall be all stainless steel, fast operating clamp assemblies that do not require bolts or screws to secure. Door hardware on NEMA 4X cabinets located in chlorine storage/feed areas shall be non-corrosive in that environment.

F. Panels and cabinets located outside fence-secured areas shall be fitted with padlockable latch kits.

G. All cabinets and panels shall be provided with drawing pockets for as-built panel drawings. One copy of the appropriate panel as-built drawings shall be furnished and left in the pocket of each panel.

H. Panels with any dimension greater than 36 inches that contain a programmable controller (PLC or DCU) shall be provided with a folding laptop programmer shelf on the inside of the door.

I. Cabinets and panels shall be prefabricated cabinets and panels by Hoffman or Rittal. The Contractor may optionally provide cabinets that are custom-fabricated by the instrumentation subcontractor or by a reputable panel fabrication shop acceptable to the Engineer.

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Refer to Section 17500 for additional requirements.

- END OF SECTION -

SECTION 17520 - FIELD PANELS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the field panels, with all spare parts, accessories, and appurtenances as specified or shown.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17500 – Enclosures, General

PART 2 -- PRODUCTS

2.01 FIELD PANELS

A. Field panels for outdoor service shall be suitable for wall or pipe mounting. Panels shall have the following features:

1. Type 316L stainless steel NEMA 4X construction unless located in chlorine environments. Chlorine environment shall be nonmetallic NEMA 4X construction.

2. Hinged and foamed-in-place continuous gasketed door(s). Door material shall match enclosure and shall have piano hinge(s) and three-point latches.

3. Field panels located outside fence-secured areas shall be fitted with staple and hasp. Provide padlock and coordinate keying with Owner.

4. Thermal insulation and thermostatically controlled space heaters where required to prevent condensation or maintain environmental conditions for installed components.

5. External sun shields or shades constructed of the same materials as the associated enclosure, unless otherwise specified. Sun shield or shade shall be fitted to enclosure supports and not to enclosure. Sun shield or shade shall have a slightly sloped top to shed water and shall extend past the front of the enclosure by at least 6 inches and extend down the side and back of enclosure.

B. All external sample/process piping, including valves and appurtenances, shall be insulated with weather-proof insulation and heat-taped to prevent freezing. Heat taping shall be thermostatically controlled and self-regulating, and shall adjust its heat output to the temperature of the lines. Heat tape shall be powered from a GFCI circuit from within panel, unless otherwise shown or specified.

C. Field panels shall be adequately sized to house instruments, power supplies, surge protection, and appurtenant equipment required for operation. Sufficient space shall be provided for servicing instruments without removal of equipment from the enclosure.

D. Field panels shall be as manufactured by Hoffman, Saginaw Control and Engineering (SCE), or equal.

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Refer to Section 17500 for additional requirements.

- END OF SECTION -

SECTION 17550 - PANEL INSTRUMENTS AND ACCESSORIES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the panel instruments and accessories, with all spare parts, accessories, and appurtenances as specified herein and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17100 – Control and Information System Hardware, General

C. Section 17500 – Enclosures, General

D. Section 17900 – Schedules and Control Descriptions

1.03 GENERAL INFORMATION AND DESCRIPTION

A. All equipment mounted on the face of a panel shall conform to the same NEMA rating specified for the panel construction.

1.04 TOOLS, SUPPLIES AND SPARE PARTS

A. Tools, supplies and spare parts shall be provided as specified in Section 17050 - Tools, Supplies and Spare Parts. In addition, the following specific spare parts items shall be provided:

A. One of each type of panel mounted equipment (i.e., indicators, signal converters, etc.) provided under this Contract.

B. Five of each type of interposing relay provided under this Contract.

PART 2 -- PRODUCTS

2.01 ELECTRONIC INDICATORS

A. Electronic indicators shall be 3.5 or 6 digit, as appropriate, with 0.56" high red LED display. Indicators shall be provided with nameplate and scale calibrated to match the calibration of the primary element. The unit shall be designed primarily for use with 4-20 mA current loop signal circuits. Indicator operating voltage shall be 115 VAC 10%, 60 Hz. Indicator controls shall include three (3) front-panel pushbuttons for modifying alarm values and

other indicator setup. Where required, a regulated and isolated 24 Vdc power supply shall be provided. Indicators shall be Red Lion Model PAX with PAX CDL Analog Output Card, or engineer approved equal.

2.02 SIGNAL CONVERTERS

A. Signal converters shall be provided as required to provide control functions and to interface instrumentation and controls, equipment panels, motor control centers and other instrumentation and controls supplied under other Divisions to the controls provided herein.

B. General Requirements – Converters shall be of the miniature type, utilizing all solid state circuitry suitable for mounting within new or existing cabinetry. Where sufficient cabinet space is not available, sub panels or supplemental enclosures shall be provided. Power supply shall be 120V, 60 hertz where required by the converter. Repeatability shall be 0.1% of span, deadband shall be 0.1% span, maximum. Where specific converters are not listed, but are required to interface with the process control system, they shall comply with the general requirements stated herein.

C. Current to Current Isolators – Current to current isolators shall be furnished where necessary to provide an isolated current loop, calculations or signal amplification between the plant process control system and instrumentation and control loops. Isolators shall be sized such that resistance of existing loops shall not exceed maximum rated resistance. Isolators shall be as manufactured by AGM, Moore Industries, Rochester Instrument Systems (RIS), or equal.

D. Voltage to Current Transducers – Voltage to current (or current to voltage) transducers shall convert a voltage signal of one magnitude to a 420 milliamp DC current signal. The output current shall be directly proportional to the input signal voltage. Transducers shall be sized such that loop resistance does not exceed maximum rated resistance. Transducers shall be as manufactured by AGM, Moore Industries, Rochester Instrument Systems (RIS), or equal.

E. Frequency to Current Transducers – Frequency to current transducers shall convert pulserate and pulseduration signals to 420 mA, 24 VDC analog signals. Converters shall include fieldadjustable input frequency range. Converter power shall be 120 VAC, 60 hertz. Transducers shall be sized such that loop resistance does not exceed maximum rated resistance. Transducers shall be suitable for signal transmission via leased telephone lines. Transducers shall be Timeverter as manufactured by AGM, Moore Industries equivalent, Rochester Instrument Systems (RIS) equivalent, or equal.

F. Current to Frequency Transducers – Current to frequency transducers shall convert 420 mA, 24 VDC analog signals to pulserate and pulseduration signals. Converters shall include fieldadjustable output frequency range. Converter power shall be 120 VAC, 60 hertz. Transducers shall be sized such that loop resistance does not exceed maximum rated resistance. Transducers shall be suitable for signal transmission via leased telephone lines. Transducers shall be Quantimer as manufactured by AGM, Moore Industries equivalent, Rochester Instrument Systems (RIS) equivalent, or equal.

G. Integrators – Integrators shall be provided as interchangeable plugin modules with zero and span adjustment available on the front plate of the units. Output shall range from 0 to 0.1 through 0 to 10 pulses per second. Accuracy shall be ± 0.1% of input span. Integrators shall convert linear analog signals to pulse rate and provide a solidstate output. Integrators shall be as manufactured by AGM Electronics, Moore Industries, Rochester Instrument Systems (RIS), or equal.

H. Electronic Switches (Alarm Relays) – Electronic switches shall be furnished with a calibrated dial for adjusting set points. The input to the switch shall be 420 mADC, and the set point shall be adjustable over the full range. Unless otherwise noted, the dead band shall be fixed at less than 2 percent of span. The set point stability shall be ±0.1% per degree F. The repeatability shall be ±0.1% of span. The units shall be furnished with SPDT relays rated at 10 amperes at 115 VAC. Electronic switches shall be as manufactured by AGM, Moore Industries, Rochester Instrument Systems (RIS), or equal.

I. RTD to Current Signal Converters – RTD to current signal converters shall convert a 3-wire RTD input signal to an isolated 420 mADC output signal. Each converter shall operate from a 120 VAC power source. Accuracy shall be 0.10 percent of span or better. Calibrated span of each converter shall be as indicated on the instrument list. The Contractor shall coordinate calibration of the signal converters with existing RTD elements. The signal converters shall be furnished in the manufacturer's standard enclosure for installation in an existing indoor electrical cabinet. Signal converters shall be as manufactured by AGM, Moore Industries, Rochester Instrument Systems (RIS), or equal.

J. Interposing Relays Used with Electrical Equipment:

1. Where required to interface between motor control centers, equipment controls, and control panels, interposing relays and associated control wiring circuitry shall be furnished and installed to provide the monitoring and/or control functions specified herein.

2. Interposing relays shall be miniature type, DPDT, minimum 10 amp, 120 VAC contact rating. Relay coils shall be 24 VDC. Relays shall be Type KU as manufactured by Square D, Potter & Brumfield, Allen-Bradley, or equal.

K. Interposing Relays Used with PLC I/O:

1. Interposing relays shall be utilized on all digital outputs in lieu of PLC output cards.
2. Interposing relays shall be miniature industrial type with 120 VAC coils or pluggable miniature type for 24 VDC coils.
3. Relays shall have LED indication of energized/de-energized state.
4. Relays shall be SPDT or DPDT type with AgNi contacts rated for 6A resistive minimum.
5. Interposing relays shall be manufactured by: Finder or Engineer Approved Equal.

L. Timing Relays – Timing Relays (TR) shall be the general purpose plug-in type, Type JCK as manufactured by Square D Company, Cutler-Hammer/Westinghouse Electric Corporation equivalent, Allen-Bradley equivalent, or equal. Timing relays shall be electronic type with 120 VAC coils unless otherwise specified or indicated on the Drawings. Timers shall be provided with a minimum of two SPDT timed output contacts and instantaneous contacts where required. Contact ratings shall be the same as for interposing relays as specified above.

M. Intrinsically Safe Relays and Barriers – Intrinsically safe relays and barriers shall be provided where required to interface with equipment such as float level switches that are located in NFPA-classified hazardous areas. Intrinsically safe relays and barriers shall be FM approved and shall be manufactured by Pepperl and Fuchs, Crouse Hinds, Square D, or equal.

2.03 ACCESSORIES

A. Control operators such as pushbuttons (PB), selector switches (SS), and pilot lights (PL) shall be Cutler-Hammer/Westinghouse Type E34, Square D Company Type SK, or equal. Control operators shall be 30.5 mm, round, heavy-duty, oil tight NEMA 4X corrosion resistant.

B. Pushbuttons shall be non-illuminated, spring release type. Pushbuttons shall include a full guard. Panic stop/alarm pushbuttons shall be red mushroom type with manual-pull release. Selector switches shall be non-illuminated, maintained contact type. Pilot lights shall be of the proper control voltage, LED type with light lens colors shall be as specified below.

	Color	Function
1.	Green	Running (Open)
2.	Red	Stopped or Off (Closed)
3.	Amber	Fault
4.	White	Other
5.	Grey	Out-of-Service

C. Control operators shall have legend plates as specified herein, indicated on the Drawings, or otherwise directed by the Engineer. Legend plates shall be plastic, black field (background) with white lettering. Engraved nameplates shall be securely fastened above each control operator. If adequate space is not available, the nameplate shall be mounted below the operator.

D. Control operators for all equipment shall be as specified herein and of the same type and manufacturer unless otherwise specified or indicated on the Drawings.

E. Alarm horns shall be general-purpose type, flush panel mount, 115 VAC power supply or 24 VDC power supply, suitable for indoor or weatherproof service, as required. Volume shall be adjustable.

2.04 ANNUNCIATOR SYSTEMS

1. The annunciator systems shall be installed as specified herein and as shown on the Drawings. Annunciator systems shall be of the all-silicon, solid state type furnished with a separately mounted alarm horn, logic circuitry, a DPDT auxiliary output relay, translucent windows and white lamps. Acknowledge and test switches shall be of the heavy-duty oil-tight type.

2. The system shall include filter networks on the power supply and each input point. Each point shall be provided with a two-position switch to allow the annunciator to operate with either normally open or normally closed field contact. Maximum field contact interrogation voltage shall be 24 VDC. Each point shall be equipped with a DPDT repeater relay.

3. The auxiliary output relay shall normally be energized whenever the horn is sounded. When the test circuit is energized, all components except the auxiliary relay shall be energized.

4. The lamps shall be operated at reduced voltage and shall be rated for 50,000 hours. The lamps shall be easily replaceable as an off-the-shelf item from at least two manufacturers.

5. The system shall be capable of operation in an ambient temperature of 0 to 150 degrees F, with a line voltage variation of ± 10 percent.

6. The system shall be capable of operating with a lock-in alarm sequence, as indicated on the following table:

	Field Contact Normal	**Field Contact Abnormal**	**Return to Normal Before Acknowledge**	**Alarm Acknowledge**	**Return to Normal**
Lamp:	OFF	FLASHING	ON	ON	OFF
Horn:	OFF	ON	OFF	OFF	OFF

G. The system shall be as manufactured by Ronan Engineering Company, or Panalarm Division of Ametek, Inc., or equal.

H. Each system shall be furnished with at least 10% but not less than two spare (active) points, with a minimum of 10% but not less than six (boxed) spare lamps.

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Refer to Section 17500 for additional requirements.

- END OF SECTION -

SECTION 17560 – TRANSIENT VOLTAGE SURGE SUPPRESSION DEVICES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish, install and place in satisfactory operation the transient voltage surge suppression (TVSS) devices as specified herein and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 - Control and Information System Scope and General Requirements

B. Section 17060 – Signal Conditioning Requirements

C. Section 17120 – Programmable Logic Controllers

D. Section 17500 – Enclosures, General

E. Section 17550 – Panel Instruments and Accessories

1.03 GENERAL INFORMATION AND DESCRIPTION

A. All surge protectors of each type provided under this Contract shall be furnished by a single manufacturer.

1.04 TOOLS, SUPPLIES AND SPARE PARTS

A. The following specific spare parts items shall be provided:

1. Five of each type of transient voltage surge suppression (TVSS) devices provided under this Contract.

PART 2 – PRODUCTS

2.01 ELECTRICAL TRANSIENT PROTECTION, GENERAL

A. All electrical and electronic elements shall be protected against damage due to electrical transients induced in interconnecting lines from lightning discharges and nearby electrical systems.

B. Manufacturer's Requirements: All transient voltage surge suppressor devices shall be multi stage serial devices manufactured by a company that has been engaged in the design, development, and manufacture of such devices for at least 5 years. Acceptable manufacturers shall be Phoenix Contact or Engineer approved equal. Transient voltage surge suppressor device design requirements shall include the following:

1. Transient voltage surge suppression devices shall be two part, DIN rail mounted, high density, plug-and-base modular terminal block format. The two part plug and base format shall facilitate arrestor module replacement without rewiring.

2. Surge suppression devices shall provide a combination of wire to ground and wire to wire protection.

3. Suppression devices shall be grounded via the grounded DIN rail.

4. Surge suppression devices shall be modular, single channel devices and shall utilize a combination of gas discharge tubes, varistors and suppression diodes in a multistage configuration to protect nominal voltage ranges between 5 VDC and 230 VAC.

5. Each surge suppression module shall provide local LED indication of arrestor status as well as dry contact output for remote indication of arrestor status the associated PLC to alert when arrestor replacement is required.

6. For surge suppression modules within control panels, for each group of up to twenty eight (28) surge suppression modules, provide a DIN rail mounted surge suppressor monitor/control module (or functional equivalent) to indicate and provide common group alert dry contact outputs to the local PLC I/O system for predictive fault monitoring. Individual status outputs shall be provided for device warning and device overload conditions. Each surge suppressor monitor/control module shall also provide the distribution of power for the LED status indication lights on each group of up to twenty eight (28) surge suppression modules serving the control panel field I/O wiring terminal block system.

7. Configure SCADA system for remote status monitoring for each installed surge suppression monitor/control module device. Provide all required additional PLC I/O as necessary to provide the specified surge suppression module group status monitoring functionality.

8. DIN rail mounted bases shall be modular type, screw or push-in wiring terminal type, with individually labeled terminals. Bases shall serve as the field terminal blocks between all panel-mounted devices and internal wiring and all field power, communications, I/O signal and ancillary wiring external to the panel.

C. Surge protection device installations shall comply with UL 94, the National Electric Code (NEC), and all applicable local codes.

D. Surge protection devices shall be installed as close to the equipment to be protected as practically possible.

E. Suppressor Locations: As a minimum, provide surge suppressors at the following locations:

1. At all connections between AC power, DC power and associated electrical and electronic equipment, including panels, cabinets, and rack assemblies, as well as at

field mounted powered instruments (where new field instrumentation devices are specified to be furnished and installed).

2. Where new field instrumentation is specified to be furnished and installed, provide protection at both ends of all two-wire analog signal circuits and all four wire analog power/ signal circuits.

3. Where existing field instrumentation is to be reconnected to modified and new local control panels, provide protection at the panel end of all two-wire analog signal circuits and all four wire analog power/ signal circuits.

4. At the panel end of all analog inputs and outputs and all discrete input (dry contact) circuits and discrete output (24 VDC or relay contact) circuits that extend to all devices outside of the PLC enclosure. Control panel field wiring terminal blocks for all discrete and analog inputs and outputs shall be DIN rail mounted, modular type with integral transient voltage surge suppression and other signal isolation and protective devices, as required. Terminal block wiring connections shall be screw or push-in type and shall accept 24-14 AWG wire; rated for the signals carried and labeled as manufactured by Phoenix Contact, or equal.

5. At each device termination point of copper-based communication cables (serial, parallel, Ethernet, Device Net, etc.).

6. On all telephone communications lines.

7. RF antenna cable radio terminus.

F. Surge suppressors shall be as follows:

1. 120-Volt power surge suppressor: The protector shall be PLUGTRAB series by Phoenix Contact, or Engineer approved equivalent.

2. 120-Volt powered, field mounted analog transmitter: The protector shall combine AC power protection and 4-20 mA signal line protection inside a compact 316 stainless steel enclosure. The enclosure shall have surge suppressor “Warning and “Alarm Status” LED indicator lights on the front of the enclosure. The suppressor shall be BOXTRAB series by Phoenix Contact or Engineer approved equivalent.

3. Two-wire field-mounted analog transmitter: 4-20 mA signal line protection shall be stainless steel pipe-type and shall be Phoenix Contact SURGETRAB S-PT1-24DC , or Engineer approved equivalent.

4. 4-20 mA analog input/output signal line protection at the panel side: The protector shall be PLUGTRAB IQ series by Phoenix Contact, or Engineer approved equivalent.

5. Two-wire discrete input/output signal line protection at the panel side: The protector shall be PLUGTRAB IQ series by Phoenix Contact, or Engineer approved equivalent.

6. Surge suppressors for copper-based data communication circuits: Shall be designed for the specific data communication media and protocol to be protected (e.g.,

telephone, serial, parallel, Ethernet, DeviceNet, coax, twinaxial, twisted pair, RF, etc.), and shall provide protection of equipment to within the equipment's surge withstand levels for applicable standard test wave forms of the following standards:

a. IEC 60-1 / DIN VDE 0432 part 2

b. CCITT K17 / DIN VDE 0845 part 2

c. IEEE C62.31

d. Shall be PLUGTRAB IQ, PLUGTRAB, or DATATRAB by Phoenix Contact, or Engineer approved equivalent.

PART 3 – EXECUTION

3.01 REQUIREMENTS

A. Install in accordance with manufacture recommended practices and applicable codes.

B. Refer to Section entitled "Enclosures, General" for additional requirements.

- - END OF SECTION - -

SECTION 17600 - UNPOWERED INSTRUMENTS, GENERAL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The instrumentation subcontractor shall furnish, install, test and place in operation process instrumentation (flow elements, pressure switches, etc.) as scheduled herein together with all signal converters, transmitters, isolators, amplifiers, etc. to interface all instrumentation, panels, controls and process equipment control panels with the process controls as shown on the Drawings and as specified. The Contractor may elect to install primary elements (flowmeters, etc.) on process lines provided that the instrumentation subcontractor provides full on-site supervision during installation. Mounting of associated transmitters, indicators, power supplies, brackets and appurtenances shall be provided as specified herein and shown on the Drawings.

B. It is the intent of the Contract Documents that all process taps, isolation valves, nipples, penetrations, embedded instrumentation supports, conduit, wiring, terminations, and the installation of process instrumentation on process lines shall be provided under this Contract. The instrumentation subcontractor shall supervise installation of equipment provided under this Division where installation is provided by others.

C. Tapping and connections for primary process sensors shall be sized to suit each individual installation and the requirements of the instrument served. The Contractor shall ensure that the location, supports, orientation and dimensions of the connections and tapping for instrumentation furnished under this Division are such as to provide the proper bracing, the required accuracy of measurement, protection of the sensor from accidental damage and accessibility for maintenance while the plant is in operation. Isolation valves shall be provided at all process taps.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17500 – Enclosures, General

C. Section 17650 – Pressure Gauges

D. Section 17670 – Level Switches (Suspended Float Type)

E. Section 17682 – Level Switches (Sliding Float Type)

F. Section 17698 – Instrumentation and Control System Accessories

G. Unpowered instruments furnished with mechanical equipment shall be furnished, installed, tested and calibrated as specified elsewhere in the Contract Documents.

1.03 TOOLS, SUPPLIES AND SPARE PARTS

A. Tools, supplies and spare parts shall be provided as specified in Section 17050.

B. In addition to the above requirements, the instrumentation subcontractor shall provide spare parts as specified in individual instrument specification sections.

PART 2 -- PRODUCTS

2.01 GENERAL

A. Unless otherwise specified, instruments shall be provided with enclosures to suit specified environmental conditions. Field-mounted devices shall be rugged and mounted on walls or pipe stanchions.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Equipment shall be located so that it is accessible for operation and maintenance. The instrumentation subcontractor shall examine the Drawings and Shop Drawings for various items of equipment in order to determine the best arrangement for the work as a whole, and shall supervise the installation of process instrumentation supplied under this Division.

B. Field equipment shall be wall mounted or mounted on two-inch diameter pipe stands welded to a 10-inch square 1/2-inch thick base plate unless shown adjacent to a wall or otherwise noted. Materials of construction shall be aluminum or 316 stainless steel. Instruments attached directly to concrete shall be spaced out from the mounting surface not less than 1/2-inch by use of phenolic spacers. Expansion anchors in walls shall be used for securing equipment or wall supports to concrete surfaces. Unless otherwise noted, field instruments shall be mounted between 48 and 60 inches above the floor or work platform.

C. Embedded pipe supports and sleeves shall be Schedule 40, Type 316 stainless steel pipe, ASA B-36.19, with stainless steel blind flange for equipment mounting as shown on the Drawings.

D. Materials for miscellaneous mounting brackets and supports shall be 316 stainless steel construction.

E. Pipe stands, miscellaneous mounting brackets and supports shall comply with the requirements of Division 5 of the specifications.

3.02 ADJUSTMENT AND CLEANING

A. The instrumentation subcontractor shall comply with the requirements of Division 1 of these Specifications and all instrumentation and control system tests, inspection, and

calibration requirements for all instrumentation and controls provided under this Contract and specified herein. The Engineer, or his designated representative(s), reserves the right to witness any test, inspection, calibration or start-up activity. Acceptance by the Engineer of any plan, report or documentation relating to any testing or commissioning activity specified herein shall not relieve the Contractor of his responsibility for meeting all specified requirements.

B. The instrumentation subcontractor shall provide the services of factory trained technicians, tools and equipment to field calibrate, test, inspect and adjust each instrument to its specified performance requirement in accordance with manufacturer's specifications and instructions. Any instrument which fails to meet any Contract requirements, or any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the Engineer, at no cost to the Owner. The Contractor shall bear all costs and provide all personnel, equipment and materials necessary to implement all installation tests and inspection activities for equipment specified herein.

C. At least 60 days before the anticipated initiation of installation testing, the Contractor shall submit to the Engineer a detailed description, of the installation tests to be conducted to demonstrate the correct operation of the instrumentation and control system.

D. Field instrument calibration requirements shall conform to the following:

1. The instrumentation subcontractor shall provide the services of factory trained instrumentation technicians, tools and equipment to field calibrate each instrument supplied under this Contract to its specified accuracy in accordance with the manufacturer's specification and instructions for calibration.

2. Each instrument shall be calibrated at 0, 25, 50, 75 and 100 percent of span using test instruments to simulate inputs and read outputs. Test instruments shall be rated to an accuracy of at least five (5) times greater than the specified accuracy of the instrument being calibrated. Where applicable, such test instruments shall have accuracy’s as set forth by the National Institute for Standards and Technology (NIST).

3. The instrumentation subcontractor shall provide a written calibration sheet to the Engineer for each instrument, certifying that it has been calibrated to its published specified accuracy. The Contractor shall submit proposed calibration sheets for various types of instruments for Engineer approval prior to the start of calibration. This sheet shall include but not be limited to date, instrument tag numbers, calibration data for the various procedures described herein, name of person performing the calibration, a listing of the published specified accuracy, permissible tolerance at each point of calibration, calibration reading as finally adjusted within tolerance, defect noted, corrective action required and corrections made.

4. If doubt exists as to the correct method for calibrating or checking the calibration of an instrument, the manufacturer's printed recommendations shall be used as an acceptable standard, subject to the approval of the Engineer.

5. Upon completion of calibration, devices shall not be subjected to sudden movements, accelerations, or shocks, and shall be installed in permanent protected positions not subject to moisture, dirt, and excessive temperature variations. Caution shall be exercised to prevent such devices from being subjected to overvoltages, incorrect voltages, overpressure or incorrect air. Damaged equipment shall be replaced and recalibrated at no cost to the Owner.

- END OF SECTION -

SECTION 17650 - PRESSURE GAUGES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the pressure gauges, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17600 – Unpowered Instruments, General

C. Section 17698 – Instrumentation Accessories

PART 2 -- PRODUCTS

2.01 PRESSURE GAUGES

A. All gauges shall be designed in accordance with the ASME B40.1 entitled, "Gauges, Pressure, Indicating Dial Type - Elastic Element".

B. All gauges shall be direct reading type. Snubbers shall be provided on all gauges. Gauge full-scale pressure range shall be selected such that the maximum operating pressure shall not exceed the approximately 75% of the full-scale range.

C. Features

1. Mounting: ½" NPT, lower stem mount type
2. Accuracy: 0.5% full scale
3. Case: Solid front, black phenolic material
4. Dial: White background and black letters
5. Glass: Shatterproof
6. Blow-out protection: Back
7. Pressure element: stainless steel bourdon tube
8. Movement: Stainless steel, Teflon coated pinion gear and segment
9. Gaskets: Buna-N

D. Liquid-filled or equivalent mechanically-damped gauges shall be used if the gauges are installed with pumps, or where gauges are subjected to vibrations or pulsation. Filling fluid shall be silicone unless oxidizing agents such as sodium hypochlorite are present, where halocarbon shall be used.

E. Gauge size shall be 2" for line sizes up to 3" and 4½" for line sizes of 4" or greater.

F. Diaphragm seals and isolating ring seals shall be furnished in accordance with the requirements specified under Section 17698 - Instrumentation and Control System Accessories.

G. The complete gauge assembly and appurtenances shall be fully assembled and tested prior to field mounting. A ½" isolation stainless steel ball valve shall be provided for each gauge assembly.

H. Pressure and vacuum gauges shall be Ashcroft Duragauge Model 1279, Ametek-U.S. Gauge Division, H.O. Trerice Co., WIKA Instrument Corporation, or equal.

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Refer to Section 17600, Part 3.

- END OF SECTION -

SECTION 17670 - LEVEL SWITCHES (SUSPENDED FLOAT TYPE)

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the float level switches, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Control and Information System, General

B. Unpowered Instruments, General

PART 2 – PRODUCTS

2.01 LEVEL SWITCHES (SUSPENDED FLOAT TYPE)

A. Level switches of the direct acting float-operated design and shall meet the following specifications:

1. Casing - hermetically sealed, approximately 5-inch diameter conductive polypropylene casing float, containing microswitches. Ingress protection shall be IP 68.

2. Cable - Level switches shall be flexibly supported by means of a three-conductor cable with PVC (or nitrile/PVC) and EPDM rubber sheath. Cable length shall be a minimum of 30’.

3. Liquid Density - Unless otherwise specified, media specific gravity is 0.95 to 1.05 g/cm3.

4. Microswitches - shall be one normally open and one normally closed. Microswitch electrical range shall be 250V/10A AC or 24V/10mA min. to 6A max.

5. Supports - Float hangers and supports shall be provided as shown on the Instrumentation Detail Drawings.

6. Weights - Each float switch shall be weighted with a cable weight furnished by the manufacturer.

7. Float switches shall be Model ENM-10 by Flygt (XYLEM) or Model 7010 by B/W Controls; No Substitutions.

2.02 FLOAT SWITCH JUNCTION BOX

A. Furnish a junction box for the float switch cable terminations near the hatch mounted cable hanger assembly shown on the Instrumentation Detail Drawings for the proposed ground storage tank.

B. Junction boxes shall include the following:

1. Minimum 6-inch x 6-inch x 4-inch stainless steel hinged cover junction box with white 14 ga carbon steel backplane.

2. Wago terminal blocks 2004-1201

3. Wago end clamps 249-117

4. Wago grounding terminal 2004-1207

5. Blackburn ground lug ADR11-21

6. Phenolic nameplate

PART 3 – EXECUTION

3.01 REQUIREMENTS

A. Refer to Section 17600 - Unpowered Instruments, General.

- END OF SECTION -

SECTION 17682 - LEVEL SWITCHES (SLIDING FLOAT TYPE)

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the float level switches, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Control and Information System Scope and General Requirements

B. Unpowered Instruments, General

PART 2 -- PRODUCTS

2.01 LEVEL SWITCHES (SLIDING FLOAT TYPE)

A. Level switches of the direct acting float-operated design shall be comprised of a hermetically sealed float assembly that slides vertically on a stainless steel column containing micro switches and supported by means of 40 foot cable connecting into a water tight electrical junction box installed at or above the platform elevation. The float assembly shall have an integral weight to hold assembly in correct position. Micro switches shall be one normally open, 5A-115V AC capacity.

B. Float support assembly shall be provided as shown on the Instrumentation Detail Drawings.

C. Float switches shall be Model LS-750 Series as manufactured by Gems Sensors, or Engineer Approved Equal.

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Refer to the Section entitled “Unpowered Instruments, General”.

- END OF SECTION -

SECTION 17698 - INSTRUMENTATION AND CONTROL SYSTEM ACCESSORIES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the instrumentation and control system accessories with all spare parts, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17600 – Unpowered Instruments, General

C. Section 17700 – Powered Instruments, General

D. Section 16902 – Electric Controls and Relays

PART 2 -- PRODUCTS

2.01 INSTRUMENTATION AND CONTROL SYSTEM ACCESSORIES

A. General: Accessories include various items of equipment that may be required in the system but are not scheduled. Accessories are shown on details, flow sheets or plans. Accessories are also called out in specifications for scheduled instruments and in the installation specifications. It is not intended, however, that each piece of hardware required will be specifically described herein. This subarticle shall be used as a guide to qualify requirements for miscellaneous hardware whether the specific item is described or not.

B. Process Tubing: Process tubing shall be 1/2 x 0.065-inch seamless, annealed, ASTM A-269 Type 316L stainless steel with Type 316 - 37 degrees stainless steel flared fittings or Swagelock or Parker-CPI flareless fittings.

C. Power, Control and Signal Cables: Power, control and signal wiring shall be provided under Division 16 of the Specifications.

D. Diaphragm Seals: Diaphragm seals shall be provided for isolation of all pressure gauges, switches and transmitters attached to systems. As a minimum, seals shall be of all 316 stainless steel construction. In general, diaphragms shall be 316L stainless steel for operating pressures at or above 15 psi and elastomers for operating pressures below 15 psi. However, all components shall be non-reactive with the process fluid in all cases. Refer to the Instrument Schedules for specific materials requirements. Seal shall have fill connection, 1/4-inch NPT valved flush port and capable of disassembly without loss of filler fluid. Where specified, diaphragm seals shall comply with the above requirements

and shall be provided with 316 SS factory filled capillaries. Seals shall be Helicoid Type 100 HA, Mansfield & Green, Ashcroft, or equal.

E. Filling Medium: The filling medium between instruments, isolating ring seals and diaphragm seals shall be a liquid suitable for operation in an ambient temperature ranging from -10°F to +150°F. Filling medium shall be silicone unless oxidizing agents such as sodium hypochlorite are present, where halocarbon shall be used.

F. Isolation Valves: Isolation valves shall be 1/2 - inch diameter ball valves with 316 stainless steel body, 316 stainless steel ball, except that materials of construction shall be suitable for the associated process fluid where applicable (i.e., chemical service).

G. Sirens: Sirens shall be UL Listed, heavy duty, AC motor driven, weatherproof type capable of producing a minimum of 111 dBA at 10 feet. Power supply shall be 120 VAC, 60 hertz. Siren shall be McMaster-Carr Model 6392T11, Federal Signal Corporation equivalent, Edwards Signaling Company equivalent, or equal.

H. Strobe Lights: Strobe lights shall be high profile with Type 304 stainless steel base. Light is rated NEMA 4. Light shall have an outer dome to provide extra lens protection. Lens color shall be as indicated on the Drawings. Surface mount hardware shall be included. Power supply shall be 120 VAC, 60 hertz. Strobe light shall be McMaster-Carr Model 5848T71, Federal Signal Corporation equivalent, Edwards Signaling Company equivalent, or equal.

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Refer to Section 17600, Part 3 of the specifications.

- END OF SECTION –

SECTION 17700 - POWERED INSTRUMENTS, GENERAL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The instrumentation subcontractor shall furnish, install, test and place in operation powered process instrumentation (flow elements, level transmitters, etc.) as scheduled herein together with all signal converters, transmitters, isolators, amplifiers, etc. to interface all instrumentation, panels, controls and process equipment control panels with the process control system as shown on the Drawings and as specified. Powered instruments are those instruments that require power (120 VAC or 24 VDC loop power) to operate. The Contractor may elect to install primary elements (flowmeters, etc.) on process lines provided that the instrumentation subcontractor provides full on-site supervision during installation. Mounting of associated transmitters, indicators, power supplies, brackets and appurtenances shall be provided as specified herein and shown on the Drawings.

B. It is the intent of the Contract Documents that all process taps, isolation valves, nipples, penetrations, embedded instrumentation supports, conduit, wiring, terminations, and the installation of process instrumentation on process lines shall be provided under this Contract. The instrumentation subcontractor shall supervise installation of equipment provided under this Division where installation is provided by others.

C. Tapping and connections for primary process sensors shall be sized to suit each individual installation and the requirements of the instrument served. The Contractor shall ensure that the location, supports, orientation and dimensions of the connections and tapping for instrumentation furnished under this Division are such as to provide the proper bracing, the required accuracy of measurement, protection of the sensor from accidental damage, and accessibility for maintenance while the plant is in operation. Isolation valves shall be provided at all process taps.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17500 – Enclosures, General

C. Section 17698 – Instrumentation and Control System Accessories

D. Section 17701 – Magnetic Flow Meters

E. Section 17731 - Humidity and Temperature Indicating Transmitters

F. Section 17760 – Pressure Indicating Transmitters

G. Powered instruments furnished with mechanical equipment shall be furnished, installed, tested and calibrated as specified elsewhere in the Contract Documents.

PART 2 -- PRODUCTS

2.01 GENERAL

A. All instrumentation supplied shall be the manufacturer's latest design. Unless otherwise specified, instruments shall be solid state, electronic, using enclosures to suit specified environmental conditions. Microprocessor-based equipment shall be supplied unless otherwise specified. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks as shown on the Drawings, or as required.

B. Equipment installed in a hazardous area shall meet Class, Group, and Division as shown on the Drawings, to comply with the National Electrical Code.

C. All field instrumentation for outdoor service shall be provided with enclosures which are suitable for outdoor service, as follows:

1. Where the manufacturer's enclosures are suitable for outdoor service, they shall be provided with instrument sunshades. Sunshades shall be Style E as manufactured by O'Brien Corporation, or equal. Where possible, these instruments shall be mounted in a north facing direction.

2. Where the manufacturer's standard enclosures are not suitable for outdoor service, instruments shall be mounted in Field Panels in accordance with Section 17520, Field Panels. It shall not be necessary to provide the manufacturer's NEMA 4 or 4X enclosures for instruments that will be subsequently mounted in separate field panels.

D. All instruments shall return to accurate measurement without manual resetting upon restoration of power after a power failure.

E. Unless otherwise shown or specified, local indicators shall be provided for all instruments. Where instruments are located in inaccessible locations, local indicators shall be provided and shall be mounted as specified in Subsection 3.01 (B) herein. All indicator readouts shall be linear in process units. Readouts of 0-100% shall not be acceptable (except for speed and valve position). Isolated outputs shall be provided for all transmitters.

F. Unless otherwise specified, field instrument and power supply enclosures shall be 316 stainless steel, fiberglass or PVC coated copper-free cast aluminum NEMA 4X construction.

G. Where separate elements and transmitters are required, they shall be fully matched, and unless otherwise noted, installed adjacent to the sensor. Special cables or equipment shall be supplied by the associated equipment manufacturer.

H. Electronic equipment shall utilize printed circuitry and shall be coated (tropicalized) to prevent contamination by dust, moisture and fungus. Solid-state components shall be conservatively rated for long-term performance and dependability over ambient atmosphere fluctuations. Ambient conditions shall be -20 to 50 degrees C and 20 to 100 percent relative humidity, unless otherwise specified. Field mounted equipment and system components shall be designed for installation in dusty, humid, and corrosive service conditions.

I. All devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single manufacturer, insofar as possible, and shall consist of equipment models that are currently in production. All equipment provided, where applicable, shall be of modular construction and shall be capable of field expansion.

J. All non-loop-powered instruments and equipment shall be designed to operate on a 60 Hz AC power source at a nominal 117 V, plus or minus 10 percent, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

K. All analog transmitter and controller outputs shall be isolated, 4-20 milliamps into a load of 0-750 ohms, unless specifically noted otherwise. All switches shall have double-pole, double-throw contacts rated at a minimum of 600 VA, unless specified otherwise.

L. Materials and equipment used shall be UL approved wherever such approved equipment and materials are available.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. General

1. Equipment shall be located so that it is accessible for operation and maintenance. The instrumentation subcontractor shall examine the Drawings and shop drawings for various items of equipment in order to determine the best arrangement for the work as a whole, and shall supervise the installation of process instrumentation supplied under this Division.

B. Electrical work shall be performed in compliance with all applicable local codes and practices. Where the Contract Documents do not delineate precise installation procedures, API RP550 shall be used as a guide to installation procedures.

C. Equipment Mounting and Support

1. Field equipment shall be wall mounted or mounted on two-inch diameter pipe stands welded to a 10-inch square by 1/2-inch thick base plate unless shown

adjacent to a wall or otherwise noted. Materials of construction shall be aluminum or 316 stainless steel. Instruments attached directly to concrete shall be spaced out from the mounting surface not less than 1/2-inch by use of phenolic spacers. Expansion anchors in walls shall be used for securing equipment or wall supports to concrete surfaces. Unless otherwise noted, field instruments shall be mounted between 48 and 60 inches above the floor or work platform.

2. Embedded pipe supports and sleeves shall be schedule 40, 316 stainless steel pipe, ASA B-36.19, with stainless steel blind flange for equipment mounting as shown on the Drawings.

3. Materials for miscellaneous mounting brackets and supports shall be 316 stainless steel construction.

4. Pipe stands, miscellaneous mounting brackets and supports shall comply with the requirements of Division 5 of the specifications.

5. Transmitters shall be oriented such that output indicators are readily visible.

D. Control and Signal Wiring

1. Electrical, control and signal wiring connections to transmitters and elements mounted on process piping or equipment shall be made through liquid-tight flexible conduit. Conduit seals shall be provided where conduits enter all field instrument enclosures and all cabinetry housing electrical or electronic equipment.

3.02 ADJUSTMENT AND CLEANING

A. General

1. The instrumentation subcontractor shall comply with the requirements of Division 1 of these Specifications and all instrumentation and control system tests, inspection, and calibration requirements for all instrumentation and controls provided under this Contract and specified herein. The Engineer, or his designated representative(s), reserves the right to witness any test, inspection, calibration or start-up activity. Acceptance by the Engineer of any plan, report or documentation relating to any testing or commissioning activity specified herein shall not relieve the Contractor of his responsibility for meeting all specified requirements.

2. The instrumentation subcontractor shall provide the services of factory trained technicians, tools and equipment to field calibrate, test, inspect and adjust each instrument to its specified performance requirement in accordance with manufacturer's specifications and instructions. Any instrument which fails to meet any Contract requirements, or any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the Engineer, at no cost to the Owner. The Contractor shall bear all costs and provide all personnel, equipment and materials necessary

to implement all installation tests and inspection activities for equipment specified herein.

3. At least 60 days before the anticipated initiation of installation testing, the Contractor shall submit to the Engineer a detailed description, of the installation tests to be conducted to demonstrate the correct operation of the instrumentation supplied hereunder.

B. Field Instrument Calibration Requirements

1. The instrumentation subcontractor shall provide the services of factory trained instrumentation technicians, tools and equipment to field calibrate each instrument supplied under this Contract to its specified accuracy in accordance with the manufacturer's specification and instructions for calibration.

2. If the manufacturer's recommendations require calibration, each instrument shall be calibrated at 0, 25, 50, 75 and 100 percent of span using test instruments to simulate inputs and read outputs. Test instruments shall be rated to an accuracy of at least five (5) times greater than the specified accuracy of the instrument being calibrated. Where applicable, such test instruments shall have accuracy's as set forth by the National Institute for Standards and Technology (NIST).

3. The instrumentation subcontractor shall provide a written calibration sheet to the Engineer for each instrument, certifying that it has been calibrated to its published specified accuracy. The Contractor shall submit proposed calibration sheets for various types of instruments for Engineer approval prior to the start of calibration. This sheet shall include but not be limited to date, instrument tag numbers, calibration data for the various procedures described herein, name of person performing the calibration, a listing of the published specified accuracy, permissible tolerance at each point of calibration, calibration reading as finally adjusted within tolerance, defect noted, corrective action required and corrections made.

4. If doubt exists as to the correct method for calibrating or checking the calibration of an instrument, the manufacturer's printed recommendations shall be used as an acceptable standard, subject to the approval of the Engineer.

5. Upon completion of calibration, devices calibrated hereunder shall not be subjected to sudden movements, accelerations, or shocks, and shall be installed in permanent protected positions not subject to moisture, dirt, and excessive temperature variations. Caution shall be exercised to prevent such devices from being subjected to overvoltages, incorrect voltages, overpressure or incorrect air. Damaged equipment shall be replaced and recalibrated at no cost to the Owner.

6. After completion of instrumentation installation, the instrumentation subcontractor shall perform a loop check. The Contractor shall submit final loop test results with all instruments listed in the loop. Loop test results shall be signed by all representatives involved for each loop test.

- END OF SECTION -

SECTION 17701 - MAGNETIC FLOW METERS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the magnetic flow meters, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17700 – Powered Instruments, General

1.03 TOOLS, SUPPLIES AND SPARE PARTS

A. None.

PART 2 -- PRODUCTS

2.01 MAGNETIC FLOW METER SYSTEMS

A. Magnetic flow meter systems shall include a magnetic flow tube and a microprocessor-based "smart" transmitter that is capable of converting and transmitting a signal from the flow tube. Magnetic flow meters shall utilize the characterized field principle of electromagnetic induction and shall produce DC signals directly proportional to the liquid flow rate.

B. Each meter shall be furnished with a carbon steel metering tube and carbon steel flanges with a hard rubber (NBR or ebonite) liner as required by the application and/or as specified herein. Liner shall have a minimum thickness of 0.125 inches. The inside diameter of the liner shall be within 0.125 inches of the inside diameter of the adjoining pipe. Liner protectors shall be provided on all flow tubes.

C. The flow tube shall be provided with flush mounted electrodes.

D. Grounding rings shall be 316 stainless steel.

E. All materials of construction for metallic wetted parts (electrodes, grounding rings, etc.) shall be minimum 316 stainless steel, but shall be compatible with the process fluid for each meter in accordance with the recommendations of the manufacturer. Verify with the manufacturer that the selected electrode material for the magmeters is the least likely material to be affected by either corrosion or erosion.

F. Flow tube shall be rated for pressures up to 1.1 times the flange rating of adjacent piping. System shall be rated for ambient temperatures of -30 to +65°C. Meter and transmitter housings shall meet NEMA 4X requirements as a minimum. Non-metallic transmitter housings shall not be acceptable.

G. The transmitter shall provide pulsed DC coil drive current to the flow tube and shall convert the returning signal to a linear, isolated 4-20 mA DC signal. The transmitter shall utilize "smart" electronics and shall contain automatic, continuous zero correction, signal processing routines for noise rejection, and an integral LCD readout capable of displaying flow rate and totalized flow. The transmitter shall continuously run self-diagnostic routines and report errors via English language messages.

H. Transmitter shall be capable of generating an electronic flow meter calibration verification (E+H Heartbeat Verification or equal by Khrone) document accessible via the Profinet communications interface.

I. The transmitter shall be equipped with an RJ45 port capable of communicating with the PLC via Profinet. A password-based security lockout feature shall be provided to prevent unauthorized modification of configuration parameters.

J. The transmitter's preamplifier input impedance shall be a minimum of 10^9-10^{11} ohms which shall make the system suited for the amplification of low-level input signals and capable of operation with a material build up on the electrodes.

K. The transmitter shall provide an automatic low flow cutoff below a user configurable low flow condition (0-10%). The transmitter's outputs shall also be capable of being forced to zero by an external contact operation.

L. Each flow tube shall be factory calibrated and assigned a calibration constant or factor to be entered into the associated transmitter as part of the meter configuration parameters. Manual calibration of the flow meter shall not be required. Meter configuration parameters shall be stored in non-volatile memory in the transmitter. An output hold feature shall be provided to maintain a constant output during configuration changes.

M. Accuracy shall be a minimum of 0.20% of rate over the flow velocity range of 0.3 to 10.0 m/s. Repeatability shall be 0.1% of rate; minimum turndown shall be 100:1. Maximum response time shall be adjustable between 1 and 100 seconds as a minimum. Transmitter ambient temperature operating limits shall be -10 to +50°C.

N. Power supply shall be 24 V DC. FIT shall be powered from the media converter enclosure 24V DC UPS.

O. Flow tubes shall be 150-lb flange mounted unless otherwise noted. The cables for interconnecting the meter and transmitter shall be furnished by the manufacturer. Transmitter shall be a remote wall mounted display/transmitter.

P. The display/transmitter shall be protected from the sun by a pipe stand mounted 316 stainless steel or aluminum sunshield. See instrumentation detail drawings for additional requirements.

Q. Magnetic flow meter systems shall be Endress + Hauser Proline Promag W 500 order code: 5W5B2F-BSEDRABIAGBAA2DHA1KGBA1+AAEAEBECPC71Z1 or Engineer approved equivalent by Krohne.

010	Approval; Transmitter; Sensor:	BS	ATEX+IECEx; Z2; Z2, IIC
011	Design:	E	Fixed Flange
015	Power Supply:	D	24VDC
020	Output; Input 1:	RA	PROFINET 2-port switch integrated
021	Output; Input 2:	B	4-20mA
022	Output; Input 3:	I	4-20mA input
023	Output; Input 4:	A	W/o;
030	Display; Operation:	G	4-line illum.; touch control + WLAN
035	Integrated ISEM Electronic:	B	Transmitter
041	Transmitter Housing:	A	Alu, coated
042	Sensor Junction Housing:	A	Alu, coated
045	Cable, Sensor Connection:	2	10m/30ft coil and signal cable
050	Electrical Connection:	D	Thread NPT1/2
060	Liner:	H	Hard Rubber
070	Process Connection:	A1K	Cl.150, carbon steel, flange ASME
075	Electrodes:	G	1.4435/316L, bullet nose
080	Calibration Flow:	B	0.2%
480	Device Model:	A1	1
500	>Operation Language Display:	AA	English
540	>>Application Package:	EA EB EC	Extended HistoROM Heartbeat Verification + Monitoring ECC electrode cleaning
850	>Firmware Version:	71	01.00.zz, PROFINET
895	Marking	Z1	FIT/FE-2051

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Ground magnetic flow meter flow tubes and grounding rings in strict accordance with the manufacturer's recommendations.

B. Refer to Section 17700, Part 3, for further requirements.

- END OF SECTION -

SECTION 17731 – HUMIDITY AND TEMPERATURE INDICATING TRANSMITTERS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the humidity and temperature monitor, with all accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17700 – Powered Instruments, General

1.03 TOOLS, SUPPLIES AND SPARE PARTS

A. One (1) spare Humidity and Temperature Indicating Transmitter of the type specified herein below.

PART 2 -- PRODUCTS

2.01 HUMIDITY AND TEMPERATURE INDICATING TRANSMITTERS

A. The Humidity and Temperature Indicating Transmitter shall be a wall mounted unit and have a local LCD display, embedded buzzer for local audible alarm, two (2) configurable 4-20 mA outputs (by software or keyboard), and two configurable relay alarm outputs.

B. The enclosure shall have an IP65 or greater rating and be able to operate in a temperature range of -40 ° C to 60 ° C.

C. The LCD display shall be a wide backlit LCD with three variables of 4 ½ digits.

D. Power Supply shall be 24VDC source from the PLC.

E. Sensor Measurement Range Minimum Requirements:

1. Temperature: -40,0 °C to 100,0 °C (DM models)/ -40,0 °C to 60,0 °C (WM models)
2. Relative humidity: 0.0 to 100.0 %RH (non-condensing)
3. Dew point: -90,0 °C a 100,0 °C

F. Measurement Resolution Minimum Requirements:
1. Temperature: 0,1 °C, 14 bits (65535 levels)
2. Relative humidity: 0,1 %, 12 bits (4095 levels)

G. Response Time:
   1. Temperature: up to 5 sec @ 25 °C with slow moving air (1 m/s)
   2. Relative humidity:up to 4 sec @ 25 °C with slow moving air (1 m/s)

H. Measurement Accuracy:
   1. Temperature: ± 0,4 °C (0 °C to 60 °C)
   2. Relative humidity: ± 1.8 % RH to 23 °C (0 % to 90 % RH)

I. Humidity and Temperature Indicating Transmitters shall be RHT Climate Relative Humidity and Temperature Transmitter as manufactured by NOVUS, or Engineer Approved Equal.

PART 3 -- EXECUTION

Grounding

3.01 REQUIREMENTS

A. The unit shall be mounted inside the Electrical Room on the wall in the location indicated on the Electrical Drawings.

B. Contractor shall configure the unit as follows:

   1. One relay output to send an Electrical Room high temperature alarm to the PLC. The alarm shall be set to 85 degrees Fahrenheit.

   2. 4-20mA outputs to send the Electrical Room temperature and humidity to the PLC.

C. Refer to Section 17700, Part 3, for further requirements.

- END OF SECTION -

SECTION 17760 - PRESSURE INDICATING TRANSMITTERS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the pressure indicating transmitters, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17700 – Powered Instruments, General

PART 2 -- PRODUCTS

2.01 PRESSURE INDICATING TRANSMITTERS, GENERAL

A. Pressure indicating transmitters shall consist of a piezoresistive silicon pressure transducer with a process-isolated diaphragm, silicone oil fill, and microprocessor-based electronics. The pressure transducer shall be mechanically, electrically, and thermally isolated from the process and the environment, and shall have an integral temperature compensation sensor. Factory set correction coefficients and diagnostic data shall be stored in the transmitter's non volatile memory, for correction and linearization of the output. Span and zero shall be continuously adjustable, externally, over the entire range. Span and zero adjustments shall be capable of being disabled internally. The maximum zero elevation and maximum zero suppression shall be adjustable to anywhere within sensor limits.

B. Provide a wall, pipe or strut mounted 316 stainless steel (or aluminum) sunshield to protect the pressure indicating transmitter from direct sunlight.

C. Each transmitter shall be furnished with an integral LCD indicator capable of displaying engineering units and/or milliamps, and mounting hardware as required. Each transmitter shall have a stainless steel tag with calibration data attached to body. Transmitters shall satisfy the performance criteria in Table 1, below.

Table 1. Pressure Indicating Transmitter Performance Criteria	
Accuracy(1)	± 0.06% of calibrated span, zero-based
Calibration Stability	± 0.20% of upper range limit (URL) over ten years
Field-Adjustable Rangeability	100:1 input range
Enclosure Type	NEMA 4X, Weather and Corrosion-Resistant
Enclosure Materials	Low-Copper Aluminum, with epoxy or powder coating
Process Wetted Materials	316 Stainless Steel, or better as scheduled or required for process compatibility
Ambient Environment Limits	-40 to 85 degrees Celsius at 0-100% relative humidity
Hazardous Environment Approval	Factory Mutual (FM) Approved for Class I, Division 1, Groups C and D
Overload Capacity	25 MPa (3,600 psi), or higher
Power Supply	24 VDC, two-wire design
Output	Linear isolated 4-20 mA 24 VDC with HART
Output Damping	Adjustable, 0-36 seconds

Notes:
(1) Including nonlinearity, hysteresis, and repeatability errors

2.02 GAUGE PRESSURE INDICATING TRANSMITTERS

A. Gauge pressure indicating transmitters shall satisfy all requirements of Article 2.01.

B. Where scheduled, gauge pressure indicating transmitters shall be calibrated in feet of liquid for liquid level service.

C. Where scheduled, gauge pressure indicating transmitters with ranges in inches water column (in. w.c.) shall achieve the scheduled range with a turndown ratio not to exceed 1:5. As an example, a gauge pressure indicating transmitter scheduled for 0-20” w.c. shall have an uncalibrated range of -50 to +50” w.c. or 0 to 100” w.c., or less.

D. Gauge pressure indicating transmitters shall be Emerson Process Management (Rosemount) Model 3051CG.

2.03 VALVE MANIFOLDS

A. Gauge and differential pressure indicating transmitters shall be furnished and installed with a valve manifold. Valve manifolds shall satisfy the criteria in Table 2, below.

Table 2. Valve Manifold Criteria	
Materials	316L Stainless Steel, or better to match transmitter wetted parts
Construction Type	Milled
Valve Type	Needle Valve with non-rotating plug, T-bar handle
Packing Material	Polytetrafluoroethylene (PTFE) (1)
Rated Pressure	4,000 psi at 200 degrees Celsius

Notes:
(1) Alternative packing materials shall be furnished as scheduled herein, shown on the drawings, and for applications where temperature may exceed 200 degrees Celsius

B. Dust caps shall be installed on all manifold connections during shipping, and remain installed until connection of the transmitter and process piping. Dust caps on vent and purge connections shall be 316 stainless steel, minimum.

C. All manifolds shall be configured to allow isolation, venting, removal, and calibration of the transmitter without disassembly of process piping.

D. Gauge pressure indicating transmitters shall be furnished with a two-valve manifold. Valve functions shall be isolate and vent. Two-valve manifolds shall be Ashcroft V02 Series, Hoke GP Series, equivalents by transmitter manufacturer, or equal.

2.04 FLANGE MOUNTED LEVEL INDICATING TRANSMITTERS

A. Flange-mounted tank liquid level indicating transmitters shall satisfy all requirements of Article 2.01.

B. The flange-mounted sensor shall consist of a special non-corrosive isolating diaphragm with fill fluid in a sealed capillary system to transmit liquid pressure to the sensing element. A second isolating diaphragm shall transmit pressure through the fill fluid to the sensing diaphragm in the center of the capacitance cell. An isolating diaphragm and fluid fill shall also be provided on the opposite side of the sensing diaphragm to convey atmospheric or reference pressure.

C. All mounting flanges, diaphragms, O-rings and materials used in construction shall be non-corroding, compatible with each other, and compatible with the liquid being measured.

D. Flange-mounted liquid level transmitters shall be Emerson Process Management (Rosemount) Model 3051L; No substitutions.

2.05 REMOTE DISPLAYS

A. Where specified or indicated on the Drawings remote display units shall be furnished to display the pressure or level signal received from the pressure indicating transmitter 4-20mA output. Remote displays shall be powered from the same loop at the pressure transmitter.

B. Remote display units shall be wall mounted or mounted on a pipe stand fastened to a concrete base provided by the Contractor. Remote display units located outdoors in direct shall be protected with a sunshield. See the Instrumentation Detail drawings for pipestand construction requirements.

C. Remote displays shall be Emerson Process Management (Rosemount) Model 751 Field Signal Indicator.

2.06 REMOTE SEALS

A. Remote seals shall be furnished with pressure indicating transmitters as scheduled or shown on the Drawings. Remote seals shall be furnished and installed complete with capillary tubes, link kits, and fill fluid as required for a complete and functional installation.

B. Remote seals, link kits, and other appurtenances shall be manufactured by the pressure indicating transmitter manufacturer, and installed pursuant to all manufacturer's recommendations.

2.07 SURGE SUPRESSION

A. A dedicated 4-20mA signal surge suppression device shall be provided for and each pressure transmitter or remote display. Refer to Section 17560 for surge suppression requirements.

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Gauge pressure indicating transmitters shall be factory calibrated and a copy of the calibration report shall be in the O&M manual.

B. Refer to Section 17700, Part 3 of the Specifications.

- END OF SECTION -

SECTION 17800 - ANALYTICAL INSTRUMENTS, GENERAL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The instrumentation subcontractor shall furnish, install, test and place in operation the analytical instruments as scheduled in the following sections together with all signal converters, transmitters, isolators, amplifiers, etc. to interface with the process control system as shown on the Drawings and as specified. The Contractor may elect to install sensors on process lines provided that the instrumentation subcontractor provides full on-site supervision during installation. Mounting of associated indicators, sensors, sampling pumps, power supplies, brackets and appurtenances shall be provided as specified herein and shown on the Drawings.

B. It is the intent of the Contract Documents that all process taps, isolation valves, nipples, penetrations, embedded instrumentation supports, conduit, wiring, terminations, and the installation of process instrumentation on process lines shall be provided under this Contract. The instrumentation subcontractor shall supervise installation of equipment provided under this Section where installation is provided by others.

C. Tapping and connections for primary process sensors shall be sized to suit each individual installation and the requirements of the analytical instrument served. The Contractor shall ensure that the location, supports, orientation and dimensions of the connections and tapping for instruments furnished under this Section are such as to provide the proper bracing, the required accuracy of measurement, protection of the sensor from accidental damage and accessibility for maintenance while the plant is in operation. Isolation valves shall be provided at all process taps.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17500 – Enclosures, General

C. Section 17600 – Unpowered Instruments General

D. Section 17698 – Instrumentation and Control System Accessories

E. Section 17700 – Powered Instruments General

F. Analytical instruments furnished with mechanical equipment shall be furnished, installed, tested and calibrated as specified elsewhere in the Contract Documents.

1.03 TOOLS, SUPPLIES AND SPARE PARTS

A. Tools, supplies and spare parts shall be provided as specified in Section 17050.

B. Additional items as recommended by the analytical instrument manufacturers or as described for the specified analytical instrument sections shall be provided.

PART 2 -- PRODUCTS

2.01 GENERAL

A. All instrumentation supplied shall be the manufacturer's latest design. Unless otherwise specified, instruments shall be solid state, electronic, using enclosures to suit specified environmental conditions. Microprocessor-based equipment shall be supplied unless otherwise specified. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks as shown on the Drawings, or as required.

B. Equipment installed in a hazardous area shall meet Class, Group, and Division as shown on the Drawings, to comply with the National Electrical Code.

C. All field instrumentation for outdoor service shall be provided with enclosures that are suitable for outdoor service, as follows:

1. Where the manufacturer's enclosures are suitable for outdoor service, they shall be provided with instrument sunshades. Sunshades shall be Style E as manufactured by O'Brien Corporation, or equal. Where possible, these instruments shall be mounted in a north facing direction.

2. Where the manufacturer's standard enclosures are not suitable for outdoor service, instruments shall be mounted in Field Panels in accordance with Section 17520, Field Panels, or may be furnished with Vipak instrument field enclosures as manufactured by O'Brien Corporation, equivalent by Intertec, or equal. It shall not be necessary to provide the manufacturer's NEMA 4 or 4X enclosures for instruments that will be subsequently mounted in separate field panels.

D. All instruments shall return to accurate measurement without manual resetting upon restoration of power after a power failure.

E. Unless otherwise shown or specified, local indicators shall be provided for all instruments. Where instruments are located in inaccessible locations, local indicators shall be provided and shall be mounted as specified in Subsection 3.01 B herein. All indicator readouts shall be linear in process units. Readouts of 0-100% shall not be acceptable (except for speed and valve position). Isolated outputs shall be provided for all transmitters.

F. Unless otherwise specified, field instrument and power supply enclosures shall be 316 stainless steel, fiberglass (or equivalent) or PVC coated copper-free cast aluminum NEMA 4X construction.

G. Where separate elements and transmitters are required, they shall be fully matched, and unless otherwise noted, installed adjacent to the sensor. Special cables or equipment shall be supplied by the associated equipment manufacturer.

H. Electronic equipment shall utilize printed circuitry and shall be coated (tropicalized) to prevent contamination by dust, moisture and fungus. Solid-state components shall be conservatively rated for long-term performance and dependability over ambient atmosphere fluctuations. Ambient conditions shall be -20 to 50 degrees C and 20 to 100 percent relative humidity, unless otherwise specified. Field mounted equipment and system components shall be designed for installation in dusty, humid, and corrosive service conditions.

I. All devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single manufacturer, insofar as possible, and shall consist of equipment models that are currently in production. All equipment provided, where applicable, shall be of modular construction and shall be capable of field expansion.

J. All non-loop-powered instruments and equipment shall be designed to operate on a 60 Hz AC power source at a nominal 117 V, plus or minus 10 percent, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

K. All analog transmitter and controller outputs shall be isolated, 4-20 milliamps into a load of 0-750 ohms, unless specifically noted otherwise. All switches shall have double-pole, double-throw contacts rated at a minimum of 600 VA, unless specified otherwise.

L. Materials and equipment used shall be UL approved wherever such approved equipment and materials are available.

2.02 ANALYSIS INSTRUMENTS

A. Liquid samples shall not pass through housings containing analyzer electronics. Process fluid temperature will be within a range of 40 to 90 degrees F.

B. Where ambient temperatures will affect accuracy by more than 1 percent of span, a suitable isothermal enclosure with thermostatically controlled space heater shall be provided.

C. Sample assemblies shall be suitable for submersion or flow-through service as noted and shall be chemically inert to constituents of raw wastewater solids or other chemical environment, as scheduled. Where the sample is drawn prior to filtration, the sample assemblies shall be capable of handling solids and grease.

D. Each analyzer requiring reagents and/or other replaceable parts shall be furnished with

sufficient chemicals and replaceable parts for startup and acceptance tests and the specified warranty period.

E. Contractor's submittals on these analyzers shall include information on monthly reagent consumption and a list of replaceable parts required for periodic maintenance and the recommended operating periods between replacements. Installation of analyzers and sample preparation shall be in accordance with the analyzer manufacturer's instructions.

F. Analysis instrumentation performance, accuracy and reproducibility shall be as prescribed in APHA/AWWA/WEF "Standard Methods for the Examination of Water and Wastewater", latest edition. For those measurements specified herein, for which performance characteristics are not listed in the above, the supplier shall state instrument performance characteristics. The "referee" method shall be as prescribed in EPA Methods for Chemical Analysis of Water and Wastes (1971).

PART 3 -- EXECUTION

3.01 INSTALLATION

A. General

1. Equipment shall be located so that it is accessible for operation and maintenance. The instrumentation subcontractor shall examine the Drawings and shop drawings for various items of equipment in order to determine the best arrangement for the work as a whole, and shall supervise the installation of process instrumentation supplied under this Division.

2. Electrical work shall be performed in compliance with all applicable local codes and practices. Where these specifications and the Drawings do not delineate precise installation procedures, API RP550 shall be used as a guide to installation procedures.

B. Equipment Mounting and Support

1. Field equipment shall be wall mounted or mounted on two-inch diameter pipe stands welded to a 10-inch square by 1/2-inch thick base plate unless shown adjacent to a wall or otherwise noted. Materials of construction shall be aluminum or 316 stainless steel. Instruments attached directly to concrete shall be spaced out from the mounting surface not less than 1/2-inch by use of phenolic spacers. Expansion anchors in walls shall be used for securing equipment or wall supports to concrete surfaces. Unless otherwise noted, field instruments shall be mounted between 48 and 60 inches above the floor or work platform.

2. Embedded pipe supports and sleeves shall be Schedule 40, Type 316 stainless steel pipe, ASA B-36.19, with stainless steel blind flange for equipment mounting as shown on the Drawings.

3. Materials for miscellaneous mounting brackets and supports shall be 316 stainless steel construction.

4. Pipe stands, miscellaneous mounting brackets and supports shall comply with the requirements of Division 5 of the specifications.

5. Transmitters shall be oriented such that output indicators are readily visible.

C. Control and Signal Wiring

1. Electrical, control and signal wiring connections to transmitters and elements mounted on process piping or equipment shall be made through liquid-tight flexible conduit. Conduit seals shall be provided where conduits enter all field instrument enclosures and all cabinetry housing electrical or electronic equipment.

3.02 ADJUSTMENT AND CLEANING

A. The instrumentation subcontractor shall comply with the requirements of Division 1 of these Specifications and all instrumentation and control system tests, inspection, and calibration requirements for all instrumentation and controls provided under this Contract and specified herein. The Engineer, or his designated representative(s), reserves the right to witness any test, inspection, calibration or start-up activity. Acceptance by the Engineer of any plan, report or documentation relating to any testing or commissioning activity specified herein shall not relieve the Contractor of his responsibility for meeting all specified requirements.

B. The instrumentation subcontractor shall provide the services of factory trained technicians, tools and equipment to field calibrate, test, inspect and adjust each instrument to its specified performance requirement in accordance with manufacturer's specifications and instructions. Any instrument which fails to meet any Contract requirements, or any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the Engineer, at no cost to the Owner. The Contractor shall bear all costs and provide all personnel, equipment and materials necessary to implement all installation tests and inspection activities for equipment specified herein.

C. At least 60 days before the anticipated initiation of installation testing, the Contractor shall submit to the Engineer a detailed description, in duplicate, of the installation tests to be conducted to demonstrate the correct operation of the instrumentation supplied hereunder.

D. Field instrument calibration shall conform to the following requirements:

1. The instrumentation subcontractor shall provide the services of factory trained instrumentation technicians, tools and equipment to field calibrate each instrument supplied under this Contract to its specified accuracy in accordance with the manufacturer's specification and instructions for calibration.

2. Each instrument shall be calibrated at 0, 25, 50, 75 and 100 percent of span using test instruments and specified chemicals of known values to simulate inputs and read outputs. Test instruments shall be rated to an accuracy of at least five (5) times greater than the specified accuracy of the instrument being calibrated. Where applicable, such test instruments shall have accuracy’s as set forth by the National Institute for Standards and Technology (NIST).

3. The instrumentation subcontractor shall provide a written calibration sheet to the Engineer for each instrument, certifying that it has been calibrated to its published specified accuracy. The Contractor shall submit proposed calibration sheets for various types of instruments for Engineer approval prior to the start of calibration. This sheet shall include but not be limited to date, instrument tag numbers, calibration data for the various procedures described herein, name of person performing the calibration, a listing of the published specified accuracy, permissible

tolerance at each point of calibration, calibration reading as finally adjusted within tolerance, defect noted, corrective action required and corrections made.

4. If doubt exists as to the correct method for calibrating or checking the calibration of an instrument, the manufacturer's printed recommendations shall be used as an acceptable standard, subject to the approval of the Engineer.

5. Upon completion of calibration, devices calibrated hereunder shall not be subjected to sudden movements, accelerations, or shocks, and shall be installed in permanent protected positions not subject to moisture, dirt, and excessive temperature variations. Caution shall be exercised to prevent such devices from being subjected to overvoltages, incorrect voltages, overpressure or incorrect air. Damaged equipment shall be replaced and recalibrated at no cost to the Owner.

6. After completion of instrumentation installation, the instrumentation subcontractor shall perform a loop check. The Contractor shall submit final loop test results with all instruments listed in the loop. Loop test results shall be signed by all representatives involved for each loop test.

- END OF SECTION -

SECTION 17831 - CHLORINE ANALYZERS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the chlorine residual analyzers, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17000 – Control and Information System Scope and General Requirements

B. Section 17800 – Analytical Instruments, General

1.03 TOOLS, SUPPLIES AND SPARE PARTS

A. One complete calibration kit shall be provided and shall include a one-year supply of reagents for measuring free (or total) chlorine.

B. One sample conditioning kit, including self-cleaning Y-strainer, pressure regulators, and Teflon tubing, shall be provided for each analyzer.

PART 2 -- PRODUCTS

2.01 CHLORINE ANALYZER

A. Chlorine analyzers shall meet or exceed the following requirements, no substitutions:

1.	Manufacturer:	Wallace & Tiernan
2.	Model:	Depolox 400
3.	Sensor Type:	Variasens C Flow Cell
4.	Sensor Type:	Depolox 5C Flow Cell
5.	Free Chlorine Range:	0 – 20 mg/l
6.	pH Measuring Range:	0 - 14
7.	Flow Control:	Stop valve

8.	Signal Output:	Four 4-20mA, Two discrete
9.	Housing:	NEMA 4X
10.	Ambient Temperature:	0 to 50 degrees Celsius
11.	Power Requirements:	120 VAC

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Refer to Section 17600, Part 3 of the specifications.

- END OF SECTION -

SECTION 17910 - INSTRUMENT SCHEDULE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation all instrumentation as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17900 – Schedules and Control Descriptions

B. Section 17920 – Control System Input/Output Schedule

C. Section 17950 – Functional Control Descriptions

PART 2 -- INSTRUMENT SCHEDULE

Pressure Gauges - Section 17650			
Tag Number	**Service Description**	**State/Span**	**Remarks**
PI-2011A	Pump No. 1 (BP-2011) Suction Pressure	0-30 PSI	
PI-2011B	Pump No. 1 (BP-2011) Discharge Pressure	0-150 PSI	
PI-2021A	Pump No. 1 (BP-2021) Suction Pressure	0-30 PSI	
PI-2021B	Pump No. 1 (BP-2021) Discharge Pressure	0-150 PSI	
PI-5021	Sodium Hypo Feed System Discharge Pressure	0-150 PSI	

Level Switches (Suspended Float) - Section 17670			
Tag Number	**Service Description**	**State/Span**	**Remarks**
LSH-1011	Ground Storage Tank No. 1 High Level	Determine in Field	
LSLL-1011	Ground Storage Tank No. 1 Low Low Level	Determine in Field	

Level Switches (Sliding Float) - Section 17682			
LSH-2005	Pump Station Containment Sump High Lvl.	2” from sump bottom	

Magnetic Flow Meters - Section 17701			
Tag Number	**Service Description**	**State/Span**	**Remarks**
FE/FIT-2051	Pump Station Discharge Flow Rate	0 – 12,000 GPM	

Humidity and Temperature Indicating Transmitters - Section 17731			
Tag Number	**Service Descriptio**	**State/Span**	**Remarks**
RHT-4021	Pump Station Electrical Room Humidity and Temperature	See 17731	

Radar Level Transmitters- Section 17745			
Tag Number	**Service Description**	**State/Span**	**Remarks**
LT-5001	Sodium Hypo Bulk Storage Tank No. 1	determine instrument range in field	
LT-5002	Sodium Hypo Bulk Storage Tank No. 2	determine instrument range in field	

Pressure Indicating Transmitters – Section 17760			
Tag Number	**Service Description**	**State/Span**	**Remarks**
PIT-1001	Reclaimed Distribution Pressure	0-150 PSI	
LIT-1011	Ground Storage Tank No. 1 – Liquid Level	0-35 feet	Hydrostatic Press. Type with Flanged Diaphragm
PIT-2001	Pump Station Suction Pressure	0-30 PSI	
PIT-2051	Pump Station Discharge Pressure Transmitter	0-150 PSI	
PIT-5021	Sodium Hypo Feed System Discharge Pressure	0-150 PSI	

Chlorine Analyzers - Section 17831			
Tag Number	**Service Description**	**State/Span**	**Remarks**

AIT/AE 2051	Pump Station Discharge Line	See 17831	

- - END OF SECTION - -

SECTION 17920 - CONTROL SYSTEM INPUT/OUTPUT SCHEDULE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish, install, test, and place into satisfactory operation all PLC input and outputs as herein specified and as required for a complete functioning system.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 17950 – Functional Control Descriptions: General

PART 2 -- CONTROL SYSTEM INPUT / OUTPUT SCHEDULE

2.01 REQUIREMENTS

A. Refer to Table 17920 following this section for a listing of the hardwired process I/O points and Table 17921 following this section for a listing of the digital (network based) I/O points.

PART 3 -- EXECUTION

3.01 INPUT/OUTPUT TYPES

A. Signals transmitted or received via PLC input/output cards are as follows:

DO – Discrete Output

DI – Discrete Input

AO – Analog Output

AI – Analog Input

B. Signals transmitted or received via digital network communications are as follows:

DDO – Digital Discrete Output

DDI – Digital Discrete Input

DAO – Digital Analog Output

DAI – Digital Analog Input

C. Refer to Section entitled “Functional Control Descriptions", Section 17950, for further description of input/output and HMI control interface requirements.

3.02 COMMON PLC INPUTS

A. The inputs listed in the table below shall be included for PLC-1.

Tag ID	Description	Type	State/Range	Comments
	PLC Chassis 1 Power Supply	DI	Failure	
	PLC Chassis 2 Power Supply	DI	Failure	
	Loop DC Power Supply No. 1	DI	Failure	
	Loop DC Power Supply No. 2	DI	Failure	
	UPS Bypass Switch Position	DI	Status	
	UPS on Utility Power (Normal)	DI	Status	
	UPS on UPS Power (Utility Lost)	DI	Fault	
	UPS Common Fault	DI	Fault	
	UPS Low Battery	DI	Fault	
	Surge Protection System - Group x	DI	Warning	Provide for x groups (up to 28 devices/group)
	Surge Protection System - Group x	DI	Overload	Provide for x groups (up to 28 devices/group)
	Panel Door	DI	Intrusion	
	Panel Air Temperature	AI	32-140 deg F	

- END OF SECTION -

TABLE 17920 - CONTROL SYSTEM INPUT / OUTPUT SCHEDULE

DWG	SERVICE DESCRIPTION	STATE/SPAN	TYPE	PLC	TAG
I-3	Reclaimed Water Distribution Pressure	Per §17910	AI	RIO-2	PI-1001
I-3	Control Valve PSV-1001 - Close Command (solenoid)	CONTROL	DO	RIO-2	ZCC-1001A
I-3	Control Valve PSV-1001 - Open Command (solenoid)	CONTROL	DO	RIO-2	ZCO-1001B
I-3	Control Valve PSV-1001 - Valve Position Feedback	STATUS	AI	RIO-2	ZI-1001
I-3	Above Ground Storage Tank No. 1 - Liquid Level	Per §17910	AI	RIO-2	LI-1011
I-3	Above Ground Storage Tank No. 1 - Liquid Level Alarm: High	ALARM	DI	RIO-2	LAH-1011
I-3	Above Ground Storage Tank No. 1 - Liquid Level Alarm: Low Low	ALARM	DI	RIO-2	LALL-1011
I-3	Pump Station - Discharge Pressure	Per §17910	AI	RIO-3	PI-2051
I-3	Pump Station - Discharge Flow Rate	Per §17910	AI	RIO-3	FI-2051
I-3	Pump Station - Suction Pressure	Per §17910	AI	PLC-1	PI-2001
I-3	Pump Station - Containment Sump Level Alarm: High	ALARM	AI	PLC-1	LAH-2005
I-3	Pump No. 1 - Discharge Check Valve Open	STATUS	DI	PLC-1	ZIO-2011
I-3	Pump No. 2 - Discharge Check Valve Open	STATUS	DI	PLC-1	ZIO-2021
I-3	Chlorine Analyzer Fault	ALARM	DI	PLC-1	YA-2051
I-3	Residual Chlorine	Per §17910	AI	PLC-1	AI-2051A
I-3	Residual pH	Per §17910	AI	PLC-1	AI-2051B
I-3	MCP-1 (PLC-1) Cabinet Intrusion Alarm	ALARM	DI	PLC-1	ZAO-1001
I-3	LCP-1 (RIO-1) Cabinet Intrusion Alarm	ALARM	DI	LCP-1	ZAO-5011
I-3	Sodium Hypo Metering Pump No. 1 - Fault	ALARM	DDI	LCP-1	YA-5011
I-3	Sodium Hypo Metering Pump No. 1 - Running	STATUS	DDI	LCP-1	YLR-5011
I-3	Sodium Hypo Metering Pump No. 1 - In Remote	STATUS	DDI	LCP-1	YL-5011
I-3	Sodium Hypo Metering Pump No. 1 - Run Command	CONTROL	DDO	LCP-1	YCR-5011
I-3	Sodium Hypo Metering Pump No. 1 - Speed Command	CONTROL	DAO	LCP-1	SC-5011
I-3	Sodium Hypo Metering Pump No. 1 - Speed Feedback	STATUS	DAI	LCP-1	SI-5011
I-3	Sodium Hypo Metering Pump No. 2 - Fault	ALARM	DDI	PLC-1	YA-5012
I-3	Sodium Hypo Metering Pump No. 2 - Running	STATUS	DDI	PLC-1	YLR-5012
I-3	Sodium Hypo Metering Pump No. 2 - In Remote	STATUS	DDI	PLC-1	YL-5012
I-3	Sodium Hypo Metering Pump No. 2 - Run Command	CONTROL	DDO	PLC-1	YCR-5012
I-3	Sodium Hypo Metering Pump No. 2 - Speed Command	CONTROL	DAO	PLC-1	SC-5012
I-3	Sodium Hypo Metering Pump No. 2 - Speed Feedback	STATUS	DAI	PLC-1	SI-5012
I-4	Sodium Hypo Truck Fill Panel - Reset/Horn Silence	STATUS	DI	LCP-1	HS-5001
I-4	Sodium Hypo Storage - Activate Common Alarm Horn/Strobe	ALARM	DI	LCP-1	YA-5001
I-4	Sodium Hypo Local Control Panel LCP-1 (RIO-1) - Intrusion	ALARM	DI	LCP-1	ZAO-5001
I-4	Sodium Hypo Bulk Storage Tank No. 1 - Level	STATUS	AI	LCP-1	LI-5001
I-4	Sodium Hypo Bulk Storage Tank No. 1 - Level Alarm: Max Fill	ALARM	DI	LCP-1	LAH-5001
I-4	Sodium Hypo Bulk Storage Tank No. 1 - Level Alarm: High High	ALARM	DO	LCP-1	LAHH-5001
I-4	Sodium Hypo Bulk Storage Tank No. 2 - Level	STATUS	AI	LCP-1	LI-5002
I-4	Sodium Hypo Bulk Storage Tank No. 2 - Level Alarm: Max Fill	ALARM	DI	LCP-1	LAH-5002
I-4	Sodium Hypo Bulk Storage Tank No. 2 - Level Alarm: High High	ALARM	DO	LCP-1	LAHH-5002
I-5	Fire Alarm Control Panel - Fire Alarm Active	ALARM	DI	PLC-1	OA-4001
I-5	Fire Alarm Control Panel - Fire Alarm System Fault	ALARM	DI	PLC-1	OB-4001
I-5	Automatic Transfer Switch - Generator Power Available	STATUS	DI	PLC-1	JL-3111
I-5	Automatic Transfer Switch - Utility Power Available	STATUS	DI	PLC-1	YN-3111
I-5	Automatic Transfer Switch - ATS Fault	ALARM	DI	PLC-1	YA-3111
I-5	Automatic Transfer Switch - Go to Emergency	CONTROL	DI	PLC-1	ZCE-3111
I-5	Automatic Transfer Switch - Go to Normal	CONTROL	DI	PLC-1	ZCN-3111
I-5	Humidity and Temperature Monitor - High Temp. Alarm	ALARM	DI	PLC-1	TAH-4021
I-5	Humidity and Temperature Monitor - Temperature	Per §17910	AI	PLC-1	TI-4021
I-5	Humidity and Temperature Monitor - Humidity	Per §17910	AI	PLC-1	MI-4021
I-5	Standby Generator - Fuel Level	Per JEA Std.	AI	RIO-4	LI-3101
I-5	Standby Generator - Battery Low Voltage Warning	ALARM	DI	RIO-4	GNL-3101
I-5	Standby Generator - Battery Fault	ALARM	DI	RIO-4	GA-3101
I-5	Standby Generator - Battery Charge AC Fail	ALARM	DI	RIO-4	IA-3101
I-5	Standby Generator - Main Line Circuit Breaker Closed	STATUS	DI	RIO-4	ZLC-3101
I-5	Standby Generator - Not In "Auto"	STATUS	DI	RIO-4	ZL-3101
I-5	Standby Generator - Fault	ALARM	DI	RIO-4	YA-3101
I-5	Standby Generator - Running	STATUS	DI	RIO-4	YLR-3101

I-5	Standby Generator - E-Stop	ALARM	DI	RIO-4	ZA-3101
I-5	Standby Generator - Over-crank	ALARM	DI	RIO-4	VA-3101
I-5	Standby Generator - Maximum Run-time	ALARM	DI	RIO-4	KAH-3101
I-5	Standby Generator - Generator Under-speed	ALARM	DI	RIO-4	SAL-3101
I-5	Standby Generator - Low Coolant Temperature	ALARM	DI	RIO-4	TAL-3101
I-5	Standby Generator - High Coolant Temperature	ALARM	DI	RIO-4	TAH-3101
I-5	Standby Generator - Low Coolant Level	ALARM	DI	RIO-4	LAL-3101
I-5	Standby Generator - Low Oil Pressure Warning	ALARM	DI	RIO-4	PAL-3101
I-5	Standby Generator - Fuel Leak	ALARM	DI	RIO-4	LAH-3101
I-5	Standby Generator - Fuel Leak Detect. Error	ALARM	DI	RIO-4	LED-3101
I-5	Standby Generator - Fuel High Level Alarm	ALARM	DI	RIO-4	LAHH-3101
I-5	Standby Generator - Fuel Low Level Alarm	ALARM	DI	RIO-4	LALL-3101

- END OF SECTION -

TABLE 17921 - DIGITAL INPUT / OUTPUT SCHEDULE

DWG	SERVICE DESCRIPTION	STATE/SPAN	TYPE	PLC	TAG	PROTOCOL
I-3	Pump No. 1 (P-2011) - Speed Status	STATUS	DAI	PLC-1	SI-2011	Profinet
I-3	Pump No. 1 (P-2011) - Speed Command	CONTROL	DAO	PLC-1	SC-2011	Profinet
I-3	Pump No. 1 (P-2011) - In Remote	STATUS	DDI	PLC-1	YL-2011	Profinet
I-3	Pump No. 1 (P-2011) - Ready	STATUS	DDI	PLC-1	YLX-2011	Profinet
I-3	Pump No. 1 (P-2011) - Running	STATUS	DDI	PLC-1	YLR-2011	Profinet
I-3	Pump No. 1 (P-2011) - VFD Remote Reset	CONTROL	DDI	PLC-1	YC-2011	Profinet
I-3	Pump No. 1 (P-2011) - Start/Stop	CONTROL	DDO	PLC-1	YCR-2011	Profinet
I-3	Pump No. 1 (P-2011) - Motor Over Temp.	ALARM	DDI	PLC-1	TAH-2011	Profinet
I-3	Pump No. 1 (P-2011) - VFD Fault	ALARM	DDI	PLC-1	YA-2011	Profinet
I-3	Pump No. 1 (P-2011) - E-Stop Pressed	ALARM	DDI	PLC-1	HS-2011	Profinet
I-3	Pump No. 2 (P-2021) - Speed Status	STATUS	DAI	PLC-1	SI-2021	Profinet
I-3	Pump No. 2 (P-2021) - Speed Command	CONTROL	DAO	PLC-1	SC-2021	Profinet
I-3	Pump No. 2 (P-2021) - In Remote	STATUS	DDI	PLC-1	YL-2021	Profinet
I-3	Pump No. 2 (P-2021) - Ready	STATUS	DDI	PLC-1	YLX-2021	Profinet
I-3	Pump No. 2 (P-2021) - Running	STATUS	DDI	PLC-1	YLR-2021	Profinet
I-3	Pump No. 2 (P-2021) - VFD Remote Reset	CONTROL	DDI	PLC-1	YCX-2021	Profinet
I-3	Pump No. 2 (P-2021) - Start/Stop	CONTROL	DDO	PLC-1	YCR-2021	Profinet
I-3	Pump No. 2 (P-2021) - Motor Over Temp.	ALARM	DDI	PLC-1	TAH-2021	Profinet
I-3	Pump No. 2 (P-2021) - VFD Fault	ALARM	DDI	PLC-1	YA-2021	Profinet
I-3	Pump No. 2 (P-2021) - E-Stop Pressed	ALARM	DDI	PLC-1	HS-2021	Profinet
I-3	Reclaimed Water Distribution Pressure	Per §17910	DAI	PLC-1	PI-1001	Profinet
I-3	Control Valve PSV-1001 - Close Command (solenoid)	CONTROL	DDO	PLC-1	ZCC-1001A	Profinet
I-3	Control Valve PSV-1001 - Open Command (solenoid)	CONTROL	DDO	PLC-1	ZCO-1001B	Profinet
I-3	Control Valve PSV-1001 - Valve Position Feedback	STATUS	DAI	PLC-1	ZI-1001	Profinet
I-3	Above Ground Storage Tank No. 1 - Liquid Level	Per §17910	DAI	PLC-1	LI-1011	Profinet
I-3	Above Ground Storage Tank No. 1 - Liquid Level Alarm: High	ALARM	DDI	PLC-1	LAH-1011	Profinet
I-3	Above Ground Storage Tank No. 1 - Liquid Level Alarm: Low Low	ALARM	DDI	PLC-1	LALL-1011	Profinet
I-3	Pump Station - Discharge Pressure	Per §17910	DAI	PLC-1	PI-2051	Profinet
I-3	Pump Station - Discharge Flow Rate	Per §17910	DAI	PLC-1	FI-2051	Profinet
I-3	LCP-1 (RIO1) Cabinet Intrusion Alarm	ALARM	DI	PLC-1	ZAO-5011	Profinet
I-3	Sodium Hypo Metering Pump No. 1 - Fault	Alarm	DDI	PLC-1	YA-5011	Profinet
I-3	Sodium Hypo Metering Pump No. 1 - Running	Alarm	DDI	PLC-1	YLR-5011	Profinet
I-3	Sodium Hypo Metering Pump No. 1 - In Remote	Alarm	DDI	PLC-1	YL-5011	Profinet
I-3	Sodium Hypo Metering Pump No. 1 - Run Command	Alarm	DDO	PLC-1	YCR-5011	Profinet
I-3	Sodium Hypo Metering Pump No. 1 - Speed Command	Alarm	DAO	PLC-1	SC-5011	Profinet
I-3	Sodium Hypo Metering Pump No. 1 - Speed Feedback	Alarm	DAI	PLC-1	SI-5011	Profinet
I-3	Sodium Hypo Metering Pump No. 2 - Fault	Alarm	DDI	PLC-1	YA-5012	Profinet
I-3	Sodium Hypo Metering Pump No. 2 - Running	Alarm	DDI	PLC-1	YLR-5012	Profinet
I-3	Sodium Hypo Metering Pump No. 2 - In Remote	Alarm	DDI	PLC-1	YL-5012	Profinet
I-3	Sodium Hypo Metering Pump No. 2 - Run Command	Alarm	DDO	PLC-1	YCR-5012	Profinet
I-3	Sodium Hypo Metering Pump No. 2 - Speed Command	Alarm	DAO	PLC-1	SC-5012	Profinet
I-3	Sodium Hypo Metering Pump No. 2 - Speed Feedback	Alarm	DAI	PLC-1	SI-5012	Profinet
I-4	Sodium Hypo Bulk Storage Tank No. 1 - Level	STATUS	DAI	PLC-1	LI-5001	Profinet
I-4	Sodium Hypo Bulk Storage Tank No. 1 - Level Alarm: High High	ALARM	DDI	PLC-1	LAHH-5001	Profinet
I-4	Sodium Hypo Bulk Storage Tank No. 2 - Level	STATUS	DAI	PLC-1	LI-5002	Profinet
I-4	Sodium Hypo Bulk Storage Tank No. 2 - Level Alarm: High High	ALARM	DDI	PLC-1	LAHH-5002	Profinet

I-5	Standby Generator - Fuel Level	Per JEA Std.	DAI	PLC-1	LI-3101	Profinet
I-5	Standby Generator - Battery Low Voltage Warning	ALARM	DDI	PLC-1	GNL-3101	Profinet
I-5	Standby Generator - Battery Fault	ALARM	DDI	PLC-1	GA-3101	Profinet
I-5	Standby Generator - Battery Charge AC Fail	ALARM	DDI	PLC-1	IA-3101	Profinet
I-5	Standby Generator - Main Line Circuit Breaker Closed	STATUS	DDI	PLC-1	ZLC-3101	Profinet
I-5	Standby Generator - Not In "Auto"	STATUS	DDI	PLC-1	ZL-3101	Profinet
I-5	Standby Generator - Fault	ALARM	DDI	PLC-1	YA-3101	Profinet
I-5	Standby Generator - Running	STATUS	DDI	PLC-1	YLR-3101	Profinet
I-5	Standby Generator - E-Stop	ALARM	DDI	PLC-1	ZA-3101	Profinet
I-5	Standby Generator - Over-crank	ALARM	DDI	PLC-1	VA-3101	Profinet
I-5	Standby Generator - Maximum Run-time	ALARM	DDI	PLC-1	KAH-3101	Profinet
I-5	Standby Generator - Generator Under-speed	ALARM	DDI	PLC-1	SAL-3101	Profinet
I-5	Standby Generator - Low Coolant Temperature	ALARM	DDI	PLC-1	TAL-3101	Profinet
I-5	Standby Generator - High Coolant Temperature	ALARM	DDI	PLC-1	TAH-3101	Profinet
I-5	Standby Generator - Low Coolant Level	ALARM	DDI	PLC-1	LAL-3101	Profinet
I-5	Standby Generator - Low Oil Pressure Warning	ALARM	DDI	PLC-1	PAL-3101	Profinet
I-5	Standby Generator - Fuel Leak	ALARM	DDI	PLC-1	LAH-3101	Profinet
I-5	Standby Generator - Fuel Leak Detect. Error	ALARM	DDI	PLC-1	LED-3101	Profinet
I-5	Standby Generator - Fuel High Level Alarm	ALARM	DDI	PLC-1	LAHH-3101	Profinet
I-5	Standby Generator - Fuel Low Level Alarm	ALARM	DDI	PLC-1	LALL-3101	Profinet

Notes:

1. Input / Output types are as follows:
   - DDI - Digital (Network) Discrete Input
   - DDO - Digital (Network) Discrete Output
   - DAI - Digital (Network) Analog Input
   - DAO - Digital (Network) Analog Output

- END OF SECTION -

SECTION 17950 - FUNCTIONAL CONTROL DESCRIPTIONS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation all equipment as herein specified and as shown on the Drawings. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING COMPLETE FUNCTIONING SYSTEMS AS DESCRIBED HEREIN.

B. Together with the control system input/output schedule, the equipment specifications (including functional descriptions for local equipment control panels), and the Drawings, the functional control descriptions describe the required operation, monitoring, and control of the facilities included in this Contract.

C. THE FUNCTIONAL DESCRIPTIONS CONTAIN REQUIREMENTS FOR FURNISHING AND INSTALLING LABOR AND MATERIALS THAT MAY NOT APPEAR ELSEWHERE IN THE CONTRACT DOCUMENTS.

D. All equipment and services required in equipment local control panels provided to implement the monitoring and control functions described herein or in the process input/output schedules shall be provided by the Contractor through individual equipment suppliers.

E. Unless specifically stated otherwise, all interconnected wiring between all instruments, panels, controls, and other devices listed in the functional descriptions as required to provide all functions specified herein shall be furnished by the Electrical Contractor under Division 16. The Electrical Contractor shall provide all cable and conduit required to carry all signals listed in the process input/output schedules. Special cables that are required for interconnection between sensors or probes and transmitters or signal conditioners shall be furnished with the instrumentation devices by the equipment supplier.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01520 – Maintenance of Utility Operations During Construction

B. Section 17900 – Schedules and Control Descriptions, General

C. Section 17910 – Instrument Schedule

D. Section 17920 – Control System Input/Output Schedule

PART 2 -- FUNCTIONAL CONTROL DESCRIPTIONS, GENERAL

2.01 DEFINITIONS

A. RUNNING status signals shall be from auxiliary contacts provided with the motor control equipment (i.e., starter, VFD, SCR, etc.).

B. AUTO status signals shall be defined as HAND-OFF-AUTO switch in the AUTO position or process control system in AUTO (versus MANUAL).

C. FAIL status signals shall be defined as motor overload and/or any other shut down mode such as overtorque, overtemperature, low oil pressure, high vibration, etc.

D. READY status signal shall be defined as all conditions, including equipment control power, satisfied to permit remote control of the equipment.

2.02 CONVENTIONS

A. Operator workstation graphic display symbols and indicator lights on all MCC's, control panels, starter enclosures, etc. shall conform to the following color convention:

Condition	Color
Running/On/Open	Red
Auto/Ready	White
Stopped/Off/Closed	Green
Fail/Alarm	Amber
Generic Status	Blue or White

2.03 PROCESS CONTROL

A. Where set-points, operating limits, and other control settings are provided by the functional descriptions, these settings shall be initial settings only and shall be used for assistance in the initial startup of the plant. All such settings shall be fully adjustable and, based on actual operating conditions, the instrumentation subcontractor shall make all necessary adjustments to provide smooth, stable operation at no additional cost to the Owner.

B. Provision shall be made in PLC logic to suppress nuisance alarms and control actions by the following means:

For alarms and control actions derived from analog input signals, use adjustable time delays and deadbands.

1. Initial settings for time delays shall be 10 seconds (range 0-120 seconds). Initial settings for deadbands shall be 5% of span (range 0-100%).

2. Equipment that is started or stopped manually by the operator shall start or stop immediately, with no time delay.

C. All feedback control shall be by PID control algorithms. Where only proportional control is specified, tuning constants shall be used to reduce the Integral and Derivative functions to zero. All set-points, sequence times, sequence orders, dead bands, PID tuning parameters, PLC delay timers, variable speed operating range limits, and similar control constants shall be accessible and alterable from the operator workstations.

D. Unless otherwise specified, all equipment shall automatically restart after a power failure utilizing adjustable start delay timers in PLC control logic. Unless otherwise specified, all PLC control strategies shall be based upon automatic restart after a power failure and shall return to a normal control mode upon restoration of power.

E. The PLC shall be capable of receiving initial run-time values for existing and proposed equipment. Initial run-time shall not automatically be assumed to be zero.

F. Equipment failure shall be generated through the PLC for any drive, motor, etc. for which a command has been issued, but for which the PLC is not receiving a confirming status signal (e.g., start command with no run feedback). The failure shall be logged.

G. Instrument failure shall be generated via the operator work stations for any instrument which is generating a signal which is significantly less than 4 mA or greater than 20 mA, or by instrument self-diagnostic alarms. An alarm shall be generated if digital communications from an instrument is lost for more than 2 seconds.

H. A control program that controls multiple pieces of equipment shall not be prevented from running because not all of the equipment is in AUTO. If equipment within an equipment chain is required to be running for program operation and it is running in HAND or MANUAL, then the program shall run and control the other equipment that is in AUTO.

I. All PLC wait states (internal time delays, etc.) after an operator action shall be displayed on the operator workstation.

PART 3 -- FUNCTIONAL CONTROL DESCRIPTIONS

3.01 PUMP STATION

A. General

1. The pumps at the JEA Radio Avenue Reclaimed Water Pump Station shall pump water from the reclaimed water storage tanks into the water distribution system. The general control strategy for the pump station is to maintain a system discharge pressure set-point. PLC and HMI programming shall be provided by the Owner.

2. The pump station HMI and PLC shall be configured for four (4) variable speed pumps. Two of the pumps shall be installed under this contract. The PLC logic and HMI programming shall provide for monitoring and control of the pumps being installed under this contract. The pumps shall be assigned the following equipment identification numbers:

Pump No.	Equipment ID No.
Pump No. 1	P-2011
Pump No. 2	P-2021
Pump No. 3	P-2031 (Future)
Pump No. 4	P-2041 (Future)

3. VFD Keypad - when a high service pump variable frequency drive (VFD) is set to "Local" from the VFD "Local/Off/Remote" switch VFD start, stop and speed adjustment shall be controlled from the VFD keypad. When the VFD is set to "Remote" VFD control shall be from PLC-1.

4. Master Control Panel - A Pump Station Master Control Panel, MCP-1, equipped with a programmable logic controller, PLC-1, and an operator interface unit, OIU-1, shall monitor and control the pump station.

5. SCADA HMI and OIU-1 - all set-points and control/monitoring functions described herein are to be adjustable on the OIU and WWTP SCADA computer workstation HMI screens. The OIU shall be a standalone platform that is not dependent on WTP SCADA system. The WTP SCADA HMI screens shall be configured with the same monitoring and control functions as the OIU HMI screens, and both the OIU and SCADA HMI screens shall be collectively referred to as the "HMI" (human-machine interface).

B. Manual Mode: When a pump VFD is in "Remote" mode, the operator may select automatic or manual mode on the HMI. In manual mode, the operator shall have the ability to start/stop individual pumps and adjust individual pump speed from the HMI.

C. Automatic Mode: When the pumps are in automatic, they shall speed up and slow down to maintain an adjustable pump station discharge pressure set-point, as described in further detail herein.

D. Pump Availability

1. A pump shall be considered unavailable if any of the following conditions are true:

   a. VFD fault is active
   b. VFD is not in automatic mode
   c. VFD Communication to PLC-1 is lost

E. Manual Duty/Standby Selection

1. In manual mode, each pump shall be assigned duty and standby by entering the designation in the HMI by entering a check box in table, as exemplified below.

Pump	Duty	Standby
No. 1 (BP-2011)	X	

No. 2 (BP-2021)		X

2. Manual adjustment of duty selections for an unavailable pump shall be disabled on the HMI.

F. Automatic Duty/Standby Selection

1. The PLC shall automatically select the Duty and Standby pumps based on an HMI adjustable runtime set-point, initially set at 24 hours.

2. When duty selection is automatically alternated, the pump with the longest runtime will be assigned the standby duty and the pump with the shortest runtime shall be assigned the lead duty. To avoid disruption of operations, the duty assignments shall only be automatically switched when all pumps are stopped.

3. If a pump becomes unavailable, the standby pump shall be assigned to that pumps duty selection.

G. Automatic Mode - Distribution Pressure Control

1. Duty Pump: In automatic mode, the duty pump shall start and stop based on the pump station discharge pressure set-point (P1) and the pump station discharge pressure measurement (PIT-2051). When the pressure remains below the set-point minus a deadband ($P1\text{-}DP1_{start}$) for a time delay, the duty pump shall start. The PLC shall modulate the duty pump speed to maintain the discharge pressure set-point (P1) using a PID control loop.

H. Pump Speed Limits:

1. In addition to pump speed limits configured in the VFD, speed limits programmed in PLC-1 shall be adjustable from the HMI. The speed limit initial set-points shall be as follows:

Pump	**BP-2011**	**BP-2021**
Max Speed, %	100	100
Min Speed, %	60	60

I. Reclaimed Water Storage Tank Low Level Alarm

1. Active an alarm on the HMI if the water tank level (LIT-1011) is less than the “Storage tank low-low water level” set-point (D1) for 15 seconds (adjustable time delay). The alarm shall deactivate if the tank level rises above the “Low Water Level Alarm Off” set-point (D2), or if the operator manually resets the alarm on the HMI.

J. Suction/Discharge Pressure Alarms

1. High Discharge Pressure Alarm: If the discharge pressure measured at the pump discharge header by the pressure transmitter is greater than the high discharge

pressure set-point (P2), for an adjustable time delay, indicate an alarm on the HMI. A manual reset on the HMI shall be required to unlatch the alarm.

2. Low Suction Pressure Alarm: If the suction pressure measured by the pressure transmitter is less than the low pressure set-point (P3) for an adjustable time delay indicate an alarm on the HMI. A manual reset on the HMI shall be required to unlatch the alarm.

K. Set-point Initial Values and Validation

1. The HMI shall use the following initial values and check that set-points are within the following limits before accepting a set-point modification:

Set-point (SP)	Initial SP Value	Minimum	Maximum	Initial Time Delay*
PS Discharge Pressure Set-point (P1)	70 psig	45 psig	100 psig	n/a
PS High Discharge Pressure Alarm (P2)	80 psig	60 psig	100 psig	5 sec
PS Low Suction Pressure Alarm (P3)	**TBD psig	**TBD psig	**TBD psig	5 sec
Pump Station Low Flow Alarm SP (Q1)	**TBD gpm	**TBD gpm	**TBD gpm	30 sec
Pump Station High Flow Alarm SP (Q2)	**TBD gpm	**TBD gpm	**TBD gpm	30 sec
Storage Tank Low-Low Level Alarm (D1)	**TBD ft	**TBD ft	**TBD ft	15 sec
Low Water Level Alarm Off (D2)	**TBD ft	**TBD ft	**TBD ft	15 sec

* All time delays shall be adjustable from 0 to 120 seconds.
** TBD - To be determined.

2. If the operator enters a set-point that is outside these limits, the HMI shall reject the requested set-point modification and shall continue to use the previous set-point. The following warning message shall appear on the HMI:

a. “Invalid Set-point. Set-point shall be within the following range: xx-yy.”, where xx-yy indicates the appropriate range and units of the set-point.

L. Pump Shutdown Hardwired Interlocks

1. When the pump is running in local or remote, the following conditions will stop the pump via hardwired inputs to the VFD and will require a manual reset by the operator at the VFD control panel or on the HMI (if the pump is in remote):

a. VFD fault

b. Refer to the Electrical Drawings for all hardwired interlocks.

M. Local Control (at VFD)

1. Refer to the Electrical Drawings for all local controls.

N. At a minimum, provide the following on the HMI (at Pump Station OIU and SCADA HMI):

1. Local/Remote indication
2. Auto/Manual selection
3. Start command (manual)
4. Stop command (manual)
5. Pump running indication
6. Pump off indication
7. Pump ready
8. Power on indication
9. Speed adjustment (manual)
10. Speed indication
11. Fault reset command (momentary output)
12. Pump common fault alarm
13. Storage tank low-low water level set-point (D1)
14. Low water level alarm off (D2)
15. Power failure restart timers (outage time, restart time)
16. Distribution flow rate indication
17. Distribution system pressure indication
18. Pump suction side pressure
19. Pump discharge side pressure
20. Pump station low flow alarm set-point (Q1)
21. Pump station high flow alarm set-point (Q2)
22. Pressure set-points (P1, P2, P3)
23. Time delays (all)
24. Distribution system low/high pressure alarms
25. Distribution system low/high pressure alarm set-points
26. Distribution system low/high pressure alarm time delays and deadbands
27. Pump discharge high pressure alarms, alarm set-points, alarm time delays and deadbands
28. Pump suction low pressure alarms, alarm set-points, alarm time delays and deadbands
29. Pump runtimes
30. Pump runtime reset command
31. Pump runtime value entry
32. Pump lead/lag1/lag2 or duty/standby status
33. Pump alternation (lead/lag or duty/standby) auto/manual selection
34. Pump lead/lag1/lag2 or duty/standby manual selection
35. Pump failed-to-start alarm
36. Pump failed-to-start time delay

37. All miscellaneous indications and controls (refer to Drawings and I/O schedule)

O. Allow Pump to Start Validation

1. When in either manual or automatic modes, the PLC shall not allow the pumps to run if the following conditions are true:

a. Water level in the water tanks (as measured by LIT-1011) is below the "Storage Tank Low-Low Water Level" set-point (D1) for an adjustable time delay, initially set at 15 seconds.

3.02 PRESSURE SUSTAINING AND TANK FILL VALVE

A. Electronic Control Valve PSV-1001

1. The GST is designed to be filled during the max month (late May, no rain) off-peak hour scenario, maintaining a system residual pressure of 35 psi. Pressures greater than this level will not allow the tank to completely fill during the design scenario. Operators may change this setting during other seasonal times of the year, based on actual demand and preference.

2. Valve status as a percentage of travel shall be displayed on the HMI (open/filling, closed).

3. The pressure sustaining and tank fill valve shall be prohibited from opening during retail service time (regardless of tank level) as set by the operator, initially set to begin at 4:30 am and end at 8:30 pm. The PLC shall automatically calculate and adjust the time for standard and daylight savings times.

4. When the GST depth is below the operator set point, which initially shall be set to 2 ft less than the stop fill set point, the control valve opens to fill the tank. The control system shall automatically fill the GST at the maximum rate possible while maintaining the operator pressure sustaining set point, initially set at 35 psi. When the GST depth achieves the LSH OR HW setpoint, the control system initiates the control valve to close to stop filling the tank.

5. Operator adjustable setpoint for ground storage tank stop fill level to allow operators to define tank stop fill level.

6. Start fill shall be hardcoded at 2 feet below operator stop fill setpoint, but not less than pump start permissive level.

7. PSV-1001 shall fail closed on power loss and shall actuate open and close as follows:

Close Valve	Open SV-1001A, Close SV-1001B

Open Valve	Close SV-1001A, Open SV 1001B
Hold Valve position	Close SV-1001A, Close SV-1001B
Maintain Pressure (control loop once valve is opened)	Maintain LP setting as described. Hold Valve position until called to change.

i. SV-1001A is a 3-way universal - Normally Open – Energize to Close

ii. SV-1001B is a 3-way universal - Normally Closed – Energize to Open

iii. Once open to fill, valve shall act in pressure sustaining mode until called to close. Valve shall pulse (repeatedly if required) to open and to close to maintain pressure setpoint. Pulse duration and frequency/rest duration shall be per valve manufacturer recommendation.

iv. Operator variable set point (allowable range 35 to 55 psi) shall be displayed on the HMI.

B. GST Fill Procedure

1. Hand/Off/Auto selector on the HMI

a. Hand selector shall be manual fill / open.

b. Off selector shall be manual stop / close selector on the HMI.

c. Auto selector shall open/start fill or close/stop fill according to the GST level setpoints described herein above or operator adjustable setpoint.

3.03 SODIUM HYPOCHLORITE SYSTEM

A. General

1. The control system shall monitor that status of the hypochlorite system including pumping system, tank level, system pressure, and fault status.

2. The control system HMI shall be configured to display the following:

a. Hypochlorite pump speed in percent format shall be displayed on the HMI

b. Adjustable setpoints, system status, pump in service/out of service

c. Reset pushbutton to reset PID control loop

B. Storage Tank Level

1. LIT-5001 and LIT-5002, reporting in feet, displayed on the HMI and trended.

2. High level alarm, Operator adjustable value, initial = 14.5 feet

3. Low level alarm, Operator adjustable value, initial = 3.0 feet

C. System Pressure

1. PIT-5021 analog reporting in pressure displayed on the HMI and trended.

2. High pressure alarm, Operator adjustable value, initial = 20.0 psi. High pressure shall shutdown hypochlorite pumps.

3. Low pressure alarm, Operator adjustable value, initial = 2.0 psi. Only applicable when hypochlorite pumps are being called to run.

D. Pumping System

1. The control system shall control and monitor hypochlorite feed pumps (P-5011, P-5012).

2. The control system shall control the speed of the pumps based on the effluent flow rate and trimmed based on the chlorine residual using a PID loop.

3. The initial speed of the metering pump shall be calculated with the following formula:

$$\text{Speed (\%)} = \frac{\text{Dosage (mg/L)} \times \text{Process Flow (MGD)} \times 0.04167 \text{ (unit conversions)}}{\text{Metering pump capacity (gph)} \times \text{Chemical concentration (\%)}}$$

For example:

Dosage = 3.50 mg/L
Process flow = 0.75 MGD
Metering pump capacity = 1.8 gph
Chemical concentration = 0.125 (12.5%)
Speed = 0.486 (48.6%)

4. The dosage shall be automatically trimmed (+/- 1 mg/L, adjustable) using a PID control loop based on chlorine residual feedback (AIT-20151) and an adjustable chlorine residual setpoint. The operator shall enable or disable chlorine residual trimming.

5. The operator shall be capable of selecting the active feed pumps.

6. Hypochlorite feed pumps shall be capable of being tagged out-of-service by the operator.

E. Control Panels

1. LCP-1 (DIO-1) control panel shall have a Hand/Off/Auto selector switch capable of operating the hypochlorite feed pumps as follows:

   a. In Hand – local control via hardwired digital and analog signals, local selector switches, and speed potentiometers located on the LCP-1 control panel or via controls interface on each hypochlorite feed pump.

   b. In Auto – control shall be by operator setpoints and discharge feedback as a function of station discharge flow.

   c. In Off - Hypochlorite feed pumps shall be off until placed in Hand or Auto position.

2. Truck Fill Panel TFP-5001

   a. TFP-5001 shall annunciate hypochlorite tank level status during filling operations to prevent overfilling conditions. The panel shall have a digital display to annunciate level in feet and an audio / visual combination horn / strobe activated upon tank high level.

- END OF SECTION –

Appendix A1

Geotechnical Report: Nassau WRF Improvements Phase 1B July 19, 2018

FIle is password protected, as a result file has been included separately

Appendix A2

Geotechnical Report: Nassau WRF Improvements Phase 1B October 1, 2019

Report of Final Geotechnical Exploration

For

Nassau WRF Improvements
Phase 1B

MAE Project No. 0110-0003E
October 1, 2019

Prepared for:

Hazen

Hazen and Sawyer
6675 Corporate Center Parkway, Suite 330
Jacksonville, Florida 32216

JEA®

Prepared by:

TEN YEARS 10 MAE
Meskel & Associates Engineering
Geotechnical ⌜ Environmental ⌜ Inspection ⌜ Testing

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October 1, 2019

Hazen and Sawyer
6675 Corporate Center Parkway, Suite 330
Jacksonville, Florida 32216

Attention: Ms. Caitlin Klug, P.E.

Reference: Report of Final Geotechnical Exploration
Nassau WRF Improvements – Phase 1B
Nassau County, Florida
MAE Project No. 0110-0003E

Dear Ms. Klug:

Meskel & Associates Engineering, PLLC (MAE) has completed a final geotechnical exploration for the subject project. Our work was performed in general accordance with our Subcontract Agreement for Professional Services dated June 4, 2018. The purpose of this exploration was to evaluate the subsurface conditions encountered at the planned Ground Storage Tank, Booster Pump Station and Electrical Room locations as shown on the provided plan sheet, to provide recommendations for foundation design and construction. A summary of our findings and recommendations are presented below; however, we recommend that this report be considered in its entirety.

As further discussed in this report, the borings located within the proposed structure areas encountered a surficial topsoil layer 3 to 6 inches thick, underlain by fine sands (SP), fine sands with silt (SP-SM) and silty fine sands (SM) to the boring termination depths of 20, 30 and 60 feet below existing grade. Trace amounts of root fragments were noted in some of the recovered samples from the ground surface to depths of 2 to 6 feet. Groundwater was encountered at all boring locations at depths varying from 3 feet 6 inches to 4 feet 2 inches below the existing ground surface at the time of this recent exploration.

Based on our findings, the encountered soils are suitable for support of the planned construction on conventional mat or shallow foundation systems provided a program of site preparation is followed. The encountered soils are generally suitable to be reused as general site development or structural fill across the site. The moisture content will need to be controlled to achieve the required level of compaction below proposed structures. This will likely require dewatering of excavations or stockpiling of soils excavated below the groundwater level to dry before placement and compaction.

We appreciate this opportunity to be of continued service as your geotechnical consultant on this phase of the project. If you have any questions, or if we may be of any further service, please contact us.

Sincerely,
MESKEL & ASSOCIATES ENGINEERING, PLLC
MAE FL Certificate of Authorization No. 28142

P. Rodney Mank, State of Florida, Professional Engineer, License No. 41986. This item has been electronically signed and sealed by P. Rodney Mank, P.E. on 10/01/2019 using a Digital Signature. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

W. Josh Mele, E.I.
Staff Engineer

P. Rodney Mank, P.E.
Principal Engineer
Licensed, Florida No. 41986

Distribution: Ms. Caitlin Klug, P.E. – Hazen and Sawyer 1 pdf

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1.0 PROJECT INFORMATION

1.1 General

Project information was provided to us by Ms. Caitlin Klug, P.E. and Mr. John Wilhoit, E.I., with Hazen and Sawyer, PC via several electronic correspondence and telephone conversations. We were provided with the Site and Yard Piping Plan sheet prepared by Hazen and Sawyer and dated May 2019. This plan sheet showed the proposed construction and the requested soil boring locations and their corresponding Northing and Easting coordinates.

A preliminary geotechnical exploration was performed for this site and reported on July 19, 2018 (MAE Project No. 0110-0003D). The results from that field exploration were reviewed as referenced in this report during our evaluation of the subsurface conditions below the proposed structures.

1.2 Project Description

The site for the subject project is an undeveloped 3.5-acre parcel, located east of Art Wilson Lane and north of Radio Avenue in Nassau County, Florida. The general site location is shown on Figure 1.

Based on the provided information and our discussions with Ms. Klug, we understand that JEA will construct a remote pump station and storage tank to act as an intermediate storage and repump for the nearby Nassau Regional Water Reclamation Facility (WRF) and to accommodate peak demands for the expected growth and development of the East Nassau Community Planning Area. We understand the proposed Ground Storage Tank (GST) will be a prestressed concrete tank with a capacity of 1.5 million gallons and a diameter of about 120 feet. Therefore, we estimate the maximum water height within the tank to be about 20 feet. We have assumed the GST will be supported on a flexible mat foundation system.

A Booster Pump Station and a Generator and Fuel Tank are also planned. The Booster Pump Station is approximately 35 feet by 65 feet in plan area. The Generator and Fuel Tank slab is approximately 8 feet by 20 feet in plan area. We have assumed that both structures will have monolithic, cast-in-place concrete grade-supported slabs.

The provided plan sheet shows the Finished Floor Elevation of the GST to be 31.0 feet, and that of the Booster Pump Station and Generator Pad and Fuel Tank is 29.5 feet. Therefore, we have estimated 2 to 3 feet of fill will be placed within the construction areas.

The recommendations provided in this report are based on the site and structure details provided above. If final project design details vary from those given above, then the recommendations in this report may need to be re-evaluated. Any changes in these conditions should be provided so the need for re-evaluation of our recommendations can be assessed.

2.0 FIELD EXPLORATION

A field exploration was performed on August 14 and 15, 2018. The Northing and Easting coordinates as shown on the provided Yard and Piping Plan were used to locate the soil borings on the site. The final boring locations are shown on the *Boring Location Plan*, Figure 2, which is a copy of the provided plan. Boring B-8, drilled on June 15, 2018 for our preliminary report, was added to Figure 2 as it was located within the proposed GST structure area.

Prior to mobilizing our equipment, a Utility Locate Request was submitted to the Sunshine State One-Call Center (SSOC). Once the site utilities were located and marked, we mobilized our ATV-mounted drilling equipment. Our field personnel located each boring using a Garmin GPSMAP 78 hand-held GPS receiver; therefore, the boring locations should be considered accurate only to the degree implied by the method of layout used.

2.1 SPT Borings

A total of 6 Standard Penetration Test (SPT) borings were located within the planned GST, Electrical Room and Booster Pump Station areas. Boring B-9, located at the approximate center of the proposed GST, was to be advanced to a depth of approximately 60 feet below existing grade. It should be noted that the boring encountered an apparent shell layer at a depth of about 51 feet below existing grade. At that depth, all drilling fluid circulation was lost and the borehole collapsed. The crew moved approximately 8 feet to the west and advanced a borehole (Boring B-9A) by rotary wash methods to a depth of about 53.5 feet, where they continued the boring as an SPT boring to the termination depth of 60 feet. No loss of drilling fluids was observed during the performance of this boring.

Borings B-10, B-11 and B-12 were located along the approximate perimeter of the GST and were each advanced to a depth of approximately 30 feet below existing grade. The borings for the Booster Pump Station and Generator and Fuel Tank (B-13 and B-14, respectively) were each advanced to a depth of approximately 20 feet. All of the borings were performed in general accordance with the methodology outlined in ASTM D 1586. Split-spoon soil samples recovered during performance of the borings were visually described in the field and representative portions of the samples were transported to our laboratory for classification and testing.

3.0 LABORATORY TESTING

Representative soil samples obtained during our field exploration were visually classified by a geotechnical engineer using the *Unified Soil Classification System* (USCS) in general accordance with ASTM D 2488. A *Key to the Soil Classification System* is included in Appendix A.

Quantitative laboratory testing was performed on selected samples of the soils encountered during the field exploration to better define the composition of the soils encountered and to provide data for correlation to their anticipated strength and compressibility characteristics. The laboratory testing determined the natural moisture content, the percent passing the U.S. No. 200 sieve (percent fines), and the organic content of the selected soil samples. The results of the laboratory testing are shown in the *Summary of Laboratory Test Results* table included in Appendix B. Also, these results are shown on the *Generalized Soil Profiles*, Figures 3 through 5, and on the *Log of Boring* records at the respective depths from which the tested samples were recovered. A description of the laboratory testing procedures is included in Appendix B.

4.0 GENERAL SUBSURFACE CONDITIONS

4.1 General Soil Profile

Graphical presentation of the generalized subsurface conditions as encountered within the proposed structure areas is presented on the *Generalized Soil Profiles*, Figures 3 through 5. Detailed boring records are included in Appendix A. When reviewing the soil profiles and boring records, it should be understood

that the soil conditions will vary between the boring locations. The following table summarizes the soil conditions encountered.

GENERAL SOIL PROFILE			
APPROXIMATE DEPTH (FT)		SOIL DESCRIPTION	USCS[1]
FROM	TO		
0	0.25 – 0.5	Topsoil	---[2]
0.25 - 0.5	2 - 6	Very loose to loose fine SAND and fine SAND with silt, poorly graded, with trace root fragments.	SP, SP-SM
2 - 6	8 - 13	Loose to medium dense fine SAND to fine SAND with silt, poorly graded.	SP, SP-SM
8 - 13	13 - 18	Dense fine SAND to fine SAND with silt, poorly graded.	SP-SM
13 - 18	43	Medium dense fine SAND with silt, poorly graded	SP-SM
43	60	Loose to medium dense silty fine SAND, few to little amounts of gravel (shell fragments) from 48 to 60 feet	SM

(1) Unified Soil Classification System
(2) Topsoil does not have an associated USCS classification

4.2 Groundwater Level

The groundwater level was encountered at each of the recent soil boring locations and recorded at the time of drilling at depths varying from 3 feet 6 inches to 4 feet 2 inches below the existing ground surface. The groundwater level was encountered at boring location B-18 at a depth of 1 foot 3 inches at the time of drilling (June 15, 2018).

It should be anticipated that groundwater levels will fluctuate seasonally and with changes in climate. As such, we recommend that the water table be measured prior to construction. Measured groundwater levels are shown on the *Generalized Soil Profiles*, Figures 3 through 5, and on the soil boring logs.

4.3 Review of the USDA Web Soil Survey Map

The results of a review of the USDA Soil Survey Conservation Service (SSCS) Web Soil Survey of Nassau County are shown in the table below. There are two predominant soil map units at the project site: Hurricane-Pottsburg and Mandarin fine sands. The soil drainage class, hydrological group, and estimated seasonal high groundwater levels reported in the Soil Survey are as follows:

Map Unit Symbol	Map Unit Name	Drainage Class	Hydrologic Group	Depth to the Water Table[1] (inches)
6	Hurricane-Pottsburg fine sands, 0 to 5 percent slopes	Somewhat Poorly Drained to Poorly Drained	A, A/D	12 to 42

Map Unit Symbol	Map Unit Name	Drainage Class	Hydrologic Group	Depth to the Water Table[1] (inches)
10	Mandarin fine sand, 0 to 2 percent slopes	Somewhat Poorly Drained	A	18 to 30

[1] The "Water Table" above refers to a saturated zone in the soil which occurs during specified months, typically the summer wet season. Estimates of the upper limit shown in the Web Soil Survey are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

4.4 Seasonal High Groundwater Level

In estimating seasonal high groundwater level, a number of factors are taken into consideration including antecedent rainfall, soil redoximorphic features (i.e., soil mottling), stratigraphy (including presence of hydraulically restrictive layers), vegetative indicators, and relief points such as drainage ditches, low-lying areas, etc.

Based on our interpretation of the current site conditions, including the boring logs and review of published data, we estimate the seasonal high groundwater levels at the site to be generally 6 to 18 inches below the ground surface at the time of our exploration. However, it should be understood that this seasonal high estimate is based on site observations and measurements at the time of our field work and on historical data on the site soil conditions. Changes in onsite stormwater drainage patterns caused by off-site development may cause seasonal high water levels to be higher or lower than historical patterns. The project drainage engineer should be consulted to evaluate the influence of these changes on groundwater levels at the site. In addition, we recommend that piezometers be installed across the site to measure groundwater fluctuations over time.

It is possible that groundwater levels may exceed the estimated seasonal high groundwater level as a result of significant or prolonged rains, which may result in ponded water in areas of the site. Therefore, we recommend that design drawings and specifications account for the possibility of groundwater level variations, and construction planning should be based on the assumption that such variations will occur.

5.0 FINAL DESIGN RECOMMENDATIONS

5.1 General

We reviewed the results of our preliminary field exploration, particularly boring B-8, which was located near the west perimeter of the proposed GST, during our evaluation for this report. Based on the results of both field explorations, it is our opinion that the encountered subsurface conditions are adaptable to support the proposed GST, Electrical Room and Booster Pump Station structures on shallow foundations and grade-supported slabs. The following evaluation and recommendations are based on the provided project information as presented in this report, the results of the field exploration and laboratory testing performed, and the construction techniques recommended in Section 6.0 below. If the described project conditions are incorrect or are changed after this report, or if subsurface conditions encountered during construction are different from those reported, then MAE should be notified so that these recommendations can be re-evaluated and revised, if necessary. We recommend that MAE review the foundation plans and earthwork specifications to verify that the recommendations in this report have

been properly interpreted and implemented.

5.2 GST Foundation Design Recommendations

We have assumed that the prestressed concrete tank will be supported on a 4-inch-thick concrete slab-on-grade. The slab will be thickened at the tank edge to support the tank walls and dome. Based on the results of our exploration, we consider the subsurface conditions at the site adaptable for support of the proposed GST structure when constructed on a properly designed shallow foundation system. Provided the site preparation and earthwork construction recommendations outlined in Section 6.0 of this report are performed, the following parameters may be used for foundation design.

5.2.1 Bearing Pressure

Based on the 1.5 million-gallon storage capacity and the tank diameter of 120 feet, we calculated a water storage height of approximately 20 feet. Therefore, we estimate the maximum load applied to the subgrade soils, or the net soil bearing pressure, to be on the order of 1,500 pounds per square foot (psf). The maximum allowable net soil bearing pressure for shallow foundations supporting the tank walls or adjacent tank features such as stair pads should not exceed 2,500 psf.

Net bearing pressure is defined as the soil bearing pressure at the foundation bearing level in excess of the natural overburden pressure at that level. The mat foundation for the GST should be designed based on the maximum load that could be imposed by all loading conditions.

5.2.2 Foundation Size

The minimum width of the perimeter footing supporting the tank walls should be 18 inches. Isolated pad footing should have a minimum dimension of 24 inches. Even though the maximum allowable soil bearing pressure may not be achieved, this width recommendation should control the size of these foundations.

5.2.3 Bearing Depth

The minimum embedment depth for the thickened edge footing portion of the GST slab is 12 inches below the adjacent outside finished grades. The minimum embedment depth of any isolated footings, supporting structures or equipment adjacent to the tank, should be 18 inches below the adjacent outside finished grades. It is recommended that surface grades adjacent to the tank structure and outside any isolated pads be graded to divert surface water away from the tank and isolated pads to reduce the possibility of erosion beneath the thickened edge slab and pad foundations.

5.2.4 Bearing Material

The tank slab including the thickened-edge portion and the isolated pad foundations may bear on either the compacted existing site soils, or on compacted import structural fill if needed to raise the site grade. The bearing level soils, after compaction, should exhibit densities equivalent to 98 percent of the modified Proctor maximum dry density (ASTM D 1557), to a depth of at least 2 feet below the foundation bearing levels.

5.2.5 Settlement Estimates

Post-construction settlements of the tank structure will be influenced by several interrelated factors, such as (1) subsurface stratification and strength/compressibility characteristics; (2) the size of the tank foundation and the bearing level, the applied loads, and the resulting bearing pressures beneath the

foundation; and (3) site preparation and earthwork construction techniques used by the contractor. The settlement estimates presented below are based on the results of our field exploration at the site, laboratory test results, and the use of the site preparation/earthwork construction techniques as recommended in this report. Any deviation from these recommendations could result in an increase in the estimated post-construction settlements of the storage tank structure.

Using the estimated load of 1,500 psf to be applied to the foundation soils by the full water tank, and the field and laboratory test data that we have correlated to geotechnical strength and compressibility characteristics of the subsurface soils, we estimate that the total settlement of the tank structure at the tank center to be approximately 1.25 inches. Total settlement of any isolated pad foundations adjacent to the tank is estimated to be less than one inch.

Differential settlements result from differences in applied bearing pressures and variations in the compressibility characteristics of the subsurface soils. Because of the general uniformity of the subsurface conditions, and assuming the recommended site preparation and earthwork construction techniques outlined in Section 6.0 are followed, we estimate the differential settlement between the center and perimeter of the tank to be approximately 0.5 to 0.75-inch. We recommend that piping, tank nozzles, and other attachments be designed with adequate consideration for the anticipated settlement.

The soil borings encountered predominately sandy soils within the expected stress zone of influence for the tank structure. Therefore, we expect the majority of the estimated total and differential settlement to occur in an elastic manner during construction and initial filling of the tank. The remainder of the estimated settlement will likely occur within approximately 2 weeks once the tank is constructed and filled to its design water level, as pore water pressures within the foundation soils recede. The majority of the estimated settlement for isolated pad foundation located adjacent to the tank will occur as the load is applied.

5.2.6 Tank Slab

The tank slab can be constructed as a slab-on-grade bearing on the existing site soils or suitable compacted structural fill soil and designed for a modulus of subgrade reaction of 200 pci. The surficial topsoil and other unsuitable material should be removed as discussed in Section 6.1.1 below. Any import structural fill needed to raise the site grade should be placed and compacted as outlined in Section 6.1.4. It is recommended that the tank slab bearing soils be covered with an impervious membrane to reduce moisture entry and floor dampness. A 6-mil thick plastic membrane is commonly used for this purpose. Care should be exercised not to tear large sections of the membrane during placement of reinforcing steel and concrete. In addition, we recommend that a minimum separation of 2 feet be maintained between the tank slab bearing level and the estimated seasonal high groundwater level.

5.3 Electrical Room and Booster Pump Station

Based on the results of our exploration, we consider the subsurface conditions at the site adaptable for support of the proposed Electrical Room and Booster Pump Station structures on monolithic slab-on-grade foundations designed for a modulus of subgrade reaction of 200 pci. Provided the site preparation and earthwork construction recommendations outlined in Section 6.0 of this report are performed, the following parameters may be used for foundation design.

5.3.1 Bearing Pressure

The maximum allowable net soil bearing pressure for the turned-down-edge footings and any isolated

pad footings should not exceed 2,500 psf. Net bearing pressure is defined as the soil bearing pressure at the foundation bearing level in excess of the natural overburden pressure at that level. The footings, grade-supported slabs and wet well slab should be designed based on the maximum load that could be imposed by all loading conditions.

5.3.2 Foundation Size

The minimum width of the turned-down-edge footings should be 12 inches. Isolated pad footing should have a minimum dimension of 24 inches. Even though the maximum allowable soil bearing pressure may not be achieved, this width recommendation should control the size of these foundations.

5.3.3 Bearing Depth

The turned-down-edge footings should bear at a depth of at least 12 inches below the exterior final grades. The minimum embedment depth of any isolated pad footings should be 18 inches below the adjacent outside finished grades. It is recommended that stormwater be diverted away from these foundations to reduce the possibility of erosion beneath the slabs and any isolated footings.

5.3.4 Bearing Material

The wet well slab and grade-supported slabs including the turned-down-edge footings and the isolated pad foundations may bear on either the compacted existing site soils, or on compacted import structural fill if needed to raise the site grade. The bearing level soils, after compaction, should exhibit densities equivalent to 98 percent of the modified Proctor maximum dry density (ASTM D 1557), to a depth of at least 2 feet below the foundation bearing levels.

5.3.5 Settlement Estimates

Post-construction settlements of the Electrical Room and Booster Pump Station structures will be influenced by several interrelated factors, such as (1) subsurface stratification and strength/compressibility characteristics; (2) the area of each structure and the bearing level, the applied loads, and the resulting bearing pressures; and (3) site preparation and earthwork construction techniques used by the contractor. The settlement estimates presented below are based on the results of our field exploration at the site, laboratory test results, and the use of the site preparation/earthwork construction techniques as recommended in this report. Any deviation from these recommendations could result in an increase in the estimated post-construction settlements of the structures.

Using the recommended bearing pressure applied to the foundation subgrade soils, and the field and laboratory test data that we have correlated to geotechnical strength and compressibility characteristics of the subsurface soils, we estimate that the total settlement of each structure to be less than one inch. Differential settlements result from differences in applied bearing pressures and variations in the compressibility characteristics of the subsurface soils. Because of the general uniformity of the subsurface conditions, and assuming the recommended site preparation and earthwork construction techniques outlined in Section 6.0 are followed, we estimate the differential settlement across the structure to be 0.5 -inch or less. We recommend that any piping or other attachments be designed with adequate consideration for the anticipated settlement.

5.4 Below Grade Structure Support Recommendations

Based on the results of the subsurface exploration and laboratory testing and considering the provided

information as discussed in this report, we consider the subsurface conditions at the sites adaptable for supporting the wet well structure and pipelines when constructed upon properly prepared subgrade soils. Provided the site preparation and earthwork construction recommendations outlined in Section 6.0 of this report are performed, the following parameters may be used for design of below-grade utilities.

5.4.1 Wet Well Slab Design Parameters

The maximum allowable net soil bearing pressure for the wet well slab for the Booster Pump Station should not exceed 1,000 psf. The net bearing pressure is defined as the soil bearing pressure at the foundation bearing level in excess of the natural overburden pressure at that level. The wet well slab may bear on the compacted existing site soils. The bearing level soils, after compaction, should exhibit densities equivalent to 95 percent of the modified Proctor maximum dry density (ASTM D 1557), to a depth of at least one foot below the slab bearing level.

5.4.2 Lateral Pressure Design Parameters

The wet well below-grade walls that are backfilled on one side and restrained against rotation at the top, should be designed to resist lateral pressures from soil and groundwater based on the following equivalent fluid unit weights:

- Above Water Table – Equivalent Fluid Density 60 lb/ft^3
- Below Water Table – Equivalent Fluid Density 90 lb/ft^3

For the design of lateral loads on below-grade walls, we recommend that the groundwater level be assumed to be at the ground surface. Lateral pressure distributions in accordance with the above do not take into account forces from construction equipment, wheel loads or other surcharge loads. To account for this loading, a pressure equal to 0.5 times the anticipated surface surcharge should be applied over the full height of all walls.

5.4.3 Hydrostatic Uplift Resistance

It is anticipated that the buried structures will exert little or no net downward pressure on the soils; rather, the structures may be subject to hydrostatic uplift pressure when empty. Below grade structures should be designed to resist hydrostatic uplift pressures appropriate for their depth below existing grade and the normal seasonal high groundwater table. Hydrostatic uplift forces can be resisted in several ways including:

- Addition of dead weight to the structure.
- Mobilizing the dead weight of the soil surrounding the structure through extension of footings outside the perimeter of the structure.

A moist compacted soil unit weight of 110 lb/ft^3 may be used in designing structures to resist buoyancy.

5.5 Borrow Considerations

Based on the subsurface soil conditions as encountered in the borings, the fine sands (SP) and fine sands with silt (SP-SM) are considered suitable for use as fill soil for general site development and as structural fill placed below proposed structures. However, it should be noted that several borings encountered soils with greater than 4 percent organic fines content. These soils are not considered suitable for use as structural fill due to their relatively high organic content. These soils will need to be stockpiled separately

from other structural fill soils and can be used as embankment fill for pavements and in landscape areas. In addition, the soils containing surficial organic material (topsoil) will require removal and are also considered unsuitable for use as structural fill. They could be used in landscape berms.

It should be anticipated that soils excavated below the groundwater level at the time of construction will have moisture contents in excess of the modified Proctor optimum moisture content. Thus, the excavations will need to be dewatered prior to excavation, or the excavated soils will need to be stockpiled or spread to bring the moisture content to within 2 percent of the soil's optimum moisture content corresponding to the required degree of compaction.

6.0 SITE PREPARATION AND EARTHWORK RECOMMENDATIONS

Site preparation as outlined in this section should be performed to provide more uniform foundation bearing conditions and to reduce the potential for post-construction settlements of the planned structures and pipeline.

6.1 GST, Booster Pump Station, Electrical Room Structures

6.1.1 Clearing and Stripping

Prior to construction, the location of existing underground utility lines within the construction area should be established. Provisions should then be made to relocate interfering utilities to appropriate locations. It should be noted that, if underground pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion, which may subsequently lead to excessive settlement of overlying structures.

The "footprint" of the proposed structures, plus a minimum additional margin of 5 feet, should be stripped of all surface vegetation, stumps, debris, organic topsoil, or other deleterious materials. During grubbing operations, roots with a diameter greater than 0.5-inch, stumps, or small roots in a concentrated state, should be grubbed and completely removed.

Based on the results of the recent field exploration and that performed in June 2018, it should be anticipated that approximately 3 to 6 inches of topsoil and soils containing significant amounts of organic materials may be encountered at the structure areas. The actual depths of unsuitable soils and materials should be determined by MAE using visual observation and judgment during earthwork operations. Any topsoil removed from the structure areas can be stockpiled and used subsequently in areas to be grassed.

6.1.2 Temporary Groundwater Control

The groundwater level at the structure locations was encountered at depths varying from 3 feet 6 inches to 4 feet 2 inches below the existing ground surface at the time of the recent exploration. Should groundwater control measures become necessary, the dewatering method should be determined by the contractor. We recommend the groundwater control measures, if necessary, maintain the groundwater level at least 2 feet below the compacted surface and remain in place until compaction of the existing soils is completed. The site should be graded to direct surface water runoff from the construction area.

6.1.3 Compaction

After completing the clearing and stripping operations, and after installing the temporary groundwater control measures if required, the exposed surface area should be compacted with a vibratory drum roller

having a minimum static, at-drum weight, on the order of 5 to 10 tons. Typically, the soils should exhibit moisture contents within ±2 percent of the modified Proctor optimum moisture content (ASTM D 1557) during the compaction operations. Several overlapping passes should be made in both directions across the footprint area of the planned structures, with each pass overlapping the previous pass by at least 30 percent. Compaction should continue until densities of at least 98 percent of the modified Proctor maximum dry density (ASTM D 1557) have been achieved within the upper 2 feet of the compacted existing soils at the site.

Should the bearing level soils experience pumping and soil strength loss during the compaction operations, compaction work should be immediately terminated. The disturbed soils should be removed and backfilled with dry structural fill soils as defined in Section 6.1.4 below, which are then compacted, or the excess moisture content within the disturbed soils should be allowed to dissipate before recompacting.

Care should be exercised to avoid damaging any nearby structures while the compaction operation is underway. Prior to commencing compaction, occupants of adjacent structures should be notified, and the existing conditions of the structures should be documented with photographs and survey. Compaction should cease if deemed detrimental to adjacent structures, and MAE should be contacted immediately.

It is recommended that the vibratory roller remain a minimum of 75 feet from existing structures. Within this zone, use of a track-mounted bulldozer or a vibratory roller, operating in the static mode, is recommended. If such methods are deemed necessary, then it may be necessary to excavate the top foot of soil subgrade, following site clearing, and compact the underlying soils to the specified level of compaction, followed by re-placement and compaction of the excavated soil.

6.1.4 Structural Backfill and Imported Fill Soils

Any structural backfill or fill required for site development should be placed in loose lifts not exceeding 12 inches in thickness and compacted by the use of the above described vibratory drum roller. The lift thickness should be reduced to 8 inches if the roller operates in the static mode or if track-mounted compaction equipment is used. If hand-held compaction equipment is used, the lift thickness should be further reduced to 6 inches.

Imported structural fill is defined as a non-plastic, inorganic, granular soil having less than 12 percent material passing the No. 200 mesh sieve and containing less than 4 percent organic material. The existing site soils consisting of fine sands and fine sands with silt, without roots or debris, as encountered in the borings, are also considered suitable as fill and backfill and, with proper moisture control, should densify using conventional compaction methods.

It should be noted that soils with more than 12 percent passing the No. 200 sieve will be more difficult to compact, due to their nature to retain soil moisture, and may require drying. Typically, the material should exhibit moisture contents within ±2 percent of the modified Proctor optimum moisture content (ASTM D 1557) during the compaction operations. Compaction should continue until densities of at least 98 percent of the modified Proctor maximum dry density (ASTM D 1557) have been achieved within each lift of the compacted structural fill.

6.1.5 Foundation Areas

After satisfactory surface compaction and placement and compaction of any additional imported

structural fill, the foundation areas may be excavated to the planned bearing levels. The foundation bearing level soils, after compaction, should exhibit densities equivalent to 98 percent of the modified Proctor maximum dry density (ASTM D 1557), to a depth of two feet below the bearing level. For confined areas, such as the footing excavations, any additional compaction operations can probably best be performed by the use of a lightweight vibratory sled or roller having a total weight on the order of 500 to 2000 pounds.

6.2 Wet Well and Pipelines

6.2.1 Clearing

Prior to construction, the location of existing underground utility lines within the construction area should be established. Provisions should then be made to relocate interfering utilities to appropriate locations. It should be noted that if underground pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion which may subsequently lead to excessive settlement of overlying structures.

Based on the results of our field exploration, it should be anticipated that approximately 4 inches of topsoil and soils containing significant amounts of organic materials may be encountered across the site. The actual depths of unsuitable soils and materials should be determined by MAE using visual observation and judgment during earthwork operations. Any topsoil removed from the structure areas can be stockpiled and used subsequently in areas to be grassed.

6.2.2 Temporary Groundwater Control

Because of the need for excavation to the wet well slab and pipe bearing levels, followed by compaction of the wet well slab subgrade and pipe bedding and backfill soils, it may be necessary to install temporary groundwater control measures to dewater the area to facilitate the excavation and compaction processes. The groundwater control measures should be determined by the contractor but can consist of sumps or wellpoints (or a combination of these or other methods) capable of lowering the groundwater level to at least 3 feet below the required depth of excavation. The dewatering system should not be decommissioned until excavation, compaction, and fill placement is complete, and sufficient deadweight exists on the structures to prevent uplift.

6.2.3 Preparation of Foundation Soils

For the wet well slab and pipelines that are anticipated to bear in the existing sandy soils (SP, SP-SM), the soils should be excavated to the proposed bearing elevation and the exposed excavation surface should be compacted as outlined in the following sections. Once the wet well slab and walls and pipe are installed, the wet well excavation and pipe trenches should be backfilled with compacted structural backfill to final grade.

6.2.4 Compaction of Excavation Bottom

After installing the temporary groundwater control measures, and achieving the required depth of excavation, the exposed sandy soil pipe bedding should be compacted with appropriate compaction equipment. Typically, the wet well slab subgrade and pipe bedding soils should exhibit moisture contents within ±2 percent of the modified Proctor optimum moisture content (AASHTO T-180) during the compaction operations. Compaction should continue until densities of at least 95 percent of the modified

Proctor maximum dry density (AASHTO T-180) have been achieved within the upper one foot below the wet well slab or pipe invert elevations.

Should the bearing level soils experience pumping and soil strength loss during the compaction operations, compaction work should be immediately terminated and (1) the disturbed soils removed and backfilled with dry structural fill soils as defined in Section 6.2.6 that are then compacted, or (2) the excess moisture content within the disturbed soils allowed to dissipate before recompacting.

Care should be exercised to avoid damaging any nearby structures while the compaction operations are underway. Compaction should cease if deemed detrimental to adjacent structures.

6.2.5 Excavation Protection

Excavation work for the wet well and pipeline construction will be required to meet OSHA Excavation Standard Subpart P regulations for Type C Soils. The use of excavation support systems will be necessary where there is not sufficient space to allow the side slopes of the excavation to be laidback to at least 2H:1V (2 horizontal to 1 vertical) to provide a safe and stable working area and to facilitate adequate compaction along the sides of the excavation. In addition, it should be anticipated that an excavation support system may be necessary to protect adjacent existing structures, pavement and/or utilities that are located along the proposed pipeline alignment.

The method of excavation support should be determined by the contractor but can consist of a trench box, drilled-in soldier piles with lagging, interlocking steel sheeting or other methods. The support structure should be designed according to OSHA sheeting and bracing requirements by a Florida registered Professional Engineer. Where the wet well and pipeline excavations and the construction of excavation support systems are within 50 feet of existing structures, the existing structures should be monitored for adverse reactions to construction vibrations and dewatering activities.

6.2.6 Structural Backfill and Compaction of Structural Backfill

Import structural backfill is defined as a non-plastic, granular soil having less than 12 percent material passing the No. 200 mesh sieve and containing less than 4 percent organic material. The sandy soils (SP, SP-SM) without roots, as encountered in the borings, may also be used as structural backfill. Typically, the backfill material should exhibit moisture contents within ±2 percent of the modified Proctor optimum moisture content (AASHTO T-180) during the compaction operations. Compaction should continue until densities of at least 95 percent of the modified Proctor maximum dry density (AASHTO T-180) have been achieved within each 6- or 12-inch-thick lift of the compacted structural backfill.

Structural backfill placed within 5 feet of the wet well structure walls should be placed in 6-inch-thick loose lifts and compacted with hand-held equipment. Outside of this 5-foot zone, backfill may be placed in 12-inch-thick lifts and compacted with appropriate equipment. Care should be taken not to damage the structure walls.

Structural backfill should be placed around and above the pipeline in loose lifts not exceeding six inches in thickness and compacted by the use of hand-operated compaction equipment. At elevations greater than 12 inches above the top of pipe, structural backfill may be placed in loose lifts not exceeding 12 inches in thickness and compacted by hand-operated compaction equipment.

We recommend that soils excavated from the pipeline trenches that will be reused as backfill be stockpiled a safe distance from the excavations and in such a manner that promotes runoff away from the open trenches and limits saturation of the materials.

7.0 QUALITY CONTROL TESTING

For all structures, a representative number of field in-place density tests should be made in the upper 2 feet of compacted existing site soils, in each lift of compacted backfill and fill, in the upper 12 inches of compacted subgrade soil in the foundation areas. The density tests are considered necessary to verify that satisfactory compaction operations have been performed. We recommend density testing be performed at one location for every 5,000 square feet of tank or slab foundation area, with a minimum of 2 test locations per structure.

For the raw water pipeline, a representative number of field in-place density tests should be made in the upper 2 feet of compacted pipe bedding soils, in each lift of compacted backfill and fill, and in the upper 12 inches below the bearing levels in the pipeline excavations. The density tests are considered necessary to verify that satisfactory compaction operations have been performed. We recommend density testing be performed at a minimum of one location for every 300 feet of pipeline.

8.0 REPORT LIMITATIONS

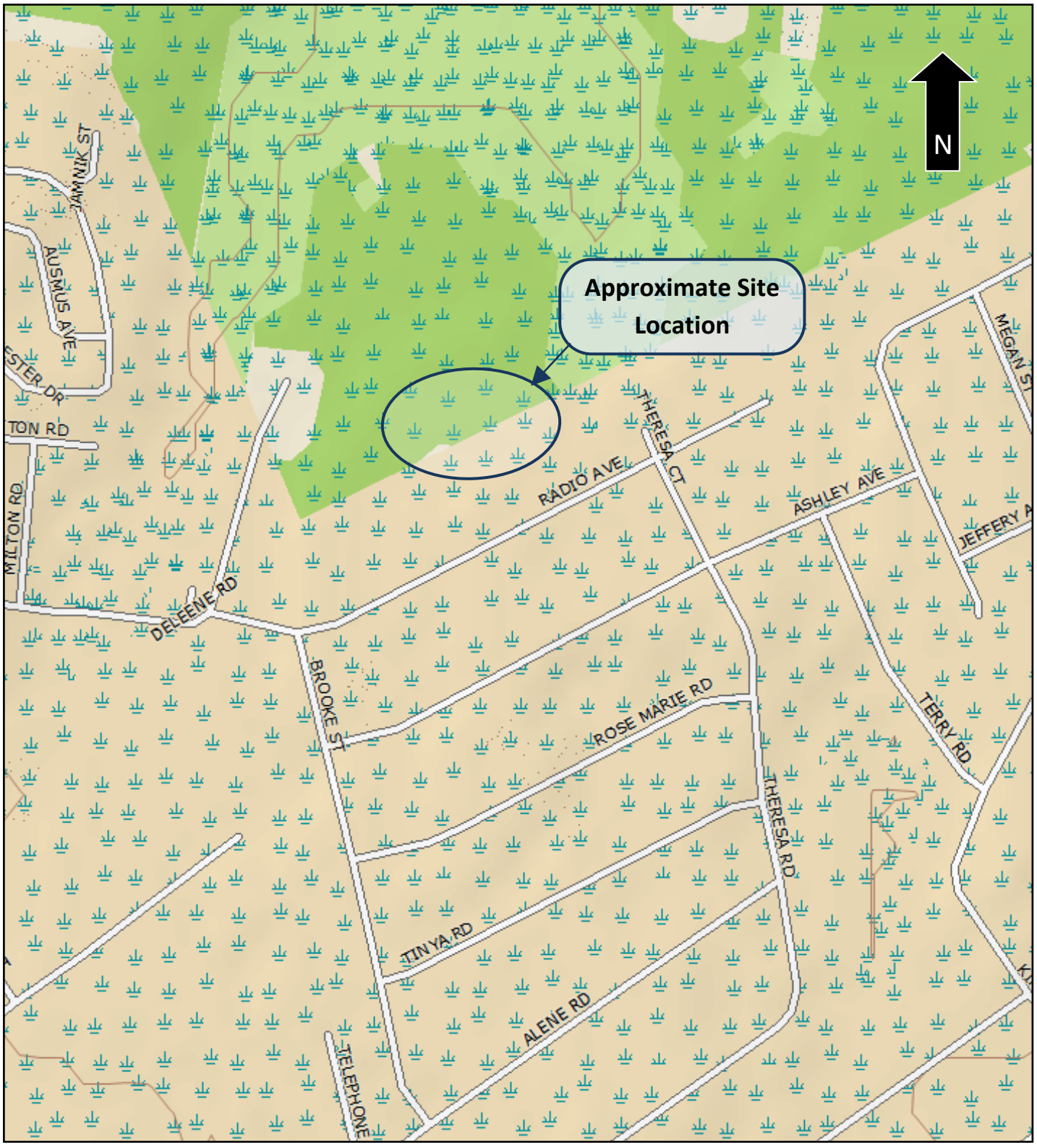
This report has been prepared for the exclusive use of Hazen and Sawyer, PC and the JEA for specific application to the design and construction of the Nassau WRF Improvements – Phase 1B project. An electronically signed and sealed version, and a version of our report that is signed and sealed in blue ink, may be considered an original of the report. Copies of an original should not be relied on unless specifically allowed by MAE in writing. Our work for this project was performed in accordance with generally accepted geotechnical engineering practice. No warranty, express or implied, is made.

The scope of our services did not include any environmental assessment or testing for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the subject site. Any statements made in this report, and/or notations made on the generalized soil profiles or boring logs, regarding odors or other potential environmental concerns are based on observations made during execution of our scope of services and as such are strictly for the information of our client. No opinion of any environmental concern of such observations is made or implied. Unless complete environmental information regarding the site is already available, an environmental assessment is recommended.

The evaluations and recommendations contained in this report are based on the data obtained from the borings performed for the proposed development. This testing indicates subsurface conditions only at the specific locations and times, and only to the depths explored. These results do not reflect subsurface variations that may exist away from the boring locations and/or at depths below the boring termination depths. Subsurface conditions and water levels at other locations may differ from conditions encountered at the tested locations. In addition, it should be understood that the passage of time may result in a change in the conditions at the tested locations. If variations in subsurface conditions from those described in this report are observed during construction, the recommendations in this report must be re-evaluated.

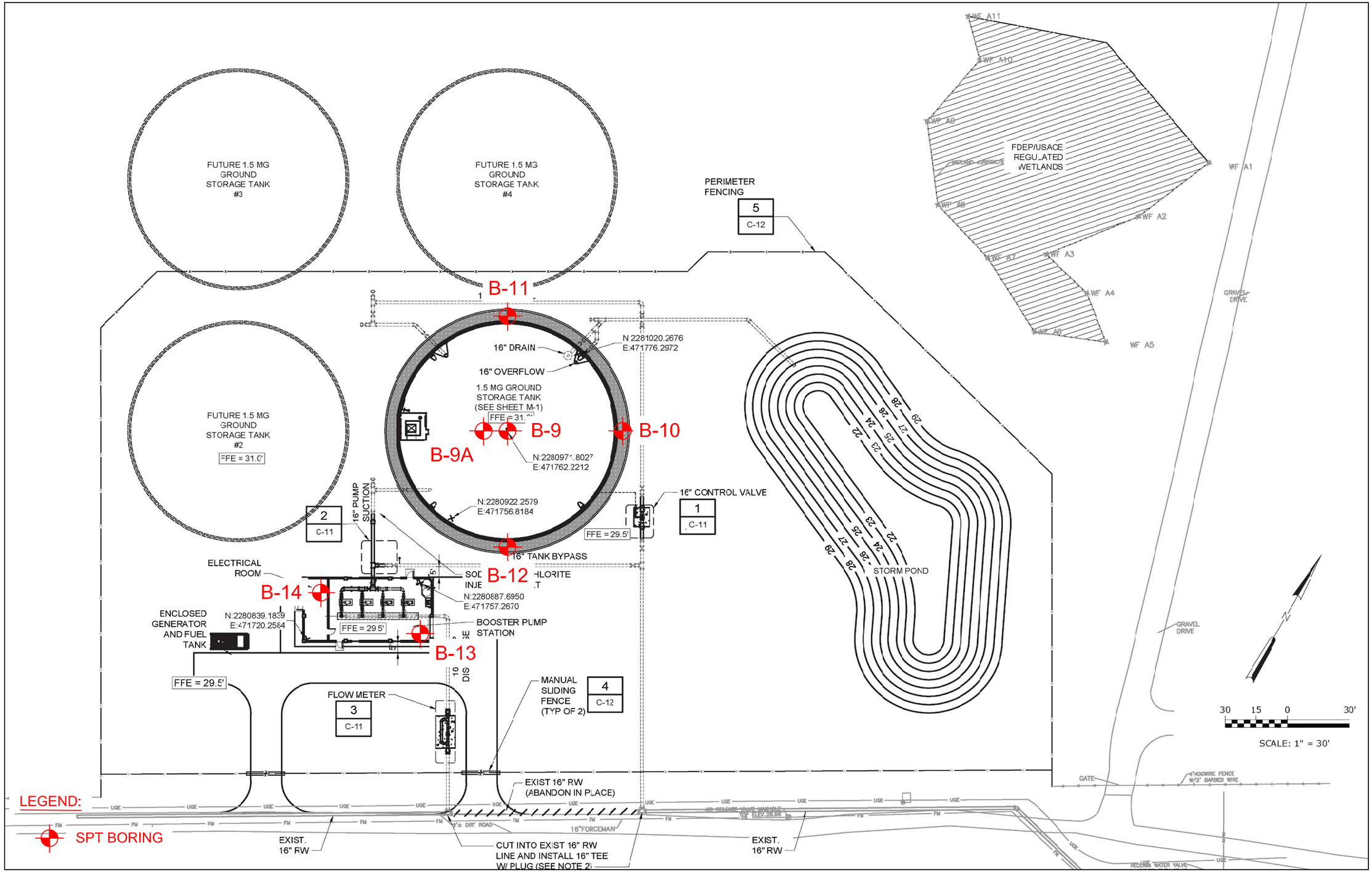
If changes in the design or location of the structures occur, the conclusions and recommendations contained in this report may need to be modified. We recommend that these changes be provided to us for our consideration. MAE is not responsible for conclusions, interpretations, opinions or recommendations made by others based on the data contained in this report.

Figures



Site Location Map

PREPARED BY	PROJECT NAME	
Meskel & Associates Engineering	**Nassau WRF Improvements-Phase 1B** **Final Geotech Evaluation Rep** **Yulee, Nassau County, Florida**	
	REFERENCE	SCALE
	Delorme XMap 7.0	NTS
PREPARED FOR	MAE PROJECT NO.	**FIGURE NO.**
Hazen & Sawyer	0110-0003E	1



NOTE: Site and Yard Piping Plan dated May 2019 was provided by Hazen & Sawyer.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

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CLIENT: Hazen & Sawyer

DATE:	MAE PROJECT NO.
9/9/2019	0110-0003E

SHEET TITLE: BORING LOCATION PLAN

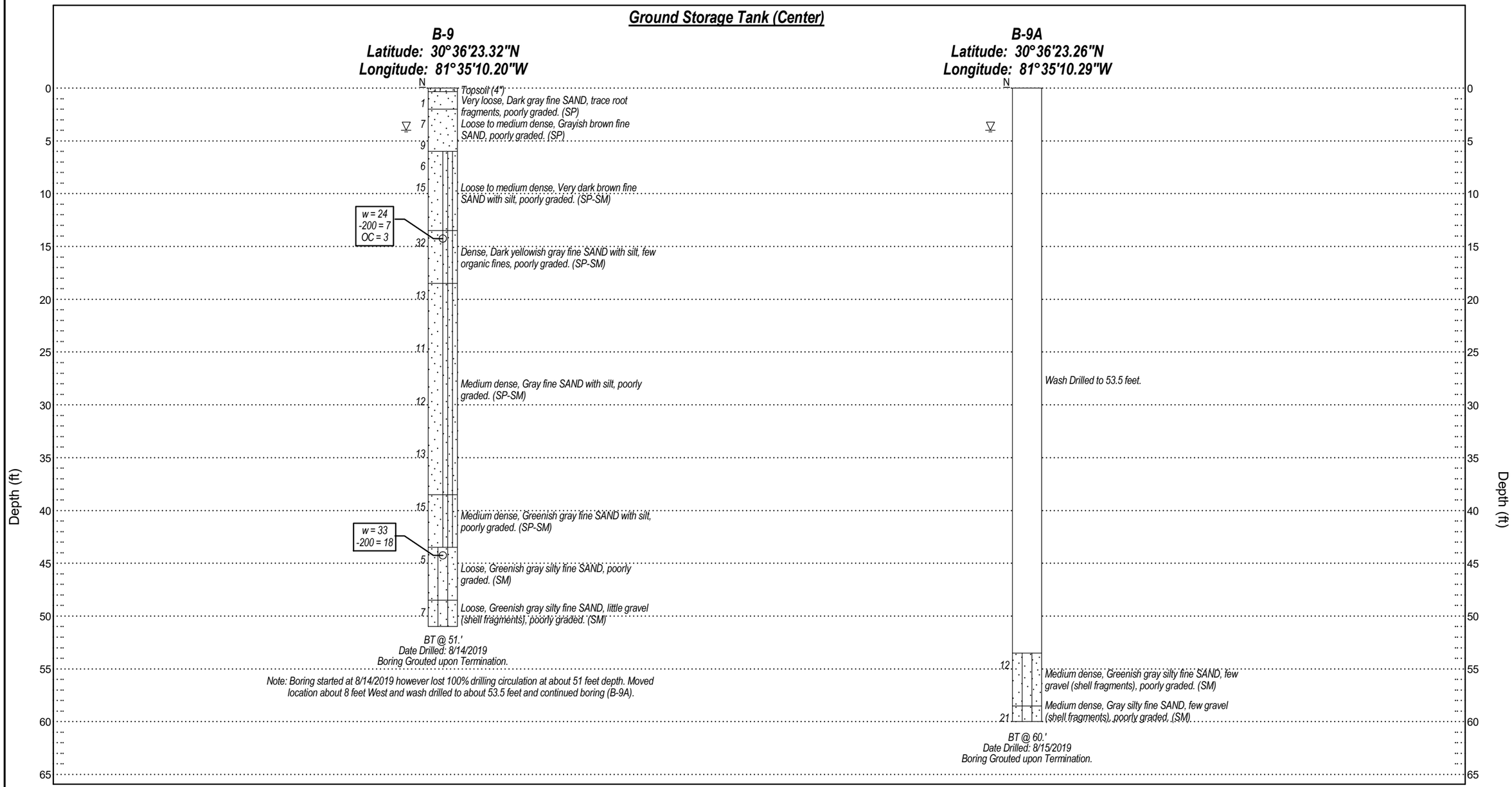
PROJECT NAME: Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report
Yulee, Nassau County, Florida

FIGURE NO. 2

Ground Storage Tank (Center)

B-9
Latitude: 30°36'23.32"N
Longitude: 81°35'10.20"W

B-9A
Latitude: 30°36'23.26"N
Longitude: 81°35'10.29"W



Legend

- Topsoil
- Silty Fine Sand
- Fine Sand
- Wash Boring
- Fine Sand with Silt
- N — Standard Penetration Resistance, Blows/Foot
- BT — Boring Terminated at Depth Below Existing Grade
- (SP) — Unified Soil Classification System (USCS)
- ▽ — Depth to Groundwater at Time of Drilling
- w — Natural Moisture Content (%)
- -200 — % Passing No. 200 U.S. Standard Sieve
- OC — Organic Content (%)

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Hazen & Sawyer

DATE:	MAE PROJECT NO.
9/9/2019	0110-0003E

SHEET TITLE: *Generalized Soil Profiles*

PROJECT NAME: *Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report*
Yulee, Nassau County, Florida

FIGURE NO. 3

Ground Storage Tank (Perimeter)

B-10
Latitude: 30°36'23.56"N
Longitude: 81°35'9.62"W

N

- 7 — Topsoil (4")
- 8 — Loose, Gray fine SAND, trace root fragments, poorly graded. (SP)
- 14 — Medium dense, Grayish brown fine SAND, trace silt, trace root fragments, poorly graded. (SP)
- 13 — Medium dense, Light gray fine SAND, tracer silt, poorly graded. (SP)
- 15 — Medium dense, Gray fine SAND with silt, poorly graded. (SP-SM)
- 29 — Dense, Yellowish brown fine SAND with silt, poorly graded. (SP-SM)
- 11 — Medium dense, Gray fine SAND with silt, poorly graded. (SP-SM)
- 15 — Medium dense, Gray fine SAND with silt, poorly graded. (SP-SM)
- 11 — Medium dense, Gray fine SAND, trace silt, poorly graded. (SP)

w = 23
-200 = 2

BT @ 30.'
Date Drilled: 8/14/2019

B-11
Latitude: 30°36'23.78"N
Longitude: 81°35'10.50"W

N

- 4 — Topsoil (4")
- 4 — Loose, Gray fine SAND, trace root fragments, poorly graded. (SP)
- 13 — Loose, Grayish brown fine SAND, trace silt, trace root fragments, poorly graded. (SP)
- 7 — Medium dense, Gray fine SAND, trace silt, trace root fragments, poorly graded. (SP)
- 12 — Loose, Light gray fine SAND, trace silt, poorly graded. (SP)
- 37 — Medium dense, Dark gray fine SAND with silt, poorly graded. (SP-SM)
- 13 — Dense, Yellowish brown fine SAND with silt, poorly graded. (SP-SM)
- 18 — Medium dense, Gray fine SAND with silt, poorly graded. (SP-SM)
- 21 — Medium dense, Gray fine SAND, trace silt, poorly graded. (SP)

w = 30
-200 = 2

BT @ 30.'
Date Drilled: 8/14/2019

B-12
Latitude: 30°36'22.85"N
Longitude: 81°35'9.88"W

N

- 4 — Topsoil (4")
- 5 — Loose, Light gray fine SAND, trace silt, poorly graded. (SP)
- 8 — Loose, Pale brown fine SAND, trace silt, trace root fragments, poorly graded. (SP)
- 5 — Medium dense, Light gray fine SAND, trace silt, poorly graded. (SP)
- 10 — Loose to medium dense, Very dark brown fine SAND, trace silt, few organic fines, poorly graded. (SP)
- 37 — Dense, Yellowish brown fine SAND with silt, poorly graded. (SP-SM)
- 11 — Medium dense, Dark grayish brown fine SAND with silt, poorly graded. (SP-SM)
- 14 — Medium dense, Gray fine SAND with silt, trace root fragments, poorly graded. (SP-SM)
- 10 — Medium dense, Gray fine SAND with silt, poorly graded. (SP-SM)

w = 25
-200 = 3
OC = 2.9

BT @ 30.'
Date Drilled: 8/14/2019

Depth (ft)

0 5 10 15 20 25 30 35

Legend

- Topsoil
- Fine Sand
- Fine Sand with Silt
- N — Standard Penetration Resistance, Blows/Foot
- BT — Boring Terminated at Depth Below Existing Grade
- (SP) — Unified Soil Classification System (USCS)
- ▽ — Depth to Groundwater at Time of Drilling
- w — Natural Moisture Content (%)
- -200 — % Passing No. 200 U.S. Standard Sieve
- OC — Organic Content (%)

REVISIONS					
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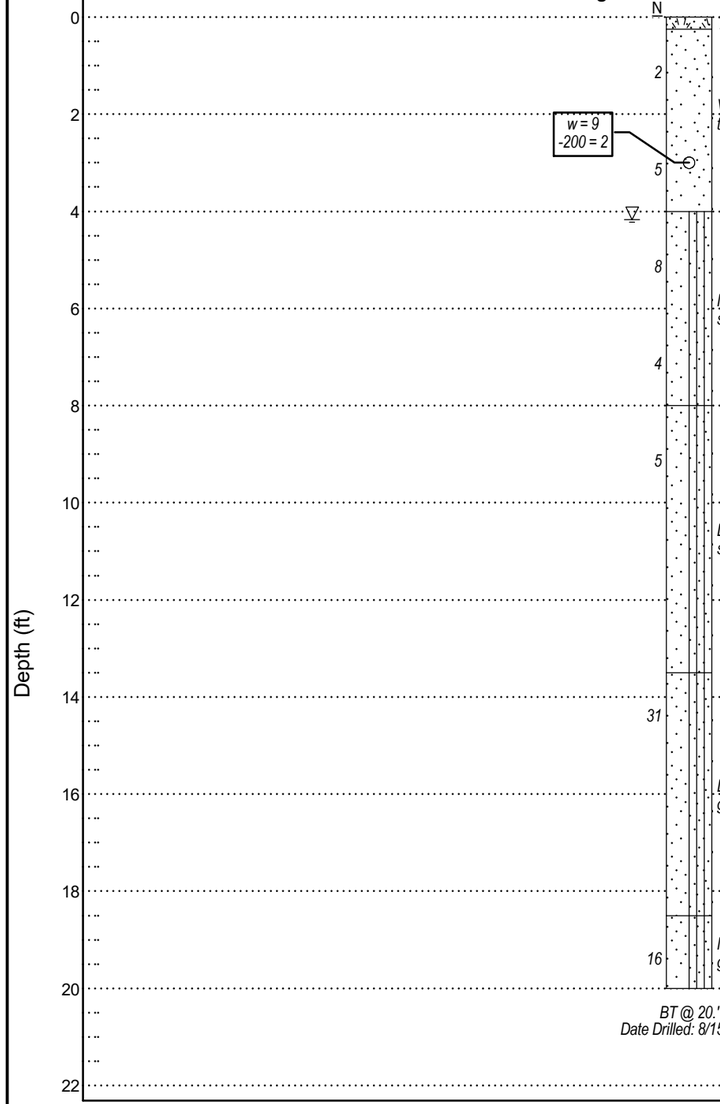
DATE:	MAE PROJECT NO.
9/9/2019	0110-0003E

SHEET TITLE: *Generalized Soil Profiles*

PROJECT NAME: *Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report*
Yulee, Nassau County, Florida

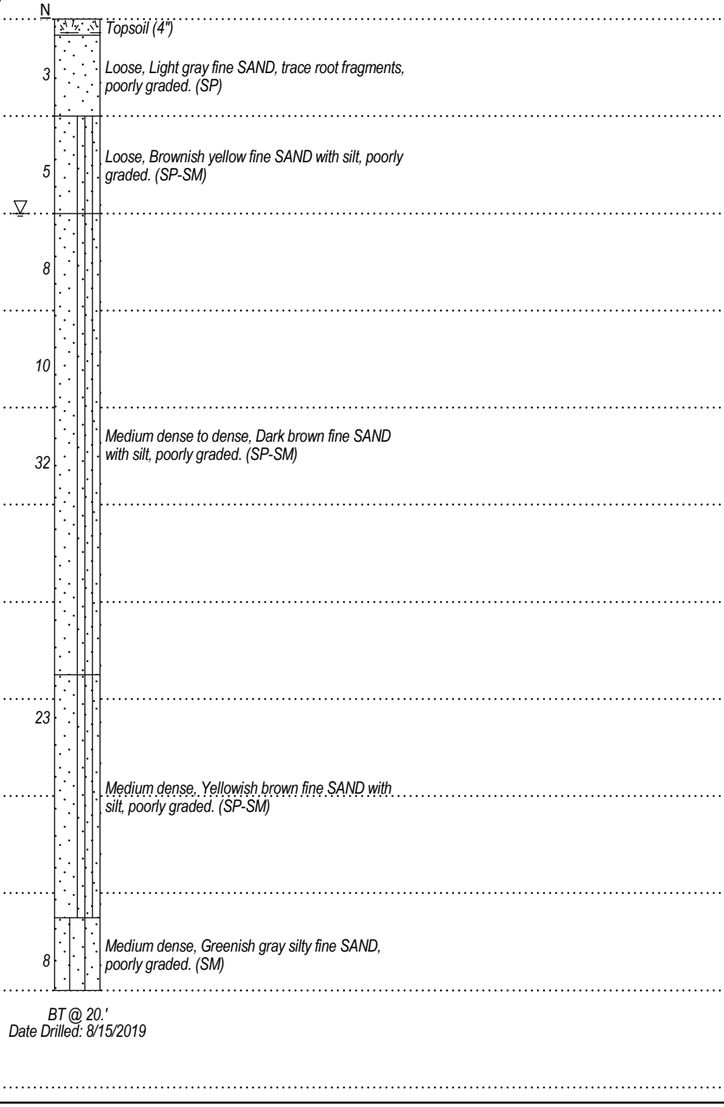
FIGURE NO. 4

Booster Pump Station
B-13
Latitude: 30°36'22.37"N
Longitude: 81°35'10.41"W



BT @ 20.'
Date Drilled: 8/15/2019

Electrical Room
B-14
Latitude: 30°36'22.38"N
Longitude: 81°35'9.80"W



BT @ 20.'
Date Drilled: 8/15/2019

Depth (ft)

0 2 4 6 8 10 12 14 16 18 20 22

Legend

Topsoil
Fine Sand
Fine Sand with Silt
Silty Fine Sand

N — Standard Penetration Resistance, Blows/Foot
BT — Boring Terminated at Depth Below Existing Grade
(SP) — Unified Soil Classification System (USCS)
▽ — Depth to Groundwater at Time of Drilling
w — Natural Moisture Content (%)
-200 — % Passing No. 200 U.S. Standard Sieve

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

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Hazen & Sawyer

DATE:	MAE PROJECT NO.
9/9/2019	0110-0003E

SHEET TITLE: *Generalized Soil Profiles*

PROJECT NAME: *Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report*
Yulee, Nassau County, Florida

FIGURE NO. 5

Appendix A

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Meskel & Associates Engineering

BORING B-9

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DATE STARTED 8/14/19 **COMPLETED** 8/14/19 **LATITUDE** 30°36'23.32"N **LONGITUDE** 81°35'10.20"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

LOGGED BY M.McLellan **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** Automatic

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0	1	Topsoil (4") Very loose, Dark gray fine SAND, trace root fragments, poorly graded.	SP		1 0 1 1	1								
	2	▽ Loose to medium dense, Grayish brown fine SAND, poorly graded.	SP		2 3 4 4	7								
5	3				2 4 5 3	9								
	4				2 2 4 5	6								
	5	Loose to medium dense, Very dark brown fine SAND with silt, poorly graded.	SP-SM		3 6 9 12	15								
10														
	6	Dense, Dark yellowish gray fine SAND with silt, few organic fines, poorly graded.	SP-SM		13 15 17	32	24	7	3.0					
15														
	7	Medium dense, Gray fine SAND with silt, poorly graded.	SP-SM		6 6 7	13								
20														

NOTES

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 4 ft 0 in *▽ **END OF DAY** ---

(Continued Next Page)

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BORING B-9

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
20														
25	8				3 5 6	11								
30	9	Medium dense, Gray fine SAND with silt, poorly graded. *(continued)*	SP-SM		2 5 7	12								
35	10				3 5 8	13								
40	11	Medium dense, Greenish gray fine SAND with silt, poorly graded.	SP-SM		5 7 8	15								

NOTES

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 4 ft 0 in *▽ **END OF DAY** ---

(Continued Next Page)

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BORING B-9

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
		Medium dense, Greenish gray fine SAND with silt, poorly graded. *(continued)*	SP-SM											
45	12	Loose, Greenish gray silty fine SAND, poorly graded.	SM		1 2 3	5	33	18						
50	13	Loose, Greenish gray silty fine SAND, little gravel (shell fragments), poorly graded.	SM		3 4 3	7								Note: Boring started at 8/14/2019 however lost 100% drilling circulation at about 51 feet depth. Moved location about 8 feet West and wash drilled to about 53.5 feet and continued boring (B-9A).
		Bottom of borehole at 51 feet. Boring Grouted upon Termination.												

NOTES

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 4 ft 0 in *▽ **END OF DAY** ---

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Meskel & Associates Engineering

BORING B-9A

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DATE STARTED 8/14/19 **COMPLETED** 8/15/19 **LATITUDE** 30°36'23.26"N **LONGITUDE** 81°35'10.29"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

LOGGED BY M.McLellan **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** Automatic

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0		Wash Drilled to 53.5 ft.												
5		▽												
10														
15														
20														

NOTES

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 4 ft 0 in *▽ **END OF DAY** ---

(Continued Next Page)

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Meskel & Associates Engineering

BORING B-9A

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
20		Wash Drilled to 53.5 ft.												
25														
30														
35														
40														

NOTES

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 4 ft 0 in *▽ **END OF DAY** ---

(Continued Next Page)

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PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
45		Wash Drilled to 53.5 ft.												
50														
55	14	Medium dense, Greenish gray silty fine SAND, few gravel (shell fragments), poorly graded.	SM		6 7 5	12								
60	15	Medium dense, Gray silty fine SAND, few gravel (shell fragments), poorly graded.	SM		10 11 10	21								
		Bottom of borehole at 60 feet. Boring Grouted upon Termination.												

NOTES

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 4 ft 0 in *▽ **END OF DAY** ---

NEW MAE LOG LAT/LONG-EOD_CUTTINGS - NEW TEMPLATE 7-30-12.GDT - 9/9/19 15:40 - F:\GINT\GINT FILES\PROJECTS\0110-0003E\RADIO AVE_FINAL EVAL REPORT.GPJ

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Meskel & Associates Engineering

BORING B-10

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DATE STARTED 8/14/19 **COMPLETED** 8/14/19 **LATITUDE** 30°36'23.56"N **LONGITUDE** 81°35'9.62"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** Automatic

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0		Topsoil (4")												
	1	Loose, Gray fine SAND, trace root fragments, poorly graded.	SP		2 3 4 7	7								
	2	Medium dense, Grayish brown fine SAND, trace silt, trace root fragments, poorly graded. ▽	SP		4 4 4 6	8								
5	3	Medium dense, Light gray fine SAND, tracer silt, poorly graded.	SP		3 6 8 10	14	23	2						
	4	Medium dense, Gray fine SAND with silt, poorly graded.	SP-SM		5 6 7 9	13								
10	5				4 6 9 11	15								
15	6				13 16 13	29								
		Dense, Yellowish brown fine SAND with silt, poorly graded.	SP-SM											
20	7	Medium dense, Gray fine SAND with silt, poorly graded.	SP-SM		3 5 6	11								

NOTES Boring backfilled with soil cuttings.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 3 ft 8 in *▽ **END OF DAY** ---

(Continued Next Page)

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BORING B-10

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
20														
25	8	Medium dense, Gray fine SAND with silt, poorly graded. *(continued)*	SP-SM		5 8 7	15								
30	9				5 5 6	11								
		Bottom of borehole at 30 feet.												

NOTES Boring backfilled with soil cuttings.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 3 ft 8 in *▽ **END OF DAY** ---

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Meskel & Associates Engineering

BORING B-11

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DATE STARTED 8/14/19 **COMPLETED** 8/14/19 **LATITUDE** 30°36'23.78"N **LONGITUDE** 81°35'10.50"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

LOGGED BY M.McLellan **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** Automatic

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0		Topsoil (4")												
	1	Loose, Gray fine SAND, trace root fragments, poorly graded.	SP		1 2 2 3	4								
	2	▽ Loose, Grayish brown fine SAND, trace silt, trace root fragments, poorly graded.	SP		1 2 2 1	4								
5	3	Medium dense, Gray fine SAND, trace silt, trace root fragments, poorly graded.	SP		4 5 8 10	13								
	4	Loose, Light gray fine SAND, trace silt, poorly graded.	SP		3 4 3 4	7								
10	5	Medium dense, Dark gray fine SAND with silt, poorly graded.	SP-SM		5 5 7 6	12								
15	6	Dense, Yellowish brown fine SAND with silt, poorly graded.	SP-SM		16 20 17	37								
20	7	Medium dense, Gray fine SAND with silt, poorly graded.	SP-SM		4 5 8	13								

NOTES Boring backfilled with soil cuttings.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 3 ft 6 in *▽ **END OF DAY** ---

(Continued Next Page)

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BORING B-11

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
20		Medium dense, Gray fine SAND with silt, poorly graded. *(continued)*	SP-SM											
25	8				4 6 12	18	30	2						
		Medium dense, Gray fine SAND, trace silt, poorly graded.	SP											
30	9				6 8 13	21								
		Bottom of borehole at 30 feet.												

NOTES Boring backfilled with soil cuttings.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 3 ft 6 in *▽ **END OF DAY** ---

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BORING B-12

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DATE STARTED 8/14/19 **COMPLETED** 8/14/19 **LATITUDE** 30°36'22.85"N **LONGITUDE** 81°35'9.88"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** Automatic

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0		Topsoil (4")												
	1	Loose, Light gray fine SAND, trace silt, poorly graded.	SP		1 2 2 2	4								
	2	Loose, Pale brown fine SAND, trace silt, trace root fragments, poorly graded. ▽	SP		2 2 3 5	5								
5	3	Medium dense, Light gray fine SAND, trace silt, poorly graded.	SP		2 3 5 3	8								
	4	Loose to medium dense, Very dark brown fine SAND, trace silt, few organic fines, poorly graded.	SP		2 2 3 3	5								
10	5				3 4 6 10	10	25	3	2.9					
15	6	Dense, Yellowish brown fine SAND with silt, poorly graded.	SP-SM		10 14 23	37								
20	7	Medium dense, Dark grayish brown fine SAND with silt, poorly graded.	SP-SM		4 4 7	11								

NOTES Boring backfilled with soil cuttings.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 4 ft 0 in *▽ **END OF DAY** ---

(Continued Next Page)

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BORING B-12

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
20														
25	8	Medium dense, Dark grayish brown fine SAND with silt, poorly graded. *(continued)*	SP-SM		4 7 7	14								
30	9	Medium dense, Gray fine SAND with silt, trace root fragments, poorly graded.	SP-SM		3 5 5	10								
		Bottom of borehole at 30 feet.												

NOTES Boring backfilled with soil cuttings.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 4 ft 0 in *▽ **END OF DAY** ---

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BORING B-13

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DATE STARTED 8/15/19 **COMPLETED** 8/15/19 **LATITUDE** 30°36'22.37"N **LONGITUDE** 81°35'10.41"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** Automatic

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0		Topsoil (3")												
	1	Very loose to loose, Gray fine SAND, trace silt, trace root fragments, poorly graded.	SP		1 1 1 2	2								
	2				2 2 3 3	5	9	2						
5	3	Medium dense to loose, Light gray fine SAND with silt, poorly graded.	SP-SM		2 3 5 6	8								
	4				2 2 2 2	4								
	5	Loose, Very dark grayish brown fine SAND with silt, poorly graded.	SP-SM		1 3 2 4	5								
10														
15	6	Dense, Yellowish brown fine SAND with silt, poorly graded.	SP-SM		9 14 17	31								
20	7	Medium dense, Brown fine SAND with silt, poorly graded.	SP-SM		4 7 9	16								

Bottom of borehole at 20 feet.

NOTES Boring backfilled with soil cuttings.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 4 ft 2 in *▽ **END OF DAY** ---

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BORING B-14

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

DATE STARTED 8/15/19 **COMPLETED** 8/15/19 **LATITUDE** 30°36'22.38"N **LONGITUDE** 81°35'9.80"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** Automatic

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	USCS	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0		Topsoil (4")												
	1	Loose, Light gray fine SAND, trace root fragments, poorly graded.	SP		1 1 2 3	3								
	2	Loose, Brownish yellow fine SAND with silt, poorly graded. ▽	SP-SM		2 3 2 3	5								
5	3				2 3 5 3	8								
	4				3 5 5 5	10								
10	5	Medium dense to dense, Dark brown fine SAND with silt, poorly graded.	SP-SM		6 13 19 27	32								
	6				6 10 13	23								
15		Medium dense, Yellowish brown fine SAND with silt, poorly graded.	SP-SM											
20	7	Medium dense, Greenish gray silty fine SAND, poorly graded.	SM		3 4 4	8								

Bottom of borehole at 20 feet.

NOTES Boring backfilled with soil cuttings.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 4 ft 0 in *▽ **END OF DAY** ---

FIELD EXPLORATION PROCEDURES

Standard Penetration Test (SPT) Borings

The Standard Penetration Test (SPT) boring(s) are performed in general accordance with the latest revision of ASTM D1586, "Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils." In some cases, the borings are advanced manually from the ground surface using a hand-held bucket auger to a depth of approximately 5 feet if there are possible shallow utility conflicts. Otherwise, the borings are advanced using rotary drilling techniques. A split-barrel sampler is inserted to the bottom of the borehole at each sampling interval. The sampler is driven 18 to 24 inches into the soil using a 140-pound hammer falling an average height of 30 inches per hammer blow. The number of hammer blows for the final 12 inches of penetration (18" sample) or for the sum of the middle 12 inches of penetration (24" sample) is termed the "penetration resistance, blow count, or N-value." This value is an index to several in-situ geotechnical properties of the material tested, such as relative density and Young's Modulus.

After driving the sampler, it was retrieved from the borehole and representative samples of the material within the split-barrel were containerized and sealed. After completing the drilling operations, the samples for each boring were transported to the laboratory where they were examined by our engineer in order to verify the field descriptions.

Once the boring is complete and the groundwater level is measured, the borehole is backfilled with soil, or it is backfilled from bottom to top with a lean cementitious grout.

KEY TO BORING LOGS – USCS

Soil Classification

Soil classification of samples obtained at the boring locations is based on the Unified Soil Classification System (USCS). Coarse grained soils have more than 50% of their dry weight retained on a #200 sieve. Their principal descriptors are: sand, cobbles and boulders. Fine grained soils have less than 50% of their dry weight retained on a #200 sieve. They are principally described as clays if they are plastic and silts if they are slightly to non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

BORING LOG LEGEND

Symbol	Description
N	Standard Penetration Resistance, the number of blows required to advance a standard spoon sampler 12" when driven by a 140-lb hammer dropping 30".
WOR	Split Spoon sampler advanced under the weight of the drill rods
WOH	Split Spoon sampler advanced under the weight of the SPT hammer
50/2"	Indicates 50 hammer blows drove the split spoon 2 inches; 50 Hammer blows for less than 6-inches of split spoon driving is considered "Refusal".
(SP)	Unified Soil Classification System
-200	Fines content, % Passing No. 200 U.S. Standard Sieve
w	Natural Moisture Content (%)
OC	Organic Content (%)
LL	Liquid Limit
PI	Plasticity Index
NP	Non-Plastic
PP	Pocket Penetrometer in tons per square foot (tsf)

MODIFIERS

SECONDARY CONSTITUENTS
(Sand, Silt or Clay)

Trace	Less than 5%
With	5% to 12%
Sandy, Silty or Clayey	12% to 35%
Very Sandy, Very Silty or Very Clayey	35% to 50%

ORGANIC CONTENT

Trace	2% or less
Few	3% to 5%
Little	5% to 10%
With	Greater than 10%

MINOR COMPONENTS
(Shell, Rock, Debris, Roots, etc.)

Trace	Less than 5%
Few	5% to 10%
Little	15% to 25%
Some	30% to 45%

RELATIVE DENSITY (Coarse-Grained Soils)

Relative Density	N-Value *
Very Loose	Less than 3
Loose	3 to 8
Medium Dense	8 to 24
Dense	24 to 40
Very Dense	Greater than 40

CONSISTENCY (Fine-Grained Soils)

Consistency	N-Value *
Very Soft	Less than 1
Soft	1 to 3
Firm	3 to 6
Stiff	6 to 12
Very Stiff	12 to 24
Hard	Greater than 24

RELATIVE HARDNESS (Limestone)

Relative Hardness	N-Value *
Soft	Less than 50
Hard	Greater than 50

* Using Automatic Hammer

Unified Soil Classification System (USCS)
(from ASTM D 2487)

Major Divisions			*Group Symbol*	*Typical Names*
Coarse-Grained Soils More than 50% retained on the 0.075 mm (No. 4) sieve	**Gravels** 50% or more of coarse fraction retained on the 4.75 mm (No. 4) sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands 50% or more of coarse fraction passes the 4.75 (No. 4) sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils More than 50% passes the 0.075 mm (No. 200) sieve	**Silts and Clays** Liquid Limit 50% or less		ML	Inorganic silts, very fine sands, rock four, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly/sandy/silty/lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays Liquid Limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck, and other highly organic soils

Prefix: G = Gravel, S = Sand, M = Silt, C = Clay, O = Organic
Suffix: W = Well Graded, P = Poorly Graded, M = Silty, L = Clay, LL < 50%, H = Clay, LL > 50%

Appendix B

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SUMMARY OF LABORATORY TEST RESULTS

PROJECT NO. 0110-0003E

PROJECT NAME Nassau WRF Improvements-Phase 1B Final Geotech Evaluation Report **DATE.** 9/9/2019

PROJECT LOCATION Yulee, Nassau County, Florida **CLIENT** Hazen & Sawyer

Borehole	Sample No.	Approx. Depth (ft)	%<#200 Sieve	Water Content (%)	Organic Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS Classification	Comments
B-9	6	15	7	24	3.0	---	---	---	SP-SM	
B-9	12	45	18	33	---	---	---	---	SM	
B-10	3	5	2	23	---	---	---	---	SP	
B-11	8	25	2	30	---	---	---	---	SP	
B-12	5	9	3	25	2.9	---	---	---	SP	
B-13	2	3	2	9	---	---	---	---	SP	

Note: "---" Untested Parameter

LABORATORY TEST PROCEDURES

Percent Fines Content

The percent fines or material passing the No. 200 mesh sieve of the sample tested was determined in general accordance with the latest revision of ASTM D 1140. The percent fines are the soil particles in the silt and clay size range.

Natural Moisture Content

The water content of the tested sample was determined in general accordance with the latest revision of ASTM D 2216. The water content is defined as the ratio of "pore" or "free" water in a given mass of material to the mass of solid material particles.

Organic Loss on Ignition (Percent Organics)

The organic loss on ignition or percent organic material in the sample tested was determined in general accordance with ASTM D 2974. The percent organics is the material, expressed as a percentage, which is burned off in a muffle furnace at 455±10 degrees Celsius.

Appendix A3

Geotechnical Report: Radio Avenue Access Road and Future Expansion” May 1, 2020

FIle is password protected, as a result file has been included separately

Appendix A4

Geotechnical Report: JEA Radio Avenue Storage & Repump Station: Stormwater Pond and Access Road" April 2, 2019

FIle is password protected, as a result file has been included separately

Appendix B

Equipment Attribute Worksheets (Asset Management)

Instructions: Equipment Attribute Worksheets
JEA Radio Avenue Reclaimed Water Ground Storage Tank and Booster Pump Station

JEA employs an Enterprise Asset Management system (EAM) to assist in efficient management of it's many assets. One component of the EAM is an Asset Management Database. JEA uses IBM's Maximo database software for this purpose. The data allows JEA to make sound business decisions regarding it's assets. Data collected includes specification information on assets and locations, Vendor and Manufacturer contact information, Local representatives for each asset, spare parts associated with each asset and preventative maintenance requirements for each asset.

Step One:

1. Go to the "Assets" tab.
2. For each asset in column E, fill in the information indicated in Columns I through AL.
3. For reference, see "Assets Sample" tab for example of filled out form.

Step Two:

1. Go to the "Vendor-Manufacturer" tab.
Manufacturer contact information.
3. Assign each Vendor/Manufacturer a unique Vendor ID.
4. For reference, see "Vendor/Manufacturer Sample" tab for example of filled out form.

Step Three:

1. Go to the "Local Representative" tab.
2. For each Vendor and/or Manufacturer listed on the "Vendor-Manufacturer" tab, fill in a row with the associated Local Representative contact information.
3. Indicate which Vendor is associated with each Local Representative by filling in the Vendor ID / Man. ID colu
4. For reference, see "Local Representative Sample" tab for example of filled out form.

Step Four:

1. Go to the "Spare Parts" tab.
2. For each Asset ID Description for which spare parts are required / provided, fill in a row with the spare part
3. For reference, see "Spare Parts Sample" tab for example of filled out form.

Step Five:

1. Go to the "Preventative Maintenance" tab.
2. For each Asset ID Description that requires preventative maintenance, fill in a row on the Preventative Maintenance
3. Assign a PM ID number to each row. Reference the appropriate Asset ID Descriptions.
4. For reference, see "Preventative Maintenance Sample" tab for example of filled out form.

Step Six:

1. On the "Preventative Maintenance" Tab, for each PM listed in the Preventative Maintenance Header Table, provide a step by step description of the preventative maintenance required. Associate the Preventative Maintenance steps with the associated Preventative Maintenance with the PM ID.
2. For reference, see "Preventative Maintenance Sample" tab for example of filled out form.

JEA Radio Avenue Reclaimed Water Ground Storage Tank and Booster Pump Station

Asset Information				Attributes required for all equipment									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	ARV-01	AIR RELEASE VALVE, AT ALTITUDE CONTROL VALVE PIPING		Y									
	ARV-02	AIR RELEASE VALVE, AT PUMP SUCTION HEADER		Y									
	ARV-03	AIR RELEASE VALVE, ON PUMP 01		Y									
	ARV-04	AIR RELEASE VALVE, ON PUMP 02		Y									
	ARV-05	AIR RELEASE VALVE , AT FLOW METER PIPING		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	BRKR-01	ISOLATION UTILITY MAIN BREAKER - RADIO AVENUE RECLAIMED WATER		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	CP-01	VENDOR CONTROL PANEL		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	CRANE-01	2 TON MOBILE GANTRY CRANE		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	GEN-01	200 KW ENCLOSED GENERATOR		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	PP-01	POWER DISTRIBUTION PANELBOARD - RADIO AVENUE RECLAIMED WATER		Y									
	MB-01	44 A MAIN BREAKER		Y									
	ATS-01	400 A AUTOMATIC TRANSFER SWITCH		Y									
	LP-1	225 A LIGHTING PANELBOARD		Y									
	XFMR-01	45 Kva TRANSFORMER		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	METER-01	DISCHARGE PIPING, 10" FLOW METER AND TRANSMITTER, FE/FIT-2151		Y									
	PIT-01	PRESSURE INDICATING TRANSMITTER, PIT-1001		Y									
	PIT-02	PRESSURE INDICATING TRANSMITTER, PIT-2101		Y									
	PIT-03	PRESSURE INDICATING TRANSMITTER, PIT-2151		Y									
	LIT-01	GST LEVEL INDICATOR, LIT-1011		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	MOTOR-01	PUMP 1, MOTOR		Y									
	MOTOR-02	PUMP 2, MOTOR		Y									

JEA Radio Avenue Reclaimed Water Ground Storage Tank and Booster Pump Station

Asset Information		Additional Attributes based on Classification																	
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**VALVE TYPE**	**VALVE SIZE-INCH**	**SLUICE GATE SIZE-INCH**	**PORT SIZE-INCH**	**BODY MATERAL**	**SEAT MATERIAL**	**PACKING SIZE**	**PRESSURE RATING**	**OPERATOR TYPE**	**NOTE:**							
ARV-01	AIR RELEASE VALVE, AT CONTROL VALVE PIPING																		
ARV-02	AIR RELEASE VALVE, AT PUMP SUCTION HEADER																		
ARV-03	AIR RELEASE VALVE, ON PUMP 01																		
ARV-04	AIR RELEASE VALVE, ON PUMP 02																		
ARV-05	AIR RELEASE VALVE , AT FLOW METER PIPING																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**AMP RATING-AMPS**	**VOLTAGE-VOLTS**	**PHASE**	**BREAKER SIZE-AMPS**													
BRKR-01	ISOLATION UTILITY MAIN BREAKER - RADIO AVENUE RECLAIMED WATER																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**VOLTAGE-VOLTS**	**PHASE**	**STARTER TYPE**	**STARTER SIZE**	**NUMBER OF STARTERS**	**MAIN BREAKER SIZE-AMPS**	**MAIN CONDUCTOR SIZE**										
CP-01	VENDOR CONTROL PANEL																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**CRANE RATING-TON**																
CRANE-01	2 TON MOBILE GANTRY CRANE																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**TBD**																
GEN-01	200 KW ENCLOSED GENERATOR																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**VOLTAGE-VOLTS**	**PHASE**	**MAIN BREAKER SIZE-AMPS**	**MAIN CONDUCTOR SIZE**													
PP-01	POWER DISTRIBUTION PANELBOARD - RADIO AVENUE RECLAIMED WATER																		
MB-01	44 A MAIN BREAKER																		
ATS-01	400 A AUTOMATIC TRANSFER SWITCH																		
LP-1	225 A LIGHTING PANELBOARD																		
XFMR-01	45 Kva TRANSFORMER																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**METER TYPE**	**PHASE**	**METER SIZE-INCH**	**DISPLAY RANGE**	**DISPLAY RANGE LOWER LIMIT**	**DISPLAY RANGE UPPER LIMIT**	**OUTPUT RANGE**	**OUTPUT RANGE LOWER LIMIT**	**OUTPUT RANGE UPPER LIMIT**	**METER ACCURACY**							
METER-01	DISCHARGE PIPING, 10" FLOW METER AND TRANSMITTER, FE/FIT-2151																		
PIT-01	PRESSURE INDICATING TRANSMITTER, PIT-1001																		
PIT-02	PRESSURE INDICATING TRANSMITTER, PIT-2101																		
PIT-03	PRESSURE INDICATING TRANSMITTER, PIT-2151																		
LIT-01	GST LEVEL INDICATOR, LIT-1011																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**HORSEPOWER**	**VOLTAGE-VOLTS**	**PHASE**	**FULL LOAD AMPS**	**RPM**	**MOTOR TYPE**	**DUTY**	**FRAME**	**LUBE OIL-GREASE**								
MOTOR-01	PUMP 1, MOTOR																		
MOTOR-02	PUMP 2, MOTOR																		

JEA Radio Avenue Reclaimed Water Ground Storage Tank and Booster Pump Station

Asset Information				Attributes required for all equipment									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	PIPE-01	16" DIP, DISCHARGE PIPING		Y									
	PUMP-01DP	PUMP 1, 8" DIP, DISCHARGE PIPING		Y									
	PUMP-01SP	PUMP 1, 8" DIP, SUCTION PIPING		Y									
	PUMP-02DP	PUMP 2, 8" DIP, DISCHARGE PIPING		Y									
	PUMP-02SP	PUMP 2, 8" DIP, SUCTION PIPING		Y									
	TANK-01B	GST, 16" DIP, BYPASS		Y									
	TANK-01D	GST, 16" DIP, DRAIN / OVERFLOW		Y									
	TANK-01DP	GST, 16" DIP, EFFLUENT PIPING		Y									
	TANK-01SP	GST, 16" DIP, FILL PIPING		Y									
	HYDRANT-01	YARD HYDRANT, 6" DIP, SUPPLY PIPING		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	PUMP-01	PUMP 1, PUMP P-2011		Y									
	PUMP-02	PUMP 2, PUMP P-2021		Y									
	PUMP-03	HYPO PUMP 1		Y									
	PUMP-04	HYPO PUMP 1		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	PLC-01	PLC-XXX CONTROL CABINET		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	PWRMON-01	TBD------POWER MONITOR UTILITY - RADIO AVENUE RECLAIMED WATER		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	SWITCH-01	PUMP 1, MOTOR DISCONNECT SWITCH		Y									
	SWITCH-02	PUMP 2, MOTOR DISCONNECT SWITCH		Y									
Parent Asset Description	**Child Asset ID**	**Child Asset Description**	**Spec Table**	**Capital Asset (Yes / No)**	**Failure Class**	**Warranty Duration (Years)**	**Vendor**	**Serial Number**	**Model Number**	**Life Expectancy (Years)**	**Purchase Price**	**Replacement Cost (Including Labor)**	**Install Date**
	TANK-01	1.5 MG RECLAIMED WATER STORAGE TANK		Y									
	TANK-02	990 GALLON GENERATOR FUEL TANK		Y									
	TANK-03	250 GALLON SODIUM HYPOCHLORITE TANK		Y									
	TANK-04	250 GALLON SODIUM HYPOCHLORITE TANK		Y									

JEA Radio Avenue Reclaimed Water Ground Storage Tank and Booster Pump Station

Asset Information		Additional Attributes based on Classification																	
Child Asset ID	**Child Asset Description**	**PIPE MATERIAL**	**SIZE**	**LINER**															
PIPE-01	16" DIP, DISCHARGE PIPING																		
PUMP-01DP	PUMP 1, 8" DIP, DISCHARGE PIPING																		
PUMP-01SP	PUMP 1, 8" DIP, SUCTION PIPING																		
PUMP-02DP	PUMP 2, 8" DIP, DISCHARGE PIPING																		
PUMP-02SP	PUMP 2, 8" DIP, SUCTION PIPING																		
TANK-01B	GST, 16" DIP, BYPASS																		
TANK-01D	GST, 16" DIP, DRAIN / OVERFLOW																		
TANK-01DP	GST, 16" DIP, EFFLUENT PIPING																		
TANK-01SP	GST, 16" DIP, FILL PIPING																		
HYDRANT-01	YARD HYDRANT, 6" DIP, SUPPLY PIPING																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**PUMP MODEL NUMBER**	**MOTOR MODEL NUMBER**	**PUMP TYPE**	**HORSEPOWER**	**VOLTAGE-VOLTS**	**PHASE**	**FULL LOAD AMPS**	**RPM**	**DISCHARGE SIZE-INCH**	**IMPELLER DIAMETER**							
PUMP-01	PUMP 1, PUMP P-2011																		
PUMP-02	PUMP 2, PUMP P-2021																		
PUMP-03	HYPO PUMP 1																		
PUMP-04	HYPO PUMP 1																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**PART NUMBER**	**NUMBER OF ANALOG INPUTS**	**NUMBER OF DIGITAL INPUTS**														
PLC-01	PLC-XXX CONTROL CABINET																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**MODEL NUMBER**	**SERIAL NUMBER**	**MANUF PART #**	**ORACLE PROJECT #**	**PURCHASE COST**	**VENDOR**	**GLOBAL ID**	**BARCODE**	**DATE MANUFACTURED**	**DATE PURCHASED**	**MANUFACTURER**	**MODEL NUMBER**	**SERIAL NUMBER**	**SIZE**	**TYPE**	**USAGE TYPE**	**VOLTAGE**
PWRMON-01	TBD------POWER MONITOR UTILITY - RADIO AVENUE RECLAIMED WATER																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**CONTINUOUS AMP RATING**	**SWITCH TYPE**															
SWITCH-01	PUMP 1, MOTOR DISCONNECT SWITCH																		
SWITCH-02	PUMP 2, MOTOR DISCONNECT SWITCH																		
Child Asset ID	**Child Asset Description**	**MANUFACTURER**	**TANK TYPE**	**MATERIAL**	**TANK CAPACITY**	**PRESSURE RATING**	**OPERATING PRESSURE**												
TANK-01	1.5 MG RECLAIMED WATER STORAGE TANK																		
TANK-02	990 GALLON GENERATOR FUEL TANK																		
TANK-03	250 GALLON SODIUM HYPOCHLORITE TANK																		
TANK-04	250 GALLON SODIUM HYPOCHLORITE TANK																		

JEA Radio Avenue Reclaimed Water Ground Storage Tank and Booster Pump Station

Asset Information				Attributes required for all equipment									
Parent Asset Description	Child Asset ID	Child Asset Description	Spec Table	Capital Asset (Yes / No)	Failure Class	Warranty Duration (Years)	Vendor	Serial Number	Model Number	Life Expectancy (Years)	Purchase Price	Replacement Cost (Including Labor)	Install Date
	VALVE-01	PUMP 1, SUCTION VALVE, 8" FLG GATE VALVE AND OPERATOR		Y									
	VALVE-02	PUMP 1, DIS VALVE, 8" FLG GATE VALVE AND OPERATOR		Y									
	VALVE-03	PUMP 1, CHECK VALVE, 8" FLG CHECK VALVE		Y									
	VALVE-04	PUMP 2, SUCTION VALVE, 8" FLG GATE VALVE AND OPERATOR		Y									
	VALVE-05	PUMP 2, DIS VALVE, 8" FLG GATE VALVE AND OPERATOR		Y									
	VALVE-06	PUMP 2, CHECK VALVE, 8" FLG CHECK VALVE		Y									
	VALVE-07	PUMP SUCTION HEADER, 16" FLG GATE VALVE AND OPERATOR		Y									
	VALVE-08	PUMP SUCTION HEADER TO FUTURE PUMPS, 16" FLG GATE VALVE NO OPERATOR		Y									
	VALVE-09	FUTURE PUMP 3, DIS VALVE, 8" FLG GATE VALVE NO OPERATOR		Y									
	VALVE-10	FUTURE PUMP 4, DIS VALVE, 8" FLG GATE VALVE NO OPERATOR		Y									
	VALVE-11	TANK BYPASS, 16" MJ GATE VALVE		Y									
	VALVE-12	TANK BYPASS, 16" MJ GATE VALVE		Y									
	VALVE-13	TANK FILL, 16" MJ GATE VALVE		Y									
	VALVE-14	INFLUENT PIPING, CONTROL VALVE, 16"		Y									
	VALVE-15	TANK FILL, 16" MJ GATE VALVE		Y									
	VALVE-16	TANK FILL, 16" MJ GATE VALVE		Y									
	VALVE-17	TANK FILL, 16" MJ GATE VALVE		Y									
	VALVE-18	TANK FILL, 16" MJ GATE VALVE		Y									
	VALVE-19	TANK FILL, 16" MJ GATE VALVE		Y									
	VALVE-20	TANK DRAIN, 16" MJ GATE VALVE		Y									
	VALVE-21	TANK DRAIN, 16" MJ GATE VALVE		Y									
	VALVE-22	TANK EFFLUENT, 16" MJ GATE VALVE		Y									
	VALVE-23	TANK EFFLUENT, 16" MJ GATE VALVE		Y									
	VALVE-24	FLOW METER STATION 10" FLG GATE VALVE AND OPERATOR		Y									
	VALVE-25	FLOW METER STATION 10" FLG GATE VALVE AND OPERATOR		Y									
	VALVE-26	FLOW METER STATION 10" FLG GATE VALVE AND OPERATOR		Y									
	VALVE-27	YARD HYDRANT, 6" MJ GATE VALVE		Y									
Parent Asset Description	Child Asset ID	Child Asset Description	Spec Table	Capital Asset (Yes / No)	Failure Class	Warranty Duration (Years)	Vendor	Serial Number	Model Number	Life Expectancy (Years)	Purchase Price	Replacement Cost (Including Labor)	Install Date
	VFD-01	PUMP 1, VFD		Y									
	VFD-02	PUMP 2, VFD		Y									
Parent Asset Description	Child Asset ID	Child Asset Description	Spec Table	Capital Asset (Yes / No)	Failure Class	Warranty Duration (Years)	Vendor	Serial Number	Model Number	Life Expectancy (Years)	Purchase Price	Replacement Cost (Including Labor)	Install Date
	XFRMR-01	TRANSFORMER [ID, 480V-208Y/120V]		Y									

JEA Radio Avenue Reclaimed Water Ground Storage Tank and Booster Pump Station

Asset Information		Additional Attributes based on Classification																	
Child Asset ID	Child Asset Description	MANUFACTURER	VALVE TYPE	VALVE SIZE-INCH	SLUICE GATE SIZE-INCH	PORT SIZE-INCH	BODY MATERAL	SEAT MATERIAL	PACKING SIZE	PRESSURE RATING	OPERATOR TYPE	NOTE:							
VALVE-01	PUMP 1, SUCTION VALVE, 8" FLG GATE VALVE AND OPERATOR																		
VALVE-02	PUMP 1, DIS VALVE, 8" FLG GATE VALVE AND OPERATOR																		
VALVE-03	PUMP 1, CHECK VALVE, 8" FLG CHECK VALVE																		
VALVE-04	PUMP 2, SUCTION VALVE, 8" FLG GATE VALVE AND OPERATOR																		
VALVE-05	PUMP 2, DIS VALVE, 8" FLG GATE VALVE AND OPERATOR																		
VALVE-06	PUMP 2, CHECK VALVE, 8" FLG CHECK VALVE																		
VALVE-07	PUMP SUCTION HEADER, 16" FLG GATE VALVE AND OPERATOR																		
VALVE-08	PUMP SUCTION HEADER TO FUTURE PUMPS, 16" FLG GATE VALVE NO OPERATOR																		
VALVE-09	FUTURE PUMP 3, DIS VALVE, 8" FLG GATE VALVE NO OPERATOR																		
VALVE-10	FUTURE PUMP 4, DIS VALVE, 8" FLG GATE VALVE NO OPERATOR																		
VALVE-11	TANK BYPASS, 16" MJ GATE VALVE																		
VALVE-12	TANK BYPASS, 16" MJ GATE VALVE																		
VALVE-13	TANK FILL, 16" MJ GATE VALVE																		
VALVE-14	INFLUENT PIPING, CONTROL VALVE, 16"																		
VALVE-15	TANK FILL, 16" MJ GATE VALVE																		
VALVE-16	TANK FILL, 16" MJ GATE VALVE																		
VALVE-17	TANK FILL, 16" MJ GATE VALVE																		
VALVE-18	TANK FILL, 16" MJ GATE VALVE																		
VALVE-19	TANK FILL, 16" MJ GATE VALVE																		
VALVE-20	TANK DRAIN, 16" MJ GATE VALVE																		
VALVE-21	TANK DRAIN, 16" MJ GATE VALVE																		
VALVE-22	TANK EFFLUENT, 16" MJ GATE VALVE																		
VALVE-23	TANK EFFLUENT, 16" MJ GATE VALVE																		
VALVE-24	FLOW METER STATION 10" FLG GATE VALVE AND OPERATOR																		
VALVE-25	FLOW METER STATION 10" FLG GATE VALVE AND OPERATOR																		
VALVE-26	FLOW METER STATION 10" FLG GATE VALVE AND OPERATOR																		
VALVE-27	YARD HYDRANT, 6" MJ GATE VALVE																		
Child Asset ID	Child Asset Description	MANUFACTURER	AMP RATING	VOLTAGE	SIZE	HP													
VFD-01	PUMP 1, VFD																		
VFD-02	PUMP 2, VFD																		
Child Asset ID	Child Asset Description	MANUFACTURER	SERIAL NUMBER	OPERATING VOLTAGE	PRIMARY 1 VOLTAGE	PRIMARY 1 VOLTAGE	SECONDARY OPERA VOLTAGE	SECONDARY 1 VOLTAGE	SECONDARY 1 VOLTAGE	MVATHIRD	IMPEDANCE	COOLING							
XFRMR-01	TRANSFORMER [ID, 480V-208Y/120V]																		

JEA Radio Avenue Reclaimed Water Ground Storage Tank and Booster Pump Station

Asset Information				Attributes required for all equipment									
Parent Asset Description	Child Asset ID	Child Asset Description	Spec Table	Capital Asset (Yes / No)	Failure Class	Warranty Duration (Years)	Vendor	Serial Number	Model Number	Life Expectancy (Years)	Purchase Price	Replacement Cost (Including Labor)	Install Date
	AC-1 & ACCU-1	AIR CONDITIONING SYSTEM 1 ELEC ROOM		y									
	AC-2 & ACCU-2	AIR CONDITIONING SYSTEM 2 ELEC ROOM		y									
	PA-1	AIR PRESSURIZATION SYSTEM ELEC ROOM		y									
	EF-1	ROOF MOUNTED EXHAUST FAN 1 PUMP ROOM		y									
	EF-2	ROOF MOUNTED EXHAUST FAN 2 PUMP ROOM		y									
	EF-3	CHEMICAL AREA EXHAUST FAN		y									

JEA Radio Avenue Reclaimed Water Ground Storage Tank and Booster Pump Station

Asset Information		Additional Attributes based on Classification																	
Child Asset ID	Child Asset Description	BLOWER TYPE	CFM	COIL GPM	COIL TYPE	DRIVE	MANUFACTURER	RPM											
AC-1 & ACCU-1	AIR CONDITIONING SYSTEM 1 ELEC ROOM																		
AC-2 & ACCU-2	AIR CONDITIONING SYSTEM 2 ELEC ROOM																		
PA-1	AIR PRESSURIZATION SYSTEM ELEC ROOM																		
EF-1	ROOF MOUNTED EXHAUST FAN 1 PUMP ROOM																		
EF-2	ROOF MOUNTED EXHAUST FAN 2 PUMP ROOM																		
EF-3	CHEMICAL AREA EXHAUST FAN																		

JEA Radio Avenue Reclaimed Water Ground Storage Tank and Booster Pump Station

Location	Parent	Parent Asset Description	Replacement Asset Number AFTER Fairfax HSP Replacement Project	Replacement Description AFTER Fairfax HSP Replacement Project	Location Description

Vendor and Manufacturer Data

Vendor ID	VendorName	Address	City	State	ZIP	Phone	Fax	Contact Name	Contact Phone	Contact Fax	Contact email

Local Representative Data

Company Name	Address	City	State	ZIP	Contact Name	Contact Phone	Contact Fax	Contact email	Vendor ID / Man. ID

Spare Part Data

Spare Part or Kit ID	Spare Part / Kit Description	Vendor ID	Kit Contents	Asset ID(s)

Preventive Maintenance Header

PM ID	PM Description	Frequency - Calendar	Frequency - Runtime	Applicable Asset ID(s)

Preventive Maintenance Tasks

PM ID	Step	Step Description	Spare Part / Kit ID	Spare Part / Kit Quantify	Special Tools / Equipment Description

Appendix C1

Florida Department of Environmental Protection, Wastewater Permit

FLORIDA DEPARTMENT OF
Environmental Protection

Northeast District
8800 Baymeadows Way West, Suite 100
Jacksonville, Florida 32256

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

August 24, 2020

In the Matter of an
Application for Permit by:

Mr. Wayne Young
Interim Chief Environmental Officer
JEA
21 West Church Street, T-8
Jacksonville, Florida 32202-3139
Telephone (904) 665-7840
Email: younow@jea.com

PA File No. FL0116793 – 019-DW1/MR
Nassau County
JEA – Nassau Regional WWTF

NOTICE OF PERMIT REVISION

Enclosed is a revision to Permit Number FL0116793 to operate JEA – Nassau Regional WWTF (WWTF), which is an existing 2.0 million gallon per day (MGD) annual average daily flow (AADF) design capacity Class I reliability domestic wastewater treatment facility (WWTF) using the membrane bioreactor (MBR) process with ultraviolet (UV) high-level disinfection. The final effluent is reused via a slow-rate public access irrigation system, or a rapid-rate infiltration system, or discharged to surface waters, which includes a natural receiving wetland and an APRICOT Act discharge as backup disposal methods.

This permit revision includes construction of a reclaimed water storage tank and pump station which consists of: (1) one 1.50-million gallon (MG) ground storage tank; (2) a booster pump station, which consists of two horizontal split-case booster pumps (one duty / one standby); (3) a sodium hypochlorite system consisting of two 250-gallon chemical storage tanks; (4) influent/effluent piping, valves, flow meter, etc.; and (5) a back-up power generator, with instrumentation and control logic for the on-site pumps, tanks and off-site reclaimed water system valves. There are not any changes to the current permitted capacity or the limit requirements in the current permit. The facility is located at latitude 30° 36’ 45” N, longitude 81° 33’ 06” W at 96237 Amelia Concourse, Yulee, Florida 32043, Nassau County. The permit is issued under Chapter 403**,** Florida Statutes.

The permit is issued under Chapter 403 of Florida Statutes and Chapters 62-4, 62-160, 62-302, 62-303, 62-600, 62-602, 62-604, 62-620, 62-640, 62-650, 62-699 and other applicable rules of Florida Administrative Code.

The permittee shall continue to monitor and report in accordance with the permit requirements.

NOTICE OF RIGHTS

This action is final and effective on the date filed with the Clerk of the Department unless a petition for an administrative hearing is timely filed under Sections 120.569 and 120.57, F.S., before the

deadline for filing a petition. On the filing of a timely and sufficient petition, this action will not be final and effective until further order of the Department. Because the administrative hearing process is designed to formulate final agency action, the hearing process may result in a modification of the agency action or even denial of the application.

Petition for Administrative Hearing

A person whose substantial interests are affected by the Department's action may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. Pursuant to Rules 28-106.201 and 28-106.301, F.A.C., a petition for an administrative hearing must contain the following information:

(a) The name and address of each agency affected and each agency's file or identification number, if known;
(b) The name, address, any e-mail address, any facsimile number, and telephone number of the petitioner, if the petitioner is not represented by an attorney or a qualified representative; the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination;
(c) A statement of when and how the petitioner received notice of the agency decision;
(d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate;
(e) A concise statement of the ultimate facts alleged, including the specific facts that the petitioner contends warrant reversal or modification of the agency's proposed action;
(f) A statement of the specific rules or statutes that the petitioner contends require reversal or modification of the agency's proposed action, including an explanation of how the alleged facts relate to the specific rules or statutes; and
(g) A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wishes the agency to take with respect to the agency's proposed action.

The petition must be filed (received by the Clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@dep.state.fl.us. Also, a copy of the petition shall be mailed to the applicant at the address indicated above at the time of filing.

Time Period for Filing a Petition

In accordance with Rule 62-110.106(3), F.A.C., petitions for an administrative hearing by the applicant and persons entitled to written notice under Section 120.60(3), F.S., must be filed within 14 days of receipt of this written notice. Petitions filed by any persons other than the applicant, and other than those entitled to written notice under Section 120.60(3), F.S., must be filed within 14 days of publication of the notice or within 14 days of receipt of the written notice, whichever occurs first. You cannot justifiably rely on the finality of this decision unless notice of this decision and the right of substantially affected persons to challenge this decision has been duly published or otherwise provided to all persons substantially affected by the decision. While you are not required to publish notice of this action, you may elect to do so pursuant Rule 62-110.106(10)(a), F.A.C.

The failure to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the

presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C. If you do not publish notice of this action, this waiver may not apply to persons who have not received a clear point-of-entry.

Extension of Time
Under Rule 62-110.106(4), F.A.C., a person whose substantial interests are affected by the Department's action may also request an extension of time to file a petition for an administrative hearing. The Department may, for good cause shown, grant the request for an extension of time. Requests for extension of time must be filed with the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@dep.state.fl.us, before the deadline for filing a petition for an administrative hearing. A timely request for extension of time shall toll the running of the time period for filing a petition until the request is acted upon.

Mediation
Mediation is not available in this proceeding.

Judicial Review
Once this decision becomes final, any party to this action has the right to seek judicial review pursuant to Section 120.68, F.S., by filing a Notice of Appeal pursuant to Florida Rules of Appellate Procedure 9.110 and 9.190 with the Clerk of the Department in the Office of General Counsel (Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000) and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice must be filed within 30 days from the date this action is filed with the Clerk of the Department.

EXECUTION AND CLERKING
Executed in Jacksonville, Florida.
STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Thomas G. Kallemeyn
Permitting Program Administrator

TK/dv/clc

CC:
Caitlin T Klug, P.E., cklug@hazenandsawyer.com
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Nassau County DOH, michael.godwin@flhealth.gov
Monica Sudano, FDEP, Tallahassee
Thomas G. Kallemeyn, FDEP
D. Anh Vo, PE, FDEP

FILING AND ACKNOWLEDGEMENT & CERTIFICATE OF SERVICE

Filed on this date pursuant to § 120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged. The undersigned hereby certifies that this NOTICE OF PERMIT REVISION and all copies were sent before the close of business on August 24, 2020to the listed persons.

Clerk

August 24, 2020
Date

FLORIDA DEPARTMENT OF Environmental Protection

Northeast District
8800 Baymeadows Way West, Suite 100
Jacksonville, Florida 32256

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

STATE OF FLORIDA
DOMESTIC WASTEWATER FACILITY PERMIT

PERMITTEE:

JEA

PERMIT NUMBER:	FL0116793 (Minor)
FILE NUMBER:	FL0116793 – DW1P
ISSUANCE DATE:	July 31, 2019 (018/NR)
EFFECTIVE DATE:	July 31, 2019
EXPIRATION DATE:	July 30, 2024
1st REVISION DATE:	August 24, 2020 (019/MR)

RESPONSIBLE OFFICIAL:

Mr. Wayne Young
Vice President, Chief Environmental Services
JEA
21 West Church Street, T-8
Jacksonville, Florida 32202
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FACILITY:
Nassau Regional WWTF
State Road 200 (A1A) At Chester Road
96237 Amelia Concourse
Yulee, Florida 32097
Nassau County
Latitude: 30° 37' 17.9" NLongitude: 81° 33' 11.11" W

This permit is issued under the provisions of Chapter 403, Florida Statutes (F.S.), and applicable rules of the Florida Administrative Code (F.A.C.) and constitutes authorization to discharge to waters of the state under the National Pollutant Discharge Elimination System. The above named permittee is hereby authorized to operate or construct the facilities in accordance with the documents attached hereto and specifically described as follows:

WASTEWATER TREATMENT:

An existing 2.0 million gallon per day (MGD) annual average daily flow (AADF) design capacity Class I reliability domestic wastewater treatment facility (WWTF) utilizing the membrane bioreactor (MBR) process with ultraviolet (UV) irradiation for high-level disinfection of effluent. The Water Reclamation Facility (WRF) consists of following main treatment units:

- A headwork structure including of two self-contained screening units with each unit containing a 2-mm mechanical center-flow perforated screen. Each screen has a capacity of 2.0 MGD AADF and 6.0 MGD PHF.

- A dual train biological treatment tank (bioreactor) with design capacity of 2.00 MGD AADF and total volume of 427,700 gallons. Each train is sized 72.3' x 29.2' x 16.0' and divided into 38,200-gallons first anoxic, 120,650-gallons aerobic and 55,000-gallons for post anoxic. Air is supplied by 870-SCFM blower. An extra carbon source for the post–anoxic reactors is also used.

- Four 69,000-gallon isolatable membrane trains. A flat plate submerged membrane system with design capacity of 2.00 MGD AADF is installed. The system consists of four membrane basins with a total of 22,400 cartridges (8.6 ft^2 each), four 2,300-SCFM membrane scour blowers, four 3,700-GPM mixed liquor recycle pumps, four 1,390-GPM permeate pumps, one lifting device and one sodium hypochlorite/acid cleaning system;

- Two equal ultraviolet (UV) disinfection channels. Twenty seven (27) modules (8 lamps on each module) arranged in three banks is initially installed in one channel for design capacity of 2.0 MGD AADF;

- A sodium aluminates (alum) system consists of a 3,500-gallon alum storage tank and two metering pumps;

- An effluent pumping station with three 3.0-MGD vertical turbine pumps to transfer reclaimed water to reuse system;

- A non-potable water pumping station with two 400-HP pumps for in-plant reuse;

- A plant drain pump station with two 100-GPM pumps;

- A 2,000 KW emergency power generator and fuel system capable of operating all critical process units and providing site safety lighting;

- A electrical service and power distribution system;

- A multipurpose air-conditioned building;

- A 0.40-MG aerobic digester, and

- A flow-equalization tank which has a diameter of 72 feet, a side water depth of 16 feet, a capacity of 0.464 million gallons.

Biosolids are transported to JEA-Buckman Biosolids Treatment Facility (BTF) for further treatment and final disposal or directly disposal on a Class I landfill.

Permitted capacity of the WWTF is limited to **1.55 MGD AADF** due to the limited reuse and disposal permitted capacity.

PERMIT REVISION HISTORY

1. First Permit Revision (PA: FL0116793 – 019 – DW1/MR)

   This permit revision includes construction of a reclaimed water storage tank and pump station which consists of the following:

   - Construction of one 1.50-million gallon (MG) ground storage tank (GST) which will have a 105ft inner diameter with a straight wall height of 32ft.

- Construction of a booster pump station, which consists of two horizontal split-case booster pumps (one duty / one standby) with a capacity of 700 GPM at a total discharge head (TDH) of 160 feet each, and 50 horsepower (HP) each. Piping and electrical, with a backup power generator, will be designed for the two pumps with provisions for a future third and fourth pump (three duty / one standby). A total discharge head (TDH) of 160 ft will be maintained on the discharge side of the pumps.
- Construction of a sodium hypochlorite system consisting of two 250-gallon chemical storage tanks, along with two skid-mounted chemical metering pumps (one duty / one standby), each metering pump rated for 1.8 gph at 100 psi with provisions for a future third pump (two duty / one standby). The system will provide maintenance dosing of sodium hypochlorite to boost chlorine residuals and control microbial growth within the reclaimed water distribution system.
- Installation of influent piping consisting of a one-way altitude control valve *(This valve will open/close depending on water level in the GST and as a backup measure will close when the booster pumps are in service.)* and effluent piping consisting of an above ground flow meter.
- Installation of a back-up power generator and instrumentation and control logic for the on-site pumps, tanks and off-site reclaimed water system valves.

There are not any changes to the current permitted capacity or the limit requirements in the current permit.

REUSE OR DISPOSAL:

Surface Water Discharge – Receiving Wetland (D – 001):

An existing 0.500 MGD AADF permitted discharge to Yulee Swamp, a receiving wetland (Class III fresh waters; WBID 2147, Grander Creek Basin), from discharge location/outfall D-001. The Yulee Swamp is connected to a tributary, then to Lofton Creek (Class III fresh waters; WBID 2129A; Lofton Creek Upper Segment, Lofton Creek Basin). Outfall location D-001 is located at approximately latitude 30° 36' 42" N, and longitude 81° 35' 16" W.

Surface Water Discharge – Apricot Act (D – 002):

An existing 0.315 MGD AADF or 115.00 million gallons maximum annual total volume permitted discharge under the **APRICOT Act** from discharge location/outfall D-002 which is an overflow from a golf course lake system on Amelia National and North Hampton to an unnamed wetland located west of Amelia National (Called Wetland Area # 1) and/or to an unnamed wetland located in the northeast of North Hampton (Called Wetland Area # 2). The unnamed wetland drains to Lofton Creek, classified as Class III fresh water, (WBID 2129) in the Lofton Creek Basin. The discharge D-002 is located at approximately latitude 30º 36' 26" N, and longitude 81º 41' 25" W.

Land Application System R-001 (Rapid- Rate Land Application/Infiltration/Percolation System):

An existing 0.300 MGD AADF permitted capacity rapid rate land application system (R-001), which consists of four percolation ponds with a total bottom area of 526,790 ft^2. The system R – 001 is located at approximately latitude 30º 37' 17.9" N, and longitude 81º 33' 11" W.

Land Application System R-002 (Slow-Rate Land Application/Public Access Reuse System):

A 0.750 MGD AADF permitted capacity to a slow-rate public access land application system R-002. Land application system R-002 is located at approximately latitude 30° 36' 45" N and longitude 81° 33' 06" W. The land application system R-002 includes the following major users:

User Name	User Type	Acreage	Capacity (MGD)
Amelia National Golf Course	Golf Course	212	0.425
North Hampton Golf Course	Golf Course	-	0.325
	Total	-	0.750

IN ACCORDANCE WITH: The limitations, monitoring requirements, and other conditions set forth in this cover sheet and Part I through Part IX on pages 1 through 52 of this permit.

I. RECLAIMED WATER AND EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Surface Water Discharges – Yulee Swamp (Receiving Wetland) D – 001:

1. During the period beginning on the effective date and lasting through the expiration date of this permit, the permittee is authorized to discharge effluent from Outfall D-001 to Yulee Swamp/receiving wetlands (WBID 2129A, Grander Creek Basin). Such discharge shall be limited and monitored by the permittee as specified below and reported in accordance with Permit Condition I.E.7. :

			Effluent Limitations		Monitoring Requirements			
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
Flow (to Yulee Swamp)	MGD	Max	0.50	Annual Average	Continuous	Recording Flow Meter with Totalizer	FLW-2	See I.A.4
		Max	Report	Monthly Average				
BOD, Carbonaceous 5 day, 20C	mg/L	Max	5.0	Annual Average	Weekly	24-hr FPC	EFA-1	
		Max	6.25	Monthly Average				
		Max	7.5	Weekly Average				
		Max	10.0	Single Sample				
Solids, Total Suspended	mg/L	Max	5.0	Annual Average	Weekly	24-hr FPC	EFA-1	
		Max	6.25	Monthly Average				
		Max	7.5	Weekly Average				
		Max	10.0	Single Sample				
pH	s.u.	Min	6.0	Single Sample	Continuous	Meter	EFA-1	See I.A.3
		Max	8.5	Single Sample				

			Effluent Limitations		Monitoring Requirements			
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
Ultraviolet Light Intensity	mW/sqcm	Min	Report	Single Sample	Daily *(7days/week)*	Meter	PPI-1	See I.C.8
Ultraviolet Light Dosage	mW-s/sqcm	Min	Report	Single Sample	Daily *(7days/week)*	Meter	PPI-1	See I.C.8
Ultraviolet Light Transmittance	percent	Min	Report	Single Sample	Daily *(7days/week)*	Meter	PPI-1	See I.C.8
Coliform, Fecal	#/100mL	Max	200	Monthly Geometric Mean	Weekly	Grab	EFA-1	See I.A.6
		Max	200	Annual Average				
		Max	800	Single Sample				
Escherichia coli Bacteria	#/100mL	Max	126	Monthly Geometric Mean	Weekly	Grab	EFA-1	See I.A.7
		Max	410	90th Percentile				
Temperature (C), Water	Degree C	Max	Report	Single Sample	Weekly	Meter	EFA-1	
Total Ammonia (as N)	mg/L	Max	Report	Annual Average	Weekly	24-hr FPC	EFA-1	
		Max	2.0	Monthly Average				
		Max	Report	Weekly Average				
		Max	Report	Single Sample				

			Effluent Limitations		Monitoring Requirements			
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
Nitrogen, Total (as N)	mg/L	Max	3.0	Annual Average	Weekly	24-hr FPC	EFA-1	
		Max	3.75	Monthly Average				
		Max	4.5	Weekly Average				
		Max	6.0	Single Sample				
Phosphorus, Total (as P)	mg/L	Max	1.0	Annual Average	Weekly	24-hr FPC	EFA-1	
		Max	1.25	Monthly Average				
		Max	1.5	Weekly Average				
		Max	2.0	Single Sample				
Chronic Whole Effluent Toxicity, 7-Day IC25 (*Ceriodaphnia dubia*)	percent	Min	100	Single Sample	Semi-Annually; twice per year	Grab	EFA-1	See I.A.9
Chronic Whole Effluent Toxicity, 7-Day IC25 (*Pimephales promelas*)	percent	Min	100	Single Sample	Semi-Annually; twice per year	Grab	EFA-1	See I.A.9
Stream Stage	feet	Max	Report	Single Sample	Continuous	Meter	WEP-01	
Nitrogen, Total	mg/L	Max	3.0	Annual Average	Quarterly	Grab	WEP-01	
		Max	Report	Single Sample				

			Effluent Limitations		Monitoring Requirements			
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
Unionized Ammonia, (as N)	mg/L	Max	0.02	Annual Average	Quarterly	Calculated	CAL-1	See I.C.11
		Max	Report	Single Sample				
Phosphorus, Total (as P)	mg/L	Max	0.20	Annual Average	Quarterly	Grab	WEP-01	
		Max	Report	Single Sample				
Nitrogen, Ammonia, Total (as N)	mg/L	Max	Report	Annual Average	Quarterly	Grab	WIM-01 WEP-01	
		Max	Report	Single Sample				
Temperature (C), Water	Deg C	Max	Report	Single Sample	Quarterly	Meter *(48 hrs. dawn/dusk, max 4 hrs. intervals)*	WIM-01 WEP-01	See I.A.10
Oxygen, Dissolved (DO)	mg/L	Min	Report	Single Sample	Quarterly	Meter *(48 hrs. dawn/dusk, max 4 hrs. intervals)*	WIM-01 WEP-01	See I.A.10
pH	s.u.	Max	Report	Single Sample	Quarterly	Meter	WIM-01 WEP-01	
Specific Conductance	umhos/cm	Max	Report	Single Sample	Quarterly	Meter	WIM-01 WEP-01	
BOD, Carbonaceous 5 day, 20C	mg/L	Max	Report	Single Sample	Quarterly	Grab	WIM-01 WEP-01	
Solids, Total Suspended	mg/L	Max	Report	Single Sample	Quarterly	Grab	WIM-01 WEP-01	

			Effluent Limitations		Monitoring Requirements			
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
Phosphorus, Total (as P)	mg/L	Max	Report	Single Sample	Quarterly	Grab	WIM-01	
Nitrogen, Kjeldahl, Total (as N)	mg/L	Max	Report	Single Sample	Quarterly	Grab	WIM-01 WEP-01	
Nitrite plus Nitrate, Total 1 det. (as N)	mg/L	Max	Report	Single Sample	Quarterly	Grab	WIM-01 WEP-01	
Sulfate, Total	mg/L	Max	Report	Single Sample	Quarterly	Grab	WIM-01 WEP-01	
Coliform, Fecal	#/100mL	Max	Report	Single Sample	Quarterly	Grab	WIM-01 WEP-01	
Chlorophyll a	mg/L	Max	Report	Single Sample	Quarterly	Grab	WIM-01 WEP-01	
Water Level at sample collection time	feet	Max	Report	Single Sample	Quarterly	Grab	WEP-01	
		Min	Report	Single Sample				
Sulfide (sediment)	mg/L	Max	Report	Single Sample	Annually	Grab	WIM-01 WIM-02 WEP-01	
Woody Vegetation	Yes or No (Yes = 1; No= 0)	Max	Report	Single Sample	Annually	Grab	WIM-01, WIM-02, WIM-03	See I.A.12

			Effluent Limitations		Monitoring Requirements			
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
Threatened and Endangered Plant & Animal Species List	Yes or No (Yes = 1; No= 0)	Max	Report	Single Sample	Annually	Grab	WIM-01, WIM-02, WIM-03	See I.C.15
Herbaceous Vegetation -- Line Intercept Method	Yes or No (Yes = 1; No= 0)	Max	Report	Single Sample	Annually	Grab	WIM-01, WIM-02, WIM-03	See I.C.14

2. Effluent samples shall be taken at the monitoring site locations listed in Permit Condition I.A.1. and as described below:

Monitoring Site	Description of Monitoring Site
CAL-1	Calculated value of total unionized ammonia discharge from the wetland
EFA-1	Sample point at the effluent pump station
FLW-2	Flow meter, on effluent pipeline to Yulee Wetland
PPI-1	Ultraviolet radiation chamber
WEP-01	Sample point at point of discharge from the wetland. Located approximately at latitude 30° 38' 7.71" N, longitude 81° 35' 33.52" W.
WIM-01	Sample is located in the immediate vicinity of the point of downstream of the point of discharge to the wetland. Located approximately at latitude 30° 36' 45.45" N, longitude 81° 35' 7.17" W.
WIM-02	Sample point in the approximate geographic middle of the wetland. Located approximately at latitude 30° 37' 10.01" N, longitude 81° 35' 10.65" W.
WIM-03	Sample location is located in the immediate vicinity of the point of discharge from the wetland. Located approximately at latitude 30° 38' 7.71" N, longitude 81° 35' 33.53" W.

3. During the period of required operator attendance hourly measurement of pH may be substituted for continuous measurement. *[62-600.660(1)]*

4. A recording flow meter with totalizer shall be utilized to measure flow and calibrated at least once every 12 months. *[62-600.200(25)]*

5. The discharge shall not contain components that, alone or in combination with other substances or in combination with other components of the discharge:

   a. Settle to form putrescent deposits or otherwise create a nuisance; or

   b. Float as debris, scum, oil, or other matter in such amounts as to form nuisances; or

   c. Produce color, odor, taste, turbidity, or other conditions in such degree as to create a nuisance; or

   d. Are acutely toxic; or

   e. Are present in concentrations which are carcinogenic, mutagenic, or teratogenic to human beings or to significant, locally occurring, wildlife or aquatic species, unless specific standards are established for such components in subsection 62-302.500(2) or Rule 62-302.530, F.A.C.; or

   f. Pose a serious danger to the public health, safety, or welfare.

[62-302.500(1)(a)]

6. The effluent limitation for the monthly geometric mean for fecal coliform is only applicable if 10 or more values are reported. If fewer than 10 values are reported, the monthly geometric mean shall be calculated and reported on the Discharge Monitoring Report to be used to calculate the annual average. *[62-600.440*(5)(b)]

7. The effluent limitation for the monthly geometric mean for E. coli is only applicable if 10 or more values are reported. If fewer than 10 values are reported, the monthly geometric mean shall be calculated and reported on the Discharge Monitoring Report. All other E. coli effluent limitations included in permit condition I.A.1 apply regardless of the number of values reported. *[62-302.530(6)(b)]*

8. Ultraviolet light shall be utilized as the primary means of disinfection. This UV system shall be monitored for proper operation on each day of operator attendance. The ultraviolet light intensity, ultraviolet light dosage, ultraviolet light transmittance and unit operation shall be verified. The operation and maintenance shall be performed on a regular basis in accordance with the manufacturer recommended factor of safety. *[62-600.440(5)]*

9. The permittee shall comply with the following requirements to evaluate chronic whole effluent toxicity of the discharge from outfall **D-001** and **D-002**.

   a. Effluent Limitation
      (1) In any routine or additional follow-up test for chronic whole effluent toxicity, the 25 percent inhibition concentration (IC25) shall not be less than 100% effluent. *[Rules 62-302.530(61) and 62-4.241(1)(b), F.A.C.]*
      (2) For acute whole effluent toxicity, the 96-hour LC50 shall not be less than 100% effluent in any test. [Rule 62-302.500(1)(a)4. and 62-4.241(1)(a), F.A.C.]

   b. Monitoring Frequency
      (1) Routine toxicity tests shall be conducted once every 6 months, the first starting within 6 months of the most recent tests and lasting for the duration of this permit.

   c. Sampling Requirements
      (1) For each routine test or additional follow-up test conducted, a total of three grab samples of final effluent shall be collected and used in accordance with the sampling protocol discussed in EPA-821-R-02-013, Section 8.
      (2) The first sample shall be used to initiate the test. The remaining two samples shall be collected according to the protocol and used as renewal solutions on Day 3 (48 hours) and Day 5 (96 hours) of the test.
      (3) Samples for routine and additional follow-up tests shall not be collected on the same day.

   d. Test Requirements
      (1) Routine Tests: All routine tests shall be conducted using a control (0% effluent) and a minimum of five test dilutions: **100%**, **50%**, **25%**, **12.5%**, and **6.25%** final effluent.
      (2) The permittee shall conduct a daphnid, ***Ceriodaphnia dubia***, Survival and Reproduction Test and a fathead minnow, ***Pimephales promelas***, Larval Survival and Growth Test, concurrently.
      (3) All test species, procedures and quality assurance criteria used shall be in accordance with Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th Edition, EPA-821-R-02-013. Any deviation of the bioassay procedures outlined herein shall be submitted in writing to the Department for review and

approval prior to use. In the event the above method is revised, the permittee shall conduct chronic toxicity testing in accordance with the revised method.

(4) The control water and dilution water shall be moderately hard water as described in EPA-821-R-02-013, Section 7.2.3.

e. Quality Assurance Requirements

(1) A standard reference toxicant (SRT) quality assurance (QA) chronic toxicity test shall be conducted with each species used in the required toxicity tests either concurrently or initiated no more than 30 days before the date of each routine or additional follow-up test conducted. Additionally, the SRT test must be conducted concurrently if the test organisms are obtained from outside the test laboratory unless the test organism supplier provides control chart data from at least the last five monthly chronic toxicity tests using the same reference toxicant and test conditions. If the organism supplier provides the required SRT data, then the organism supplier's SRT data and the test laboratory's monthly SRT-QA data shall be included in the reports for each companion routine or additional follow-up test required.

(2) If the mortality in the control exceeds 20% for either species in any test, or any other test acceptability criteria are not met, then the test for that species (including the control) shall be invalidated and the test repeated. Test acceptability criteria for each species are defined in EPA-821-R-02-013, Section 13.12 (***Ceriodaphnia dubia***) and Section 11.11 (***Pimephales promelas***). The repeat test shall begin within 21 days after the last day of the invalid test.

(3) If 100% mortality occurs in all effluent concentrations for either test species prior to the end of any test and the control mortality is less than 20% at that time, the test (including the control) for that species shall be terminated with the conclusion that the test fails and constitutes non-compliance.

(4) Routine and additional follow-up tests shall be evaluated for acceptability based on the observed dose-response relationship as required by EPA-821-R-02-013, Section 10.2.6., and the evaluation shall be included with the bioassay laboratory reports.

f. Reporting Requirements

(1) Results from all required tests shall be entered on the MONTHLY Discharge Monitoring Report (DMR) as the calculated IC_{25} for each test species.

(2) A bioassay laboratory report for each routine test shall be prepared according to EPA-821-R-02-013, Section 10, Report Preparation and Test Review, and mailed or ***emailed*** to the Department at the address below ***within 30 days*** after the last day of the test.

(3) For additional follow-up tests, a single bioassay laboratory report shall be prepared according to EPA-821-R-02-013, Section 10, and mailed or ***emailed within 30 days*** after the last day of the second valid additional follow-up test.

(4) Data for invalid tests shall be included in the bioassay laboratory report for the repeat test.

(5) The same bioassay data shall not be reported as the results of more than one test.

(6) All bioassay laboratory reports shall be mailed or ***e-mailed*** to *Jacksonville* only:

Florida Department of Environmental Protection
Northeast District – Wastewater Compliance
8800 Baymeadows Way West, Suite 100
Jacksonville, Florida 32256

g. Test Failures

(1) A test fails when the test results do not meet the limits in 9.a.(1).

(2) Additional Follow-up Tests:

(a) If a routine test does not meet the chronic toxicity limitation in 9.a.(1) above, the permittee shall **notify** the Department at the address above **within 21 days** after the last day of the failed routine test and conduct two additional follow-up tests on each species that failed the test in accordance with 9.d.

(b) The first test shall be initiated within 28 days after the last day of the failed routine test. The remaining additional follow-up tests shall be conducted weekly thereafter until a total of two valid additional follow-up tests are completed.
(c) The additional follow-up tests shall be conducted using a control (0% effluent) and a minimum of five dilutions: 100%, 50%, 25%, 12.5%, and 6.25% effluent. The permittee may modify the dilution series in the additional follow-up tests to more accurately bracket the toxicity such that at least two dilutions above and two dilutions below the target concentration and a control (0% effluent) are run. All test results shall be analyzed according to the procedures in EPA-821-R-02-013.

(3) In the event of three valid test failures (whether routine or additional follow-up tests) within a 12-month period, the permittee shall **notify** the Department **within 21 days** after the last day of the third test failure.
(a) The permittee shall submit a plan for correction of the effluent toxicity within 60 days after the last day of the third test failure.
(b) The Department shall review and approve the plan before initiation.
(c) The plan shall be initiated within 30 days following the Department's written approval of the plan.
(d) Progress reports shall be submitted quarterly to the Department at the address above.
(e) During the implementation of the plan, the permittee shall conduct quarterly routine whole effluent toxicity tests in accordance with 9.d. Additional follow-up tests are not required while the plan is in progress. Following completion or termination of the plan, the frequency of monitoring for routine and additional follow-up tests shall return to the schedule established in 9.b.(1). If a routine test is invalid according to the acceptance criteria in EPA-821-R-02-013, a repeat test shall be initiated within 21 days after the last day of the invalid routine test.
(f) Upon completion of four consecutive quarterly valid routine tests that demonstrate compliance with the effluent limitation in 9.a.(1) above, the permittee may submit a written request to the Department to terminate the plan. The plan shall be terminated upon written verification by the Department that the facility has passed at least four consecutive quarterly valid routine whole effluent toxicity tests.
(g) If a test within the sequence of the four is deemed invalid, but is replaced by a repeat valid test initiated within 21 days after the last day of the invalid test, then the invalid test will not be counted against the requirement for four consecutive quarterly valid routine tests for the purpose of terminating the plan.

(4) If chronic toxicity test results indicate greater than 50% mortality within 96 hours in an effluent concentration equal to or less than the effluent concentration specified as the acute toxicity limit in 9.a.(2), then the Department may revise this permit to require acute definitive whole effluent toxicity testing.
(5) The additional follow-up testing and the plan do not preclude the Department taking enforcement action for acute or chronic whole effluent toxicity failures.

[62-4.241, 62-620.620(3)]

10. Dissolved oxygen and temperature measurements shall be performed at any of the water quality sampling stations during each sampling event. (48-hour, dawn to dusk maximum of four-hour interval.) *[62-611.700(1) Table 3]*

11. Un-ionized ammonia shall be calculated based on a separate single grab sample for total ammonia. The pH and temperature at the time of the grab sample shall be used for the calculation and reported on the DMR. *[[62-302]]*

12. Canopy and subcanopy woody vegetation shall be surveyed in each of the three 30x30 meter biological sampling quadrants (WIM-01, WIM-02, WIM-03) along the two 30m transects at each station identified in the supplemental baseline monitoring report. The importance value of each of the species shall be calculated and compared to the supplemental baseline monitoring report. The importance value of any of the most common species in the canopy and subcanopy as averaged over the three quadrants at any station shall not be reduced by more than 50 percent. In addition, the average importance value for all three quadrants of any of the most common plant species occupying the canopy or subcanopy stratum shall not be reduced by more than 25 percent. *[[62-611.700(1)Table 3 62-611.500(3)(d)1]]*

13. The discharge of reclaimed water to the receiving wetlands shall:

    a. Minimize change in the natural hydroperiod of the wetlands. *[62-611.350(1)]*

    b. Preserve or enhance the type, nature, and function of the wetlands. *[373.414 (4), F.S.]*

14. Herbaceous vegetation shall be surveyed with the line-intercept method along each of the six transects within biological sampling stations (WIM-01, WIM-02, WIM-03) identified in the supplemental baseline monitoring report. After two years of placing the expansion into service, the permittee may request for a modification in the frequency of the monitoring this parameter based on a demonstration that there is an adequate date base to predict future trends in the effects of discharge of reclaimed water on the wetland *[62-611.700(1) Table 3]*

15. The threatened and endangered species list shall be updated annually based on qualitative observations of flora and fauna. *[[62-611.700(1)Table 3]]*

16. Monitoring results exceeding the requirements defined in Condition I.A.10. above may or may not be considered to be in compliance with the provisions of Chapter 62-611, F.A.C., depending on the circumstances that have caused changes in the woody vegetation. If the results of the field monitoring program indicate that the criteria established in Condition I.A.11 above are exceeded, the permittee shall promptly schedule a meeting with the Department to discuss what, if any, remedial measures or modified permit requirements may be required to prevent future impacts. As necessary, the permit may be reopened and modified to include additional requirements to ensure compliance with the provisions of 62-611 FAC as well as a compliance schedule to implement such additional requirements. *[62-611 FAC]*

17. Stage is used to determine flow and is required only at the point of discharge from the wetland. *[[62-611.700(1) Table 3]]*

18. Public access to the receiving wetlands shall be restricted, and the permittee, JEA, is responsible to restrict public access to the receiving wetlands. *[[62-611.600(6)]]*

19. The permittee shall submit an annual wetland summary report. The summary report shall include a site description, including a site map showing the point of discharge, location monitoring stations, and general flow patterns in the wetland, and biological monitoring summary. Summary discussion topics should include, but not limited to, the following: [62-611.700(2)]

    a. Evaluation of the data in regard to rule criteria;

    b. Interpretation of the data results;

c. Specific comments concerning each potential exceedance of the criteria; Any information deemed pertinent including any specific preventative or remedial measures needed. Any items noted for needing preventive of remedial measures should have a corresponding schedule date for completion.

d. Influence of the wastewater discharge on the wetlands and its effects on the type, nature and function of the wetlands (e. g. regeneration, growth, and sustainability of woody species, macroinvertebrate community presence and location; presence and biomass of fish species; and hydrologic variability)

The Annual Wetlands Monitoring Summary Report is due on January first of each year and will be sent to the District Office and the Domestic Wastewater Section at the addresses specified below:

Florida Department of Environmental Protection
Northeast District Attn: Domestic Wastewater Section
8800 Baymeadows Way West, Suite 100
Jacksonville, Florida 32256
Phone (904) 256-1700; FAX (904) 256-1588

Florida Department of Environmental Protection
Domestic Wastewater Section, Mail Station 3540
Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400 *[62-611 FAC]*

B. Surface Water Discharges – Apricot Act Discharge (Wetland/Lofton Creek) D – 002:

1. During the period beginning on the effective date and lasting through the expiration date of this permit, the permittee is authorized to discharge effluent from Outfall D-002 under the Apricot Act to unnamed wetlands which drain to Lofton Creek (WBID 2119). Such discharge shall be limited and monitored by the permittee as specified below and reported in accordance with Permit Condition I.E.7. :

			Effluent Limitations		Monitoring Requirements			
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
Flow (Apricot)	MGD	Max	0.315	Annual Average	Continuous	Recording Flow Meter with Totalizer	EFD-1	See I.B.4
		Max	Report	Monthly Average				
Flow, Volume of Effluent Discharge under the APRICOT Act	MG	Max	115.00	Annual Total	Daily During Discharge	Calculated	CAL-2	
		Max	Report	Monthly Total				
		Max	Report	Daily Maximum				
BOD, Carbonaceous 5 day, 20C	mg/L	Max	5.0	Annual Average	Weekly	24-hr FPC	EFA-1	
		Max	6.25	Monthly Average				
		Max	7.5	Weekly Average				
		Max	10.0	Single Sample				
Solids, Total Suspended	mg/L	Max	5.0	Single Sample	Daily *(7days/week)*	Grab	EFB-1	
Ultraviolet Light Operational Dose	MW-s/cm^2	Min	100	Single Sample	Continuous	Meter	PPI-1	See I.D.16
Ultraviolet Light Transmittance	%	Min	65	Single Sample	Continuous	Meter	PPI-1	See I.D.15

			Effluent Limitations		Monitoring Requirements			
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
Ultraviolet Light Intensity	mW/cm^2	Min	Report	Single Sample	Continuous	Meter	PPI-1	See I.D.14
Water Level in Reactors	Ft	Min	Report	Single Sample	Continuous	Meter	PPI-1	See I.D.11
		Max	Report	Single Sample				
Reactor Status	On/off		Report	Single Sample	Continuous	Meter	PPI-1	
Lamp Status	On/off		Report	Single Sample	Continuous	Meter	PPI-1	See I.D.9
Lamp Age	Hrs		Report	Single Sample	Continuous	Meter	PPI-1	See I.D.10
Reactor On/Off Cycles	Total Number		Report	Single Sample	Continuous	Meter	PPI-1	
Reactor Power Setpoint	-	-	Report	Single Sample	Continuous	Meter	PPI-1	See I.D.12
Ground Fault Interrupt Status	Yes/No	-	Report	Single Sample	Continuous	Meter	PPI-1	See I.D.13
pH	s.u.	Min	6.0	Single Sample	Continuous	Meter	EFA-1	See I.B.3
		Max	8.5	Single Sample				
Coliform, Fecal	#/100mL	Max	25	Single Sample	Daily; 24 hours	Grab	EFA-2	See I.B.5
Coliform, Fecal, % less than detection	percent	Min	75	Monthly Total	Monthly	Calculated	CAL-4	See I.B.5

			Effluent Limitations		Monitoring Requirements			
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
E. Coli	#/100 mL	Max	126	Monthly Geometric Mean	Weekly	Grab	EFA-1	See I.A.7
	#/100 mL	Max	410	90th Percentile				
Oxygen, Dissolved (DO)	mg/L	Min	Report	Single Sample	Daily, 24 hours	Meter	EFA-1	
Nitrogen, Total	mg/L	Max	3.0	Annual Average	Weekly	24-hr FPC	EFA-1	
		Max	3.75	Monthly Average				
		Max	4.5	Weekly Average				
		Max	6.0	Single Sample				
Phosphorus, Total (as P)	mg/L	Max	1.0	Annual Average	Weekly	24-hr FPC	EFA-1	
		Max	1.25	Monthly Average				
		Max	1.5	Weekly Average				
		Max	2.0	Single Sample				
Chronic Whole Effluent Toxicity, 7-Day IC25 (*Ceriodaphnia dubia*)	percent	Min	100	Single Sample	Semi-Annually; twice per year	Grab	EFA-1	See I.A.9.
Chronic Whole Effluent Toxicity, 7-Day IC25 (*Pimephales promelas*)	percent	Min	100	Single Sample	Semi-Annually; twice per year	Grab	EFA-1	See I.A.9.

2. Effluent samples shall be taken at the monitoring site locations listed in Permit Condition I.B.1. and as described below:

Monitoring Site	Description of Monitoring Site
CAL-2	Calculated total annual volume effluent discharge under the Apricot Act
EFA-1	Sample point at the effluent pump station.
EFD-1	Apricot discharge
PPI-1	Ultraviolet radiation chamber

3. During the period of required operator attendance hourly measurement of pH may be substituted for continuous measurement. *[62-600.660(1)]*

4. A recording flow meter with totalizer shall be utilized to measure flow and calibrated at least once every 12 months. *[62-600.200(25)]*

5. Over a 30-day period, at least 75 percent of the fecal coliform values shall be below the detection limits. No sample shall exceed 25 fecal coliform values per 100 mL. No sample shall exceed 5.0 mg/L of total suspended solids (TSS) at a point before the application of the disinfectant. Note: To report the "% less than detection," count the number of fecal coliform observations that were less than detection, divide by the total number of fecal coliform observations in the month, and multiply by 100% (round to the nearest integer). *[62-600.440(6)(a)]*

8. The Florida water quality criteria and standards shall not be violated as a result of the discharge. *[62-620.320(9)] & [62-302.530]*

9. The Department reserves the right to request the permittee, JEA, to conduct monitoring at the unnamed wetlands as required by Chapter 62-611, FAC and the ambient water quality monitoring for the receiving waterbodies. *[BPJ]*

C. Reuse and Land Application Systems – Rapid Rate Infiltration System (R – 001)

1. During the period beginning on the effective date and lasting through the expiration date of this permit, the permittee is authorized to direct reclaimed water to the rapid-infiltration reuse system R-001. Such reclaimed water shall be limited and monitored by the permittee as specified below and reported in accordance with Permit Condition I.E.7.:

			Reclaimed Water Limitations		Monitoring Requirements			
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Monitoring**	**Sample Type**	**Monitoring Site**	**Notes**
Flow (Percolation Ponds)	MGD	Max	0.30	Annual Average	Daily (7days/week)	Calculated	CAL-3	See I.C.7
		Max	Report	Monthly Average				
BOD, Carbonaceous 5 day, 20C	mg/L	Max	20.0	Annual Average	Weekly	24-hr FPC	EFA-2	
		Max	30.0	Monthly Average				
		Max	45.0	Weekly Average				
		Max	60.0	Single Sample				
Solids, Total Suspended	mg/L	Max	20.0	Annual Average	Weekly	24-hr FPC	EFA-2	
		Max	30.0	Monthly Average				
		Max	45.0	Weekly Average				
		Max	60.0	Single Sample				
Coliform, Fecal	#/100mL	Max	200	Monthly Geometric Mean	Weekly	Grab	EFA-2	See I.C.5
		Max	200	Annual Average				
		Max	800	Single Sample				

			Reclaimed Water Limitations		Monitoring Requirements			
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Monitoring**	**Sample Type**	**Monitoring Site**	**Notes**
pH	s.u.	Min	6.0	Single Sample	Continuous	Meter	EFA-2	See I.C.3
		Max	8.5	Single Sample				
Total Nitrogen (as N)	mg/L	Max	12.0	Single Sample	Weekly	24-hr FPC	EFA-2	
Ultraviolet Light Operational Dose	MW-s/cm^2	Min	Report	Single Sample	Continuous	Instrument	PPI-1	See I.C.6
Ultraviolet Light Transmittance	%	Min	Report	Single Sample	Continuous	Instrument	PPI-1	See I.C.6
Ultraviolet Light Intensity	MW/ cm^2	Min	Report	Single Sample	Continuous	Instrument	PPI-1	See I.C.6

2. Reclaimed water samples shall be taken at the monitoring site locations listed in Permit Condition I.C.1. and as described below:

Monitoring Site	Description of Monitoring Site
CAL-3	Calculated flow to the on-site percolation ponds (the difference between flow rate to the WWTF measured at FLW-1 and the flow rate to the public access reuse (PAR) system measured at FLW-3 and flow rate to the Yulee Wetland measured at FLW-2)
EFA-2	Following UV disinfection and prior to transfer to the reuse system
PPI-1	Ultraviolet radiation chamber

3. During the period of required operator attendance hourly measurement of pH may be substituted for continuous measurement. *[62-600.660(1)]*

4. A recording flow meter with totalizer shall be utilized to measure flow and calibrated at least once every 12 months. *[62-600.200(25)]*

5. The effluent limitation for the monthly geometric mean for fecal coliform is only applicable if 10 or more values are reported. If fewer than 10 values are reported, the monthly geometric mean shall be calculated and reported on the Discharge Monitoring Report. *[62-600.440(4)(c)]*

6. This facility utilizes an ultraviolet disinfection system as the primary means of disinfection. This UV system shall be monitored for proper operation on each day of operator attendance. The ultraviolet light intensity, ultraviolet light dosage, ultraviolet light transmittance and unit operation shall be verified. All the monitored records shall be kept for at least 5 years. The operation and maintenance shall be performed on a regular basis in accordance with the manufacturer recommended factor of safety. *[62-600.440(4)(b)]*

7. Flow rate to the on-site percolation ponds shall be the difference between flow rate to the WWTF measured at FLW-1 and the flow rate to the public access reuse (PAR) system measured at FLW-3 and flow rate to the Yulee Wetland measured at FLW-2. *[BPJ]*

D. **Reuse and Land Application Systems – Public Access Reuse System (R – 002)**

1. During the period beginning on the effective date and lasting through the expiration date of this permit, the permittee is authorized to direct reclaimed water to public access Reuse System R-002. Such reclaimed water shall be limited and monitored by the permittee as specified below and reported in accordance with Permit Condition I.E.7.:

			Reclaimed Water Limitations		**Monitoring Requirements**			
Parameter	**Units**	**Max./ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
Flow	MGD	Max	0.750	Annual Average	Continuous	Recording Flow Meter with Totalizer	FLW-3	See I.D.4
		Max	Report	Monthly Average				
BOD, Carbonaceous 5 day, 20C	mg/L	Max	20.0	Annual Average	Weekly	24-hr FPC	EFA-2	
		Max	30.0	Monthly Average				
		Max	40.0	Weekly Average				
		Max	60.0	Single Sample				
Solids, Total Suspended	mg/L	Max	5.0	Single Sample	Daily *(7days/week)*	Grab	EFB-1	
Turbidity	NTU	Max	Report	Single Sample	Continuous	Meter	EFB-1	See I.D.7
Nitrogen, Total (as N)	mg/L	Max	12.0	Single Sample	Weekly	24-hr FPC	EFA-2	
Coliform, Fecal	#/100mL	Max	25	Single Sample	Daily (7days/week)	Grab	EFA-2	
Coliform, Fecal, % less than detection	percent	Min	75	Monthly Total	Monthly	Calculated	CAL-4	See I.D.5

			Reclaimed Water Limitations		Monitoring Requirements			
Parameter	**Units**	**Max./ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
pH	s.u.	Min	6.0	Single Sample	Continuous	Meter	EFA-2	See I.D.3
		Max	8.5	Single Sample				
Ultraviolet Light Operational Dose	MW-s/cm^2	Min	100	Single Sample	Continuous	Meter	PPI-1	See I.D.16
Ultraviolet Light Transmittance	%	Min	65	Single Sample	Continuous	Meter	PPI-1	See I.D.15
Ultraviolet Light Intensity	mW/cm^2	Min	Report	Single Sample	Continuous	Meter	PPI-1	See I.D.14
Water Level in Reactors	Ft	Min Max	Report Report	Single Sample Single Sample	Continuous	Meter	PPI-1	See I.D.11
Reactor Status	On/off	-	Report	Single Sample	Continuous	Meter	PPI-1	
Lamp Status	On/off	-	Report	Single Sample	Continuous	Meter	PPI-1	See I.D.9
Lamp Age	Hrs	-	Report	Single Sample	Continuous	Meter	PPI-1	See I.D.10
Reactor On/Off Cycles	Total Number	-	Report	Single Sample	Continuous	Meter	PPI-1	
Reactor Power Setpoint	-	-	Report	Single Sample	Continuous	Meter	PPI-1	See I.D.12
Ground Fault Interrupt Status	Yes/No		Report	Single Sample	Continuous	Meter	PPI-1	See I.D.13
Giardia	Cysts/ 100L	Max	Report	Single Sample	Every two years	Filtered	EFA-2	See I.D.18

			Reclaimed Water Limitations		Monitoring Requirements			
Parameter	**Units**	**Max./ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
Cryptosporidium	Oocysts/ 100 L	Max	Report	Single Sample	Every two years	Filtered	EFA-2	See I.D.18
Primary Drinking Water Standards	mg/L	-	Report	Single Sample	Annually	24-hour flow proportioned composite	RWS-A	See I.E.8
Secondary Drinking Water Standards	mg/L	-	Report	Single Sample	Annually	24-hour flow proportioned composite	RWS-A	See I.E.8

2. Reclaimed water samples shall be taken at the monitoring site locations listed in Permit Condition I.D.1. and as described below:

Monitoring Site	Description of Monitoring Site
CAL-4	Calculated percent the fecal coliform values are less the detection limit in 30 days.
EFA-1	Sample point at the effluent pump station
EFA-2	Following UV disinfection and prior to transfer to the reuse system
EFB-1	After membranes and prior to UV disinfection
EFB-2	At UV disinfection channels
FLW-3	At Flow meter before going to the golf course lakes
RWS-A	Reclaimed Water Scan / Effluent Analysis Report sampling location, same as EFA-2

3. Hourly measurement of pH during the period of required operator attendance may be substituted for continuous measurement. *[Chapter 62-600.660(1)]*

4. A recording flow meter with totalizer shall be utilized to measure flow and calibrated at least once every 12 months. *[62-600.200(25)]*

5. Over a 30-day period, at least 75 percent of the fecal coliform values shall be below the detection limits. No sample shall exceed 25 fecal coliform values per 100 mL. No sample shall exceed 5.0 mg/L of total suspended solids (TSS) at a point before the application of the disinfectant. Note: To report the "% less than detection," count the number of fecal coliform observations that were less than detection, divide by the total number of fecal coliform observations in the month, and multiply by 100% (round to the nearest integer). *[62-600.440(5)(f)]*

6. The filtration and UV disinfection systems shall be operated in compliance with the approved operating protocol, such that the permit limitations for fecal coliform bacteria shall be achieved. *[62-600.440(5)(b); 62-610.460(2); 62-610.463(2)]*

7. Instruments for continuous on-line monitoring of turbidity shall be equipped with an automated data logging or recording device. *[62-610.463(2) & .865(8)(d)]*

8. The treatment facilities shall be operated in accordance with all approved operating protocols. Only reclaimed water that meets the criteria established in the approved operating protocol(s) may be released to system storage or to the reuse system. Reclaimed water that fails to meet the criteria in the approved operating protocol(s) shall be directed to the following permitted alternate discharge system, R-001, existing percolation ponds. The operating protocol(s) shall be reviewed and updated periodically to ensure continuous compliance with the minimum treatment and disinfection requirements. Updated operating protocols shall be submitted to the Department for review and approval upon revision of the operating protocol(s) and with each permit application. *[62-610.320(6) and 62-610.463(2)]*

9. The on/off status of each lamp shall be monitored and logged continuously. As described in the approved operating protocol, failure of two or more adjacent lamps in a bank, shall result in reclaimed water being diverted away from both the system storage and reuse systems. Failure of more than five percent of lamps in a bank also shall result in reclaimed water being diverted away from both the system storage and reuse systems. *[62-600.440(1); 62-4.070; 62-610.463(2)]*

10. The lamp age of each lamp shall be monitored and logged continuously. As described in the approved operating protocol, lamps shall be replaced at the appropriate lamp age. *[62-600.440(1); 62-4.070; 62-610.463(2)]*

11. The water level in each reactor shall be monitored and logged continuously. As described in the approved operating protocol, a high or low water level condition shall result in reclaimed water being diverted away from both the system storage and reuse systems. *([62-600.440(1); 62-4.070; 62-610.463(2)]*

12. The reactor power settings shall be as described in the approved operating protocol. The occurrence of power settings below that prescribed in the operating protocol shall result in reclaimed water being diverted away from both the system storage and reuse systems. *[62-600.440(1); 62-4.070; 62-610.463(2)]*

13. Ground fault interrupt (GFI) status of the UV disinfection system shall be monitored and logged continuously. As described in the approved operating protocol, a GFI condition shall result in reclaimed water being diverted away from both the system storage and reuse systems. *[62-600.440(1); 62-4.070; 62-610.463(2)]*

14. UV intensity shall be monitored and logged continuously in each reactor. The location of the probe shall be at the same point as was used in the validation testing. *[62-600.440(1); 62-4.070; 62-610.463(2)]*

15. UV transmittance shall be monitored and logged continuously, and shall be limited as described in the approved operating protocol. *[62-600.440(1); 62-4.070; 62-610.463(2)]*

16. Operational UV dosage shall be continuously calculated and logged and shall be limited as described in the approved operating protocol. *[62-600.440(1); 62-4.070; 62-610.463(2)]*

17. Operating data for UV light transmittance, UV intensity, UV dose, turbidity, reactor status, lamp status, lamp age, reactor on/off cycles, reactor power settings, ground fault interrupt status shall be available for inspection at the treatment facility and shall be summarized and submitted to the Department as part of the documentation associated with reviews and approvals of operating protocols pursuant to Rule 62-610.320(6), F.A.C. *[62-600.440(1); 62-4.070; 62-610.463(2); 62-610.320(6)]*

18. Intervals between sampling for Giardia and Cryptosporidium shall not exceed two years. Samples shall be taken at a point immediately following the high-level disinfection process. Sampling results shall be reported on DEP Form 62-610.300(4)(a)4, Pathogen Monitoring, (available at the FDEP website at: http://www.dep.state.fl.us/water/wastewater/forms.htm). This form shall be submitted to the Department's Northeast District Office and to DEP's Reuse Coordinator in Tallahassee. *[62-610.300(4)(a)]*

E. Other Limitations and Monitoring and Reporting Requirements

1. During the period beginning on the effective date and lasting through the expiration date of this permit, the treatment facility shall be limited and monitored by the permittee as specified below and reported in accordance with condition I.E.7.:

			Limitations		Monitoring Requirements			
Parameter	**Units**	**Max /Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**	**Notes**
Flow, Through the WWTF	MGD	Max	1.55	Annual Average	Continuous	Recording Flow Meter with Totalizer	INF-1	See I.E.4
		Max	Report	Monthly Average				
		Max	Report	Quarterly Average				
Percent Capacity, (TMADF ÷ Permitted Capacity) x 100	percent	Max	Report	Monthly Average	Monthly	Calculated	CAL-5	See I.E.12
BOD, Carbonaceous 5 day, 20C (Influent)	mg/L	Max	Report	Monthly Average	Weekly	24-hr FPC	INF-1	See I.E.3
Solids, Total Suspended (Influent)	mg/L	Max	Report	Monthly Average	Weekly	24-hr FPC	INF-1	See I.E.3

2. Samples shall be taken at the monitoring site locations listed in Permit Condition I.E.1. and as described below:

Monitoring Site	Description of Monitoring Site
INF-1	Influent, prior to biological, chemical, physical process or dilution
CAL-5	Calculated value, [3-month ADF / permitted capacity] x 100.

3. Influent samples shall be collected so that they do not contain digester supernatant or return activated sludge, or any other plant process recycled waters. *[62-600.660(4)(a)]*

4. Recording flow meter and totalizer located at MBR permeate pumping station shall be utilized to measure flow and calibrated at least annually. *[62-600.200(25)]*

5. The sample collection, analytical test methods, and method detection limits (MDLs) applicable to this permit shall be conducted using a sufficiently sensitive method to ensure compliance with applicable water quality standards and effluent limitations and shall be in accordance with Rule 62-4.246, Chapters 62-160 and 62-601, F.A.C., and 40 CFR 136, as appropriate. The list of Department established analytical methods, and corresponding MDLs (method detection limits) and PQLs (practical quantitation limits), which is titled "Rule 62-4, F.A.C. MDL/PQL Table (May 31, 2019)" is available at https://floridadep.gov/dear/quality-assurance/content/quality-assurance-resources. The MDLs and PQLs as described in this list shall constitute the minimum acceptable MDL/PQL values and the Department shall not accept results for which the laboratory's MDLs or PQLs are greater than those described above unless alternate MDLs and/or PQLs have been specifically approved by the Department for this permit. Any method included in the list may be used for reporting as long as it meets the following requirements:

   a. The laboratory's reported MDL and PQL values for the particular method must be equal or less than the corresponding method values specified in the Department's approved MDL and PQL list;

   b. The laboratory reported MDL for the specific parameter is less than or equal to the permit limit or the applicable water quality criteria, if any, stated in Chapter 62-302, F.A.C. Parameters that are listed as "report only" in the permit shall use methods that provide an MDL, which is equal to or less than the applicable water quality criteria stated in 62-302, F.A.C.; and

   c. If the MDLs for all methods available in the approved list are above the stated permit limit or applicable water quality criteria for that parameter, then the method with the lowest stated MDL shall be used.

   When the analytical results are below method detection or practical quantitation limits, the permittee shall report the actual laboratory MDL and/or PQL values for the analyses that were performed following the instructions on the applicable discharge monitoring report.

   Where necessary, the permittee may request approval of alternate methods or for alternative MDLs or PQLs for any approved analytical method. Approval of alternate

laboratory MDLs or PQLs are not necessary if the laboratory reported MDLs and PQLs are less than or equal to the permit limit or the applicable water quality criteria, if any, stated in Chapter 62-302, F.A.C. Approval of an analytical method not included in the above-referenced list is not necessary if the analytical method is approved in accordance with 40 CFR 136 or deemed acceptable by the Department. *[62-4.246, 62-160]*

6. The permittee shall provide safe access points for obtaining representative influent, reclaimed water, and effluent samples which are required by this permit. *[62-600.650(2)]*

7. Monitoring requirements under this permit are effective on the first day of the second month following the effective date of the permit. Until such time, the permittee shall continue to monitor and report in accordance with previously effective permit requirements, if any. During the period of operation authorized by this permit, the permittee shall complete and submit to the Department Discharge Monitoring Reports (DMRs) in accordance with the frequencies specified by the REPORT type (i.e. monthly, quarterly, semiannual, annual, etc.) indicated on the DMR forms attached to this permit. Unless specified otherwise in this permit, monitoring results for each monitoring period shall be submitted in accordance with the associated DMR due dates below. DMRs shall be submitted for each required monitoring period including periods of no discharge.

REPORT Type on DMR	Monitoring Period	Mail or Electronically Submit by
Monthly	first day of month - last day of month	28th day of following month
Toxicity	first day of month - last day of month	28th day of following month
Quarterly	January 1 - March 31 April 1 - June 30 July 1 - September 30 October 1 - December 31	April 28 July 28 October 28 January 28
Semi-annual	January 1 - June 30 July 1 - December 31	July 28 January 28
Annual	January 1 - December 31	January 28

The permittee shall use the electronic DMR system approved by the Department (EzDMR) and shall electronically submit the completed DMR forms using the DEP Business Portal at http://www.fldepportal.com/go/ , unless the permittee has a waiver from the Department in accordance with 40 CFR 127.15. Reports shall be submitted to the Department by the twenty-eighth (28th) of the month following the month of operation.

[62-620.610(18)][62-600.680(1)]

8. During the period of operation authorized by this permit, reclaimed water or effluent shall be monitored annually for the primary and secondary drinking water standards contained in Chapter 62-550, F.A.C., (except for asbestos, color, odor, and corrosivity). These monitoring results shall be reported to the Department annually on the DMR. During years when a permit is not renewed, a certification stating that no new non-domestic wastewater dischargers have been added to the collection system since the last reclaimed water or effluent analysis was conducted may be submitted in lieu of the report. The annual reclaimed water or effluent analysis report or the certification shall be completed

and submitted in a timely manner so as to be received by the Department at the address identified on the DMR by June 28 of each year. Approved analytical methods identified in Rule 62-620.100(3)(j), F.A.C., shall be used for the analysis. If no method is included for a parameter, methods specified in Chapter 62-550, F.A.C., shall be used. *[62-600.660(2) and (3)(d)][62-600.680(2)][62-610.300(4)]*

9. The permittee shall submit an Annual Reuse Report using DEP Form 62-610.300(4)(a)2. on or before January 1 of each year. *[62-610.870(3)]*

10. Unless specified otherwise in this permit, all reports and other information required by this permit, including 24-hour notifications, shall be submitted to or reported to, as appropriate, the FDEP Northeast District Office at the address specified below:

    Florida Department of Environmental Protection Northeast District Office
    8800 Baymeadows Way West, Suite 100
    Jacksonville, Florida 32256
    Phone (904) 256-1700; FAX (904) 256-1590
    (All FAX copies and e-mails shall be followed by original copies.)*[62-620.305]*

11. All reports and other information shall be signed in accordance with the requirements of Rule 62-620.305, F.A.C. *[62-620.305]*

12. The quarterly flow average is computed using a rolling three (3) month period [3-month average daily flow – TMADF]. The calculation shall be the average of the most recent 3-month period inclusive of the DMR reporting month and the two prior months.

II. BIOSOLIDS MANAGEMENT REQUIREMENTS

A. Basis Requirement

1. Biosolids generated by this facility may be transferred to Buckman BTF or disposed of in a Class I solid waste landfill. Transferring biosolids to an alternative biosolids treatment facility does not require a permit modification. However, use of an alternative biosolids treatment facility requires submittal of a copy of the agreement pursuant to Rule 62-640.880(1)(c), F.A.C., along with a written notification to the Department at least 30 days before transport of the biosolids. *[62-620.320(6), 62-640.880(1)]*

2. The permittee shall monitor and keep records of the quantities of biosolids generated, received from source facilities, treated, distributed and marketed, land applied, used as a biofuel or for bioenergy, transferred to another facility, or landfilled. These records shall be kept for a minimum of five years. *[62-640.650(4)(a)]*

3. Biosolids quantities shall be monitored by the permittee as specified below. Results shall be reported on the permittee's Discharge Monitoring Report in accordance with Condition I.E.7.

			Biosolids Limitations		Monitoring Requirements		
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**
Biosolids Quantity (Transferred)	ton (d)	Max	Report	Monthly Total	Monthly	Calculated	RMP-1

			Biosolids Limitations		Monitoring Requirements		
Parameter	**Units**	**Max/ Min**	**Limit**	**Statistical Basis**	**Frequency of Analysis**	**Sample Type**	**Monitoring Site**
Biosolids Quantity (Landfilled)	ton (d)	Max	Report	Monthly Total	Monthly	Calculated	RMP-2

[62-640.650(5)(a)1]

4. Biosolids quantities shall be calculated as listed in Permit Condition II.3 and as described below:

Monitoring Site	Description of Monitoring Site Calculations
RMP-1	Biosolids Quantity Transferred, monitored at Digester.
RMP-2	Biosolids Quantity disposal on a Class I landfill, monitored at Digester.

5. The treatment, management, transportation, use, land application, or disposal of biosolids shall not cause a violation of the odor prohibition in subsection 62-296.320(2), F.A.C. *[62-640.400(6)]*

6. Storage of biosolids or other solids at this facility shall be in accordance with the Facility Biosolids Storage Plan. *[62-640.300(4)]*

7. Biosolids shall not be spilled from or tracked off the treatment facility site by the hauling vehicle. *[62-640.400(9)]*

B. Disposal

8. Disposal of biosolids, septage, and "other solids" in a solid waste disposal facility, or disposal by placement on land for purposes other than soil conditioning or fertilization, such as at a monofill, surface impoundment, waste pile, or dedicated site, shall be in accordance with Chapter 62-701, F.A.C. *[62-640.100(6)(b) & (c)]*

C. Transfer

9. The permittee shall not be held responsible for treatment and management violations that occur after its biosolids have been accepted by a permitted biosolids treatment facility with which the source facility has an agreement in accordance with subsection 62-640.880(1)(c), F.A.C., for further treatment, management, or disposal. *[62-640.880(1)(b)]*

10. The permittee shall keep hauling records to track the transport of biosolids between the facilities. The hauling records shall contain the following information:

Source Facility
1. Date and time shipped
2. Amount of biosolids shipped
3. Degree of treatment (if applicable)

Biosolids Treatment Facility or Treatment Facility
1. Date and time received
2. Amount of biosolids received
3. Name and ID number of source facility

Source Facility

4. Name and ID Number of treatment facility
5. Signature of responsible party at source facility
6. Signature of hauler and name of hauling firm

Biosolids Treatment Facility or Treatment Facility

4. Signature of hauler
5. Signature of responsible party at treatment facility

A copy of the source facility hauling records for each shipment shall be provided upon delivery of the biosolids to the biosolids treatment facility or treatment facility. The treatment facility permittee shall report to the Department within 24 hours of discovery any discrepancy in the quantity of biosolids leaving the source facility and arriving at the biosolids treatment facility or treatment facility.

[62-640.880(4)]

D. Receipt

11. If the permittee intends to accept biosolids from other facilities, a permit revision is required pursuant to paragraph 62-640.880(2)(d), F.A.C. *[62-640.880(2)(d)]*

III. GROUND WATER REQUIREMENTS

1. The permittee shall give at least 72-hours' notice to the FDEP Northeast District Office, prior to the installation of any monitoring wells. *[62-520.600(6)(h)]*

2. Before construction of new ground water monitoring wells, a soil boring shall be made at each new monitoring well location to properly determine monitoring well specifications such as well depth, screen interval, screen slot, and filter pack. *[62-520.600(6)(g)]*

3. Within 30 days after installation of a monitoring well, the permittee shall submit to the Department's Northeast District Office well completion reports and soil boring/lithologic logs on the attached DEP Form(s) 62-520.900(3), Monitoring Well Completion Report. *[62-520.600(6)(j) and .900(3)]*

4. All piezometers and monitoring wells not part of the approved ground water monitoring plan shall be plugged and abandoned in accordance with Rule 62-532.500(5), F.A.C., unless future use is intended. *[62-532.500(5)]*

5. For the Part III public-access Land Application System(s) R-002, groundwater monitoring is not required at this time. The exemption from ground water monitoring will remain subject to revocation if subsequent monitoring reveals that permit limits are not met, or if the Permittee fails to conduct monitoring as required to assess compliance. *[62-600 and 62-520.600]*

6. For the Part IV Land Application System(s) R-001, groundwater monitoring is required, in accordance with Part III of this permit. *[62-600 and 62-520.600]*

7. For the Part III public-access Land Application System(s) R-002, and the Part IV Land Application System(s) R-001, all ground water quality criteria specified in Chapter 62-

520, F.A.C., shall be met at the edge of the zone of discharge. The zone of discharge for Land Application Site(s) R-001 and R-002 shall extend horizontally 100 feet from the application site, or to the property boundaries, whichever is less, and vertically to the base of the surficial aquifer. *[62-520.200(27)] [62-520.465]*

8. The ground water minimum criteria specified in Rule 62-520.400 F.A.C., shall be met within the zone of discharge. *[62-520.400 and 62-520.420(4)]*

9. If the concentration for any constituent listed in Permit Condition III.12. in the natural background quality of the ground water is greater than the stated maximum, or in the case of pH is also less than the minimum, the representative background quality shall be the prevailing standard. *[62-520.420(2)]*

10. During the period of operation authorized by this permit, the permittee shall continue to sample ground water at the monitoring wells identified in Permit Condition III.11., below in accordance with this permit and the approved ground water monitoring plan prepared in accordance with Rule 62-520.600, F.A.C. *[62-520.600] [62-610.510]*

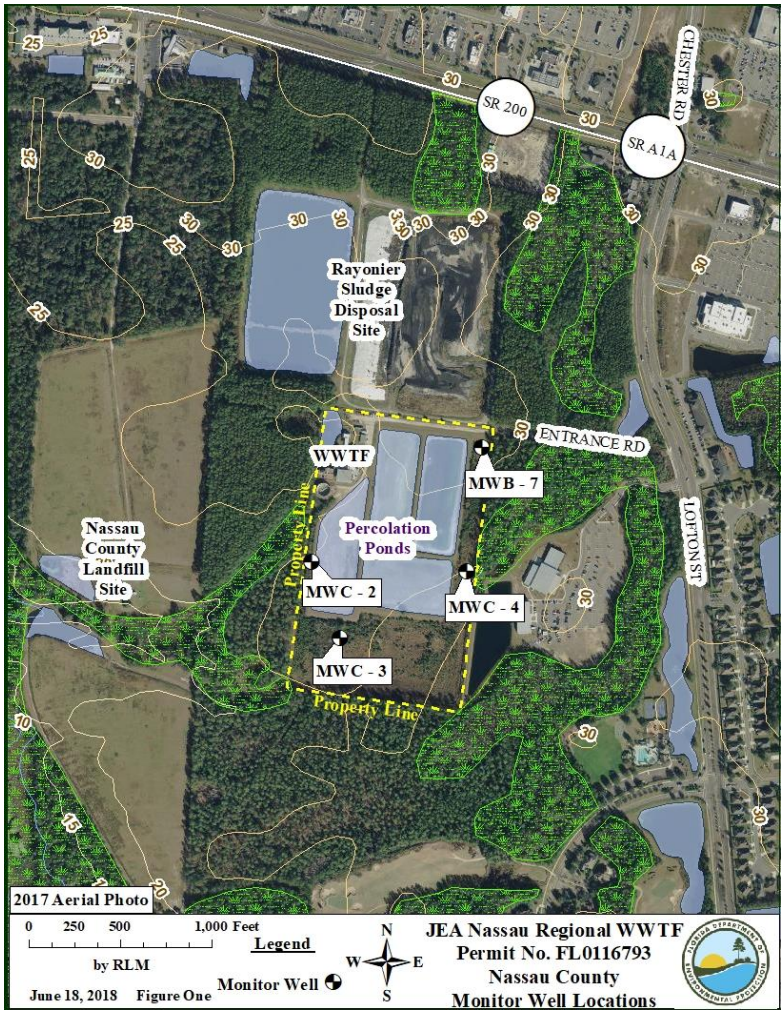
11. The following monitoring wells shall be sampled at Land Application Site R-001.

Monitoring Well ID	Alternate Well Name and/or Description of Monitoring Location	Latitude			Longitude			Depth (Feet)	Aquifer Monitored	New or Existing
		°	'	"	°	'	"			
MWB-7	Northeast corner of Percolation Pond System.	30	37	18	81	33	3	10	Surficial	Existing
MWC-2	Off west side of Percolation Pond No.3, along west property line.	30	37	12	81	33	14	11	Surficial	Existing
MWC-3*	South of Percolation Pond No.3.	30	37	9	81	33	11	11	Surficial	Existing
MWC-4	Off NE corner of Percolation Pond No. 4, along east property line.	30	37	12	81	33	4	10	Surficial	Existing

MWC = Compliance; MWB = Background

* See permit condition III.13 for additional monitoring requirements on this well.

[62-520.600] [62-610.510]



12. The following parameters shall be analyzed for each monitoring well identified in Permit Condition III.11.:

Parameter	Compliance Well Limit	Units	Sample Type	Monitoring Frequency
Water Level Relative to NGVD	Report	ft	In Situ	Quarterly
Nitrite plus Nitrate, Total 1 det. (as N)	10	mg/L	Grab	Quarterly
Solids, Total Dissolved (TDS)	650	mg/L	Grab	Quarterly
Chloride (as Cl)	250	mg/L	Grab	Quarterly
Coliform, Fecal	4	#/100mL	Grab	Quarterly
pH	5.5-8.5	s.u.	In Situ	Quarterly
Sulfate, Total	250	mg/L	Grab	Quarterly

[62-520.600(11)(b)] [62-600.670] [62-600.650(3)] [62-520.310(5)]

13. Within 240 days preceding permit expiration, the permittee shall sample MWC-3 for the primary and secondary drinking water parameters included in Rules 62-550.310 and 62-550.320, F.A.C., Tables 1 (excluding asbestos), Table 4, and Table 6, and Di(2-ethylhexyl) adipate and Di(2-ethylhexyl) phthalate in Table 5, plus turbidity. All

analytical results from this expanded sampling shall be submitted as an attachment to the permit renewal application. *[62-520.600(5)(b)]*

14. Water levels shall be recorded before evacuating each well for sample collection. Elevation references shall include the top of the well casing and land surface at each well site (NAVD allowable) at a precision of plus or minus 0.01 foot. *[62-520.600(11)(c)] [62-610.510(3)(b)]*

15. Ground water monitoring wells shall be purged prior to sampling to obtain representative samples. *62-160.210] [62-600.670(3)]*

16. Analyses shall be conducted on unfiltered samples, unless filtered samples have been approved by the Department's Northeast District Office as being more representative of ground water conditions. *[62-520.310(5)]*

17. Ground water monitoring test results shall be submitted on Part D of Form 62-620.910(10) in accordance with Permit Condition I.E.7. *[62-520.600(11)(b)] [62-600.670] [62-600.680(1)] [62-620.610(18)]*

18. If any monitoring well becomes inoperable or damaged to the extent that sampling or well integrity may be affected, the permittee shall notify the Department's Northeast District Office within two business days from discovery, and a detailed written report shall follow within ten days after notification to the Department. The written report shall detail what problem has occurred and remedial measures that have been taken to prevent recurrence or request approval for replacement of the monitoring well. All monitoring well design and replacement shall be approved by the Department's Northeast District Office before installation. *[62-520.600(6)(l)]*

IV. ADDITIONAL REUSE AND LAND APPLICATION REQUIREMENTS

A. Part III Public Access System(s)

1. This reuse system includes the following major user(s) of reclaimed water (i.e., using 0.1 MGD or more) and general service area(s):

User Name	User Type	Acreage	Capacity (MGD)
Amelia National Golf Course	Golf Course	212	0.425
North Hampton Golf Course	Golf Course	-	0.325
	Total	-	0.750

[62-610.800(5)][62-620.630(10)(b)]

2. Cross-connections to the potable water system are prohibited. *[62-610.469(7)]*

3. A cross-connection control program shall be implemented and/or remain in effect within the areas where reclaimed water will be provided for use and shall be in compliance with the Rule 62-555.360, F.A.C. *[62-610.469(7)]*

4. The permittee shall conduct inspections within the reclaimed water service area to verify proper connections, to minimize illegal cross-connections, and to verify both the proper use of reclaimed water and that the proper backflow prevention assemblies or devices have been installed and tested. Inspections are required when a customer first connects to the reuse distribution system. Subsequent inspections are required as specified in the cross-connection control and inspection program. *[62-610.469(7)(h)]*

5. If an actual or potential (e.g. no dual check device on residential connections served by a reuse system) cross-connection between the potable and reclaimed water systems is discovered, the permittee shall:

   a. Immediately discontinue potable water and/or reclaimed water service to the affected area if an actual cross-connection is discovered.

   b. If the potable water system is contaminated, clear the potable water lines.

   c. Eliminate the cross-connection and install a backflow prevention device as required by the Rule 62-555.360.F.A.C.

   d. Test the affected area for other possible cross-connections.

   e. Within 24 hours, notify the Department's Northeast District Office's domestic wastewater and drinking water programs.

   f. Within 5 days of discovery of an actual or potential cross-connection, submit a written report to the Department's Northeast District Office detailing: a description of the cross-connection, how the cross-connection was discovered, the exact date and time of discovery, approximate time that the cross-connection existed, the location, the cause, steps taken to eliminate the cross-connection, whether reclaimed water was consumed, and reports of possible illness, whether the drinking water system was contaminated and the steps taken to clear the drinking water system, when the cross-connection was eliminated, plan of action for testing for other possible cross-connections in the area, and an evaluation of the cross-connection control and inspection program to ensure that future cross-connections do not occur.

   [62-555.350(3) and 62-555.360][62-620.610(20)]

6. Maximum obtainable separation of reclaimed water lines and potable water lines shall be provided and the minimum separation distances specified in Rule 62-610.469(7), F.A.C., shall be provided. Reuse facilities shall be color coded or marked. Underground piping which is not manufactured of metal or concrete shall be color coded using Pantone Purple 522C using light stable colorants. Underground metal and concrete pipe shall be color coded or marked using purple as the predominant color. *[62-610.469(7)]*

7. In constructing reclaimed water distribution piping, the permittee shall maintain a 75-foot setback distance from a reclaimed water transmission facility to public water supply wells. No setback distances are required to other potable water supply wells or to any non-potable water supply wells. *[62-610.471(3)]*

8. A setback distance of 75 feet shall be maintained between the edge of the wetted area and potable water supply wells, unless the utility adopts and enforces an ordinance prohibiting potable water supply wells within the reuse service area. No setback distances are required to any non-potable water supply well, to any surface water, to any

developed areas, or to any private swimming pools, hot tubs, spas, saunas, picnic tables, barbecue pits, or barbecue grills. *[62-610.471(1), (2), (5), and (7)]*

9. Reclaimed water shall not be used to fill swimming pools, hot tubs, or wading pools. *[62-610.469(4)]*

10. Low trajectory nozzles, or other means to minimize aerosol formation shall be used within 100 feet from outdoor public eating, drinking, or bathing facilities. *[62-610.471(6)]*

11. A setback distance of 100 feet shall be maintained from indoor aesthetic features using reclaimed water to adjacent indoor public eating and drinking facilities. *[62-610.471(8)]*

12. The public shall be notified of the use of reclaimed water. This shall be accomplished by posting of advisory signs in areas where reuse is practiced, notes on scorecards, or other methods. *[62-610.468(2)]*

13. All new advisory signs and labels on vaults, service boxes, or compartments that house hose bibbs along with all labels on hose bibbs, valves, and outlets shall bear the words "do not drink" and "no beber" along with the equivalent standard international symbol. In addition to the words "do not drink" and "no beber," advisory signs posted at storage ponds and decorative water features shall also bear the words "do not swim" and "no nadar" along with the equivalent standard international symbols. Existing advisory signs and labels shall be retrofitted, modified, or replaced in order to comply with the revised wording requirements. For existing advisory signs and labels this retrofit, modification, or replacement shall occur within 365 days after the date of this permit. For labels on existing vaults, service boxes, or compartments housing hose bibbs this retrofit, modification, or replacement shall occur within 730 days after the date of this permit. *[62-610.468, 62-610.469]*

14. The permittee shall ensure that users of reclaimed water are informed about the origin, nature, and characteristics of reclaimed water; the manner in which reclaimed water can be safely used; and limitations on the use of reclaimed water. Notification is required at the time of initial connection to the reclaimed water distribution system and annually after the reuse system is placed into operation. A description of on-going public notification activities shall be included in the Annual Reuse Report. *[62-610.468(6)]*

15. Routine aquatic weed control and regular maintenance of storage pond embankments and access areas are required. *[62-610.414(8)]*

16. Overflows from emergency discharge facilities on storage ponds shall be reported as abnormal events in accordance with Permit Condition IX.20. *[62-610.800(9)]*

B. Part IV Rapid Infiltration Basins

1. Advisory signs shall be posted around the site boundaries to designate the nature of the project area. *[62-610.518]*

2. The maximum annual average loading rate to the R-001 consists of four percolation ponds with a total bottom area of 526,790 ft2. shall be limited to 1.37 inches per day (as applied to the entire bottom area). *[62-610.523(3)]*

3. The R-001 consists of four percolation ponds with a total bottom area of 526,790 ft2. normally shall be loaded for 7 days and shall be rested for 7 days. Infiltration ponds, basins, or trenches shall be allowed to dry during the resting portion of the cycle.*[62-610.523(4)]*

4. Rapid infiltration basins shall be routinely maintained to control vegetation growth and to maintain percolation capability by scarification or removal of deposited solids. Basin bottoms shall be maintained to be level. *[62-610.523(6) and (7)]*

5. Routine aquatic weed control and regular maintenance of storage pond embankments and access areas are required. *[62-610.514 and 62-610.414]*

6. Overflows from emergency discharge facilities on storage ponds or on infiltration ponds, basins, or trenches shall be reported as abnormal events in accordance with Permit Condition IX.20. *[62-610.800(9)]*

V. OPERATION AND MAINTENANCE REQUIREMENTS

A. Staffing Requirements

11. During the period of operation authorized by this permit, the wastewater facilities shall be operated under the supervision of a(n) operator(s) certified in accordance with Chapter 62-602, FAC. The facility staffing requirements shall be changed with the increase in permitted capacity and reuse of reclaimed water as following:

    a. In accordance with Chapter 62-699 and Rule 62-610.462, FAC, the WWTF is a Category I, Class B facility and provides provisions for increased facility reliability (provides electronic control system, automatic control system), the minimum staffing requirement at the wastewater treatment facility shall be a Class C or higher operator **8 hours/day for 7 days per week**. The lead operator must be a Class B operator or higher. *[62-620.630(3] [62-699.310] [62-610.462(3)]*

    b. In accordance with Chapter 62-699, F.A.C., the WWTF is a Category I, Class B facility. In accordance with Rule 62-610.462(2), FAC, if provisions for increased facility reliability are not provided (i.e. The electronic control system, automatic control system, or the electronic surveillance system does not work properly), the staffing requirement at the wastewater treatment facility shall be a Class C or higher operator **24 hours/day for 7 days per week.** The lead operator must be a Class B operator or higher. *[62-620.630(3] [62-699.310] [62- 610.462(2)]*

    [62-620.630(3)] [62-699.310] [62-610.462]

12. The lead/chief operator shall be employed at the plant full time. "Full time" shall mean at least 4 days per week, working a minimum of 35 hours per week, including leave time. A licensed operator shall be on-site and in charge of each required shift for periods of required staffing time when the lead/chief operator is not on-site. An operator meeting the lead/chief operator class for the treatment plant shall be available during all periods of plant operation. "Available" means able to be contacted as needed to initiate the appropriate action in a timely manner. *[62-699.311(10), (6) and (1)]*

B. Capacity Analysis Report and Operation and Maintenance Performance Report Requirements

1. The application to renew this permit shall include an updated capacity analysis report prepared in accordance with Rule 62-600.405, F.A.C. *[62-600.405(5)]*

2. The application to renew this permit shall include a detailed operation and maintenance performance report prepared in accordance with Rule 62-600.735, F.A.C. *[62-600.735(1)]*

C. Recordkeeping Requirements

1. The permittee shall maintain the following records and make them available for inspection on the site of the permitted facility.

   a. Records of all compliance monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, including, if applicable, a copy of the laboratory certification showing the certification number of the laboratory, for at least three years from the date the sample or measurement was taken;

   b. Copies of all reports required by the permit for at least three years from the date the report was prepared;

   c. Records of all data, including reports and documents, used to complete the application for the permit for at least three years from the date the application was filed;

   d. Monitoring information, including a copy of the laboratory certification showing the laboratory certification number, related to the residuals use and disposal activities for the time period set forth in Chapter 62-640, F.A.C., for at least three years from the date of sampling or measurement;

   e. A copy of the current permit;

   f. A copy of the current operation and maintenance manual as required by Chapter 62-600, F.A.C.;

   g. A copy of any required record drawings;

   h. Copies of the licenses of the current certified operators;

   i. Copies of the logs and schedules showing plant operations and equipment maintenance for three years from the date of the logs or schedules. The logs shall, at a minimum, include identification of the plant; the signature and license number of the operator(s) and the signature of the person(s) making any entries; date and time in and out; specific operation and maintenance activities, including any preventive maintenance or repairs made or requested; results of tests performed and samples taken, unless documented on a laboratory sheet; and notation of any notification or reporting completed in accordance with Rule 62-602.650(3), F.A.C. The logs shall be maintained on-site in a location accessible to 24-hour inspection, protected from weather damage, and current to the last operation and maintenance performed; and

   j. Records of biosolids quantities, treatment, monitoring, and hauling for at least five years.

[62-620.350, 62-602.650, 62-640.650(4)]

VI. SCHEDULES

11. The following improvement actions shall be completed according to the following schedule:

Improvement Action	Completion Date
a. The repairs to the damaged berm of Percolation Pond #1 shall be completed, and notification of completion must be submitted to DEP.	December 31, 2021
b. Notify DEP of any leaks from the damaged berm of Percolation Pond #1.	Within 7 days of observance.
c. Installation of an odor control system	Begin construction of a new odor control system at the facility within six months from tripping complaint threshold (*)

Note (*): *If the facility receives more than 2 odor complaints in 30 days or 6 odor complaints in in 180 days, JEA shall begin construction of a new odor control system at the facility within six months from tripping complaint threshold.*

[62-620.320(6)]

1. Prior to placing any new treatment/processing unit into operation, for any purpose other than testing for leaks and equipment operation, the Permittee shall complete and submit to the Department DEP Form 62-620.910(12), Notification of Completion of Construction for Domestic Wastewater Facilities. *[62-620.630(2)]*

2. The permittee is not authorized to discharge to waters of the state after the expiration date of this permit, unless:

   a. The permittee has applied for renewal of this permit at least 180 days before the expiration date of this permit using the appropriate forms listed in Rule 62-620.910, F.A.C., and in the manner established in the Department of Environmental Protection Guide to Permitting Wastewater Facilities or Activities Under Chapter 62-620, F.A.C., including submittal of the appropriate processing fee set forth in Rule 62-4.050, F.A.C.; or

   b. The permittee has made complete the application for renewal of this permit before the permit expiration date.

      Please note, effluent testing shall be conducted for each outfall in accordance with the instructions provided in Sections 3.A.12., 13., and 14. of the application form. A minimum of three samples shall be taken within four and one-half years prior to the date of the permit application and must be representative of the seasonal variation in the discharge from each outfall. *[62-620.335(1) - (4)]*

VII. INDUSTRIAL PRETREATMENT PROGRAM REQUIREMENTS

1. This facility is not required to have a pretreatment program at this time. *[62-625.500]*

VIII. REOPENER CLAUSE

1. The permit shall be revised, or alternatively, revoked and reissued in accordance with the provisions contained in Rules 62-620.325 and 62-620.345 F.A.C., if applicable, or to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2) and 307(a)(2) of the Clean Water Act (the Act), as amended, if the effluent standards, limitations, or water quality standards so issued or approved:

   a. Contains different conditions or is otherwise more stringent than any condition in the permit/or;

   b. Controls any pollutant not addressed in the permit.

   The permit as revised or reissued under this paragraph shall contain any other requirements then applicable.

2. The permit may be reopened to adjust effluent limitations or monitoring requirements should future Water Quality Based Effluent Limitation determinations, water quality studies, DEP approved changes in water quality standards, or other information show a need for a different limitation or monitoring requirement.

IX. OTHER SPECIFIC CONDITIONS

1. In the event that the treatment facilities or equipment no longer function as intended, are no longer safe in terms of public health and safety, or odor, noise, aerosol drift, or lighting adversely affects neighboring developed areas at the levels prohibited by Rule 62-600.400(2)(a), F.A.C., corrective action (which may include additional maintenance or modifications of the permitted facilities) shall be taken by the permittee. Other corrective action may be required to ensure compliance with rules of the Department. Additionally, the treatment, management, use or land application of residuals shall not cause a violation of the odor prohibition in Rule 62-296.320(2), F.A.C. *[62-600.410(8) and 62-640.400(6)]*

2. The deliberate introduction of stormwater in any amount into collection/transmission systems designed solely for the introduction (and conveyance) of domestic/industrial wastewater; or the deliberate introduction of stormwater into collection/transmission systems designed for the introduction or conveyance of combinations of storm and domestic/industrial wastewater in amounts which may reduce the efficiency of pollutant removal by the treatment plant is prohibited, except as provided by Rule 62-610.472, F.A.C. *[62-604.130(3)]*

3. Collection/transmission system overflows shall be reported to the Department in accordance with Permit Condition X. 20. *[62-604.550] [62-620.610(20)]*

4. The operating authority of a collection/transmission system and the permittee of a treatment plant are prohibited from accepting connections of wastewater discharges which have not received necessary pretreatment or which contain materials or pollutants (other than normal domestic wastewater constituents):

   a. Which may cause fire or explosion hazards; or

b. Which may cause excessive corrosion or other deterioration of wastewater facilities due to chemical action or pH levels; or

c. Which are solid or viscous and obstruct flow or otherwise interfere with wastewater facility operations or treatment; or

d. Which result in the wastewater temperature at the introduction of the treatment plant exceeding 40^{o}C or otherwise inhibiting treatment; or

e. Which result in the presence of toxic gases, vapors, or fumes that may cause worker health and safety problems.

[62-604.130(5)]

5. The treatment facility, storage ponds for Part II systems, rapid infiltration basins, and/or infiltration trenches shall be enclosed with a fence or otherwise provided with features to discourage the entry of animals and unauthorized persons. *[62-610.418(1); 62-610.518(1); and 62-600.400(2)(b)]*

6. Screenings and grit removed from the wastewater facilities shall be collected in suitable containers and hauled to a Department approved Class I landfill or to a landfill approved by the Department for receipt/disposal of screenings and grit. *[62-701.300(1)(a)]*

7. Where required by Chapter 471 or Chapter 492, F.S., applicable portions of reports that must be submitted under this permit shall be signed and sealed by a professional engineer or a professional geologist, as appropriate. *[62-620.310(4)]*

8. The permittee shall provide verbal notice to the Department's Northeast District Office as soon as practical after discovery of a sinkhole or other karst feature within an area for the management or application of wastewater, wastewater residuals (sludges), or reclaimed water. The permittee shall immediately implement measures appropriate to control the entry of contaminants, and shall detail these measures to the Department's Northeast District Office in a written report within 7 days of the sinkhole discovery. *[62-620.320(6)]*

9. The permittee shall provide adequate notice to the Department of the following:

   a. Any new introduction of pollutants into the facility from an industrial discharger which would be subject to Chapter 403, F.S., and the requirements of Chapter 62-620, F.A.C., if it were directly discharging those pollutants; and

   b. Any substantial change in the volume or character of pollutants being introduced into that facility by a source which was identified in the permit application and known to be discharging at the time the permit was issued.

      Adequate notice shall include information on the quality and quantity of effluent introduced into the facility and any anticipated impact of the change on the quantity or quality of effluent or reclaimed water to be discharged from the facility.

   [62-620.625(2)]

10. The permit shall be revised, or alternatively, revoked and reissued in accordance with the provisions contained in Rules 62-620.325 and 62-620.345 F.A.C., if applicable, or to comply with any applicable effluent standard or limitation issued or approved under

Sections 301(b)(2)(C) and (D), 304(b)(2) and 307(a)(2) of the Clean Water Act (the Act), as amended, if the effluent standards, limitations, or water quality standards so issued or approved:

Contains different conditions or is otherwise more stringent than any condition in the permit/or;

Controls any pollutant not addressed in the permit.

The permit as revised or reissued under this paragraph shall contain any other requirements then applicable.

11. The permit may be reopened to adjust effluent limitations or monitoring requirements should future Water Quality Based Effluent Limitation determinations, water quality studies, DEP approved changes in water quality standards, or other information show a need for a different limitation or monitoring requirement

X. GENERAL CONDITIONS

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are binding and enforceable pursuant to Chapter 403, Florida Statutes. Any permit noncompliance constitutes a violation of Chapter 403, Florida Statutes, and is grounds for enforcement action, permit termination, permit revocation and reissuance, or permit revision. *[62-620.610(1)]*

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviations from the approved drawings, exhibits, specifications, or conditions of this permit constitute grounds for revocation and enforcement action by the Department. *[62-620.610(2)]*

3. As provided in subsection 403.087(7), F.S., the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor authorize any infringement of federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit or authorization that may be required for other aspects of the total project which are not addressed in this permit. *[62-620.610(3)]*

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title. *[62-620.610(4)]*

5. This permit does not relieve the permittee from liability and penalties for harm or injury to human health or welfare, animal or plant life, or property caused by the construction or operation of this permitted source; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department. The permittee shall take all reasonable steps to minimize or prevent any discharge, reuse of reclaimed water, or residuals use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. It shall not be a defense for a permittee in an

enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. *[62-620.610(5)]*

6. If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee shall apply for and obtain a new permit. *[62-620.610(6)]*

7. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control, and related appurtenances, that are installed and used by the permittee to achieve compliance with the conditions of this permit. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to maintain or achieve compliance with the conditions of the permit. *[62-620.610(7)]*

8. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit revision, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition. *[62-620.610(8)]*

9. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, including an authorized representative of the Department and authorized EPA personnel, when applicable, upon presentation of credentials or other documents as may be required by law, and at reasonable times, depending upon the nature of the concern being investigated, to:

   a. Enter upon the permittee's premises where a regulated facility, system, or activity is located or conducted, or where records shall be kept under the conditions of this permit;

   b. Have access to and copy any records that shall be kept under the conditions of this permit;

   c. Inspect the facilities, equipment, practices, or operations regulated or required under this permit; and

   d. Sample or monitor any substances or parameters at any location necessary to assure compliance with this permit or Department rules.

   [62-620.610(9)]

10. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data, and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except as such use is proscribed by Section 403.111, F.S., or Rule 62-620.302, F.A.C. Such evidence shall only be used to the extent that it is consistent with the Florida Rules of Civil Procedure and applicable evidentiary rules. *[62-620.610(10)]*

11. When requested by the Department, the permittee shall within a reasonable time provide any information required by law which is needed to determine whether there is cause for revising, revoking and reissuing, or terminating this permit, or to determine compliance with the permit. The permittee shall also provide to the Department upon request copies

of records required by this permit to be kept. If the permittee becomes aware of relevant facts that were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be promptly submitted or corrections promptly reported to the Department. *[62-620.610(11)]*

12. Unless specifically stated otherwise in Department rules, the permittee, in accepting this permit, agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules. A reasonable time for compliance with a new or amended surface water quality standard, other than those standards addressed in Rule 62-302.500, F.A.C., shall include a reasonable time to obtain or be denied a mixing zone for the new or amended standard. *[62-620.610(12)]*

13. The permittee, in accepting this permit, agrees to pay the applicable regulatory program and surveillance fee in accordance with Rule 62-4.052, F.A.C. *[62-620.610(13)]*

14. This permit is transferable only upon Department approval in accordance with Rule 62-620.340, F.A.C. The permittee shall be liable for any noncompliance of the permitted activity until the transfer is approved by the Department. *[62-620.610(14)]*

15. The permittee shall give the Department written notice at least 60 days before inactivation or abandonment of a wastewater facility or activity and shall specify what steps will be taken to safeguard public health and safety during and following inactivation or abandonment. *[62-620.610(15)]*

16. The permittee shall apply for a revision to the Department permit in accordance with Rules 62-620.300, F.A.C., and the Department of Environmental Protection Guide to Permitting Wastewater Facilities or Activities Under Chapter 62-620, F.A.C., at least 90 days before construction of any planned substantial modifications to the permitted facility is to commence or with Rule 62-620.325(2), F.A.C., for minor modifications to the permitted facility. A revised permit shall be obtained before construction begins except as provided in Rule 62-620.300, F.A.C. *[62-620.610(16)]*

17. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. The permittee shall be responsible for any and all damages which may result from the changes and may be subject to enforcement action by the Department for penalties or revocation of this permit. The notice shall include the following information:

    a. A description of the anticipated noncompliance;

    b. The period of the anticipated noncompliance, including dates and times; and

    c. Steps being taken to prevent future occurrence of the noncompliance.

    [62-620.610(17)]

18. Sampling and monitoring data shall be collected and analyzed in accordance with Rule 62-4.246 and Chapters 62-160, 62-600, and 62-610, F.A.C., and 40 CFR 136, as appropriate.

a. Monitoring results shall be reported at the intervals specified elsewhere in this permit and shall be reported on a Discharge Monitoring Report (DMR), DEP Form 62-620.910(10), or as specified elsewhere in the permit.

b. If the permittee monitors any contaminant more frequently than required by the permit, using Department approved test procedures, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

c. Calculations for all limitations which require averaging of measurements shall use an arithmetic mean unless otherwise specified in this permit.

d. Except as specifically provided in Rule 62-160.300, F.A.C., any laboratory test required by this permit shall be performed by a laboratory that has been certified by the Department of Health Environmental Laboratory Certification Program (DOH ELCP). Such certification shall be for the matrix, test method and analyte(s) being measured to comply with this permit. For domestic wastewater facilities, testing for parameters listed in Rule 62-160.300(4), F.A.C., shall be conducted under the direction of a certified operator.

e. Field activities including on-site tests and sample collection shall follow the applicable standard operating procedures described in DEP-SOP-001/01 adopted by reference in Chapter 62-160, F.A.C.

f. Alternate field procedures and laboratory methods may be used where they have been approved in accordance with Rules 62-160.220, and 62-160.330, F.A.C.

[62-620.610(18)]

19. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule detailed elsewhere in this permit shall be submitted no later than 14 days following each schedule date. *[62-620.610(19)]*

20. The permittee shall report to the Department any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance including exact dates and time, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. For noncompliance events related to sanitary sewer overflows or bypass events, these reports must include the data described above (with the exception of time of discovery) as well as the type of event (sanitary sewer overflows or bypass events), type of sewer overflow (e.g., manhole), discharge volumes by the treatment works treating domestic sewage, types of human health and environmental impacts of the sewer overflow event, and whether the noncompliance was related to wet weather. The written submission may be provided electronically using the Department's Business Portal at http://www.fldepportal.com/go/ (via "Submit" followed by "Report" or "Registration/Notification"). Notice required under paragraph (d) may be provided together with the written submission using the Business Portal. All noncompliance events related to sanitary sewer overflows or bypass events submitted after December 21, 2020 shall be submitted electronically.

a. The following shall be included as information which must be reported within 24 hours under this condition:
   (1) Any unanticipated bypass which causes any reclaimed water or effluent to exceed any permit limitation or results in an unpermitted discharge,
   (2) Any upset which causes any reclaimed water or the effluent to exceed any limitation in the permit,
   (3) Violation of a maximum daily discharge limitation for any of the pollutants specifically listed in the permit for such notice, and
   (4) Any unauthorized discharge to surface or ground waters.

b. Oral reports as required by this subsection shall be provided as follows:
   (1) For unauthorized releases or spills of treated or untreated wastewater reported pursuant to subparagraph (a)4. that are in excess of 1,000 gallons per incident, or where information indicates that public health or the environment will be endangered, oral reports shall be provided to the STATE WATCH OFFICE TOLL FREE NUMBER (800) 320-0519, as soon as practical, but no later than 24 hours from the time the permittee becomes aware of the discharge. The permittee, to the extent known, shall provide the following information to the State Watch Office:
      (a) Name, address, and telephone number of person reporting;
      (b) Name, address, and telephone number of permittee or responsible person for the discharge;
      (c) Date and time of the discharge and status of discharge (ongoing or ceased);
      (d) Characteristics of the wastewater spilled or released (untreated or treated, industrial or domestic wastewater);
      (e) Estimated amount of the discharge;
      (f) Location or address of the discharge;
      (g) Source and cause of the discharge;
      (h) Whether the discharge was contained on-site, and cleanup actions taken to date;
      (i) Description of area affected by the discharge, including name of water body affected, if any; and
      (j) Other persons or agencies contacted.
   (2) Oral reports, not otherwise required to be provided pursuant to subparagraph b.1 above, shall be provided to the Department's Northeast District Office within 24 hours from the time the permittee becomes aware of the circumstances.

c. If the oral report has been received within 24 hours, the noncompliance has been corrected, and the noncompliance did not endanger health or the environment, the Department's Northeast District Office shall waive the written report.

d. In accordance with Section 403.077, F.S., unauthorized releases or spills reportable to the StateWatch Office pursuant to subparagraph (b)1. above shall also be reported to the Department within 24 hours from the time the permittee becomes aware of the discharge. The permittee shall provide to the Department information reported to the State Watch Office. Notice of unauthorized releases or spills may be provided to the Department through the Department's Public Notice of Pollution web page at https://floridadep.gov/pollutionnotice.

(1) If, after providing notice pursuant to paragraph (d) above, the permittee determines that a reportable unauthorized release or spill did not occur or that an amendment to the notice is warranted, the permittee may submit additional notice to the Department documenting such determination.

(2) 2. If, after providing notice pursuant to paragraph (d) above, the permittee discovers that a reportable unauthorized release or spill has migrated outside the property boundaries of the installation, the permittee must provide an additional notice to the Department that the release has migrated outside the property boundaries within 24 hours after its discovery of the migration outside of the property boundaries.

[62-620.610(20)] [62-620.100(3)] [403.077, F.S.]

21. The permittee shall report all instances of noncompliance not reported under Permit Conditions X.17., X.18., or X.19. of this permit at the time monitoring reports are submitted. This report shall contain the same information required by Permit Condition X.20. of this permit. *[62-620.610(21)]*

22. Bypass Provisions.

    a. "Bypass" means the intentional diversion of waste streams from any portion of a treatment works.

    b. Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless the permittee affirmatively demonstrates that:

        (1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; and

        (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

        (3) The permittee submitted notices as required under Permit Condition X.22.c. of this permit.

    c. If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least 10 days before the date of the bypass. The permittee shall submit notice of an unanticipated bypass within 24 hours of learning about the bypass as required in Permit Condition X.20. of this permit. A notice shall include a description of the bypass and its cause; the period of the bypass, including exact dates and times; if the bypass has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent recurrence of the bypass.

    d. The Department shall approve an anticipated bypass, after considering its adverse effect, if the permittee demonstrates that it will meet the three conditions listed in Permit Condition X.22.b.(1) through (3) of this permit.

    e. A permittee may allow any bypass to occur which does not cause reclaimed water or effluent limitations to be exceeded if it is for essential maintenance to assure

efficient operation. These bypasses are not subject to the provisions of Permit Condition X.22.b. through d. of this permit.

[62-620.610(22)]

23. Upset Provisions.

a. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based effluent limitations because of factors beyond the reasonable control of the permittee.

(1) An upset does not include noncompliance caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, careless or improper operation.

(2) An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of upset provisions of Rule 62-620.610, F.A.C., are met.

b. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the cause(s) of the upset;

(2) The permitted facility was at the time being properly operated;

(3) The permittee submitted notice of the upset as required in Permit Condition X.20. of this permit; and

(4) The permittee complied with any remedial measures required under Permit Condition X.5. of this permit.

c. In any enforcement proceeding, the burden of proof for establishing the occurrence of an upset rests with the permittee.

d. Before an enforcement proceeding is instituted, no representation made during the Department review of a claim that noncompliance was caused by an upset is final agency action subject to judicial review.

[62-620.610(23)]

Executed in Jacksonville, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Thomas G. Kallemeyn
Permitting Program Administrator

PERMIT ISSUANCE DATE: August 24, 2020

Attachment(s):
Discharge Monitoring Report

AMENDMENT TO FACT SHEET
FOR
STATE OF FLORIDA DOMESTIC WASTEWATER FACILITY PERMIT

PERMIT NUMBER:	FL0116793 (Minor)
FILE NUMBER:	FL0116793 – 019 – DW1P/NR
FACILITY NAME:	Nassau Regional WWTF
FACILITY LOCATION:	State Road 200 (A1A) At Chester Road 96237 Amelia Concourse Yulee, Florida 32097 Nassau County
NAME OF PERMITTEE:	JEA
RESPONSIBLE OFFICIAL:	Mr. Wayne Young Interim Chief Environmental Officer JEA 21 West Church Street, T-8 Jacksonville, FL 32202-3139 Telephone (904) 665-7840 Email: younow@jea.com
PERMIT WRITERS:	D. Anh Vo, P.E., FDEP- NED, Permitting Program
PERMIT REVIEWER:	Jeff Martin, P.E., FDEP- NED, Permitting Program

1. Permit Revision

Due to the distance from Nassau Regional WRF to the East Nassau Community Planning Area (ENCPA) development is too great to maintain acceptable delivery pressure and provide for peak demands without an intermediate storage tank, this project (Figure 1) includes construction of a reclaimed water storage tank and pump station which consists of following:

- Construction of one 1.50-million gallon (MG) ground storage tank (GST) which will have a 105ft inner diameter with a straight wall height of 32ft.
- Construction of a booster pump station, which consists of two horizontal split-case booster pumps (one duty / one standby) with a capacity of 700 GPM at a total discharge head (TDH) of 160 feet each, and 50 horsepower (HP) each. Piping and electrical, with a backup power generator, will be designed for the two pumps with provisions for a future third and fourth pump (three duty / one standby). A total discharge head (TDH) of 160 ft will be maintained on the discharge side of the pumps.
- Construction of a sodium hypochlorite system consisting of two 250-gallon chemical storage tanks, along with two skid-mounted chemical metering pumps (one duty / one standby), each metering pump rated for 1.8 gph at 100 psi with provisions for a future third pump (two duty / one standby). The system will provide maintenance dosing of sodium hypochlorite to boost chlorine residuals and control microbial growth within the reclaimed water distribution system.
- Installation of influent piping consisting of a one-way altitude control valve *(This valve will open/close depending on water level in the GST and as a backup measure will close when the booster pumps are in service.)* and effluent piping consisting of an above ground flow meter.

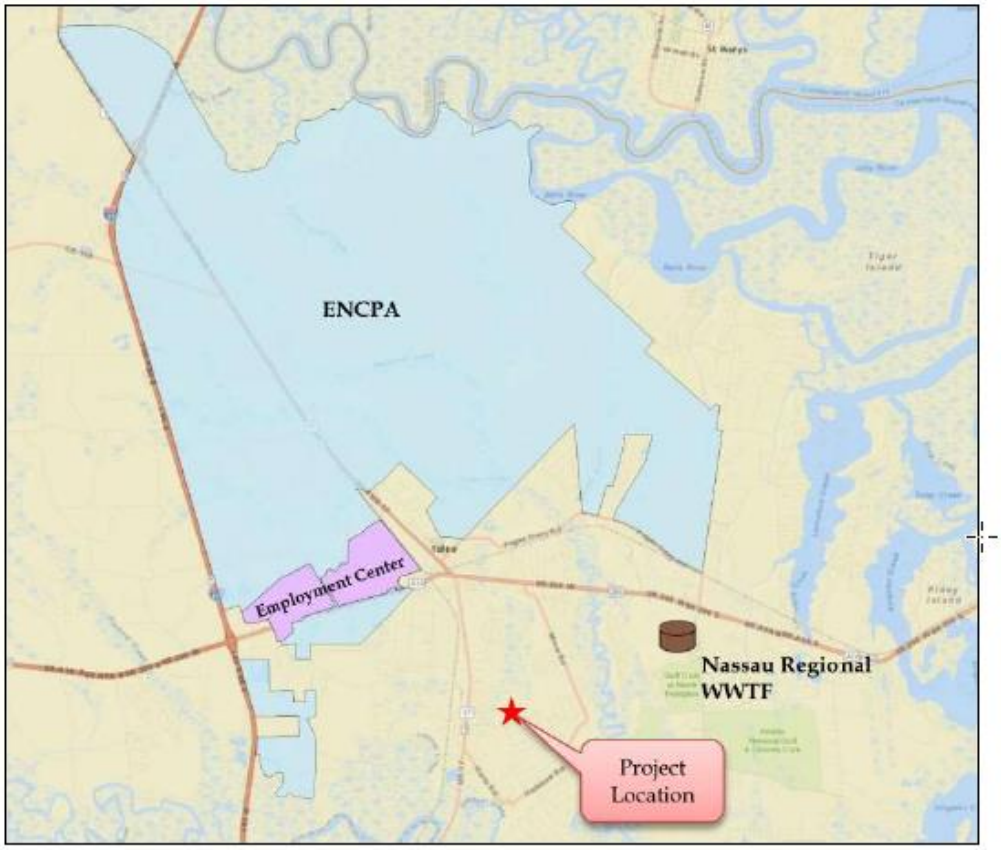
- Installation of a back-up power generator and instrumentation and control logic for the on-site pumps, tanks and off-site reclaimed water system valves.

There are not any changes to the current permitted capacity or the limit requirements in the current permit.

2. Publication and EPA Concurrence

A minor permit revision without any changes to the current permit limitations or permit conditions is not subject to the public comments nor EPA review and comments.

Figure 1. Project Location and ENCPA Development Map



FACT SHEET
FOR
STATE OF FLORIDA DOMESTIC WASTEWATER FACILITY PERMIT

PERMIT NUMBER:	FL0116793 (Minor)
FILE NUMBER:	FL0116793 – 018 – DW1P/NR
FACILITY NAME:	Nassau Regional WWTF
FACILITY LOCATION:	State Road 200 (A1A) At Chester Road 96237 Amelia Concourse Yulee, Florida 32097 Nassau County
NAME OF PERMITTEE:	JEA
RESPONSIBLE OFFICIAL:	Paul K. Steinbrecher, P.E., Director JEA-Permitting & Regulatory Conformance 21 West Church Street, T-8 Jacksonville, Florida 32202 Telephone (904) 665-5653
PERMIT WRITERS:	D. Anh Vo, P.E., FDEP- NED, Permitting Program
PERMIT REVIEWER:	Jeff Martin, P.E., FDEP- NED, Permitting Program

2. SUMMARY OF APPLICATION

a. Chronology of Application

Application Submittal Date:	September 27, 2018
Request for Additional Information:	October 11, 2018
Received Additional Information:	January 10, 2019
Deemed Application Complete:	January 10, 2019
Draft permit to applicant and EPA:	February 18, 2019
No comments received -Intent to Issue:	June 18, 2019

The facility has entered into a CO.

b. Type of Facility

Domestic Wastewater Treatment Plant

Ownership Type: Municipal

SIC Code: 4952

c. Facility Capacity

i) Treatment Capacity:

	Design Capacity	Permitted Capacity
Existing	2.00 MGD AADF	2.00 MGD AADF
Proposed Increase	0.00 MGD AADF	0.00 MGD AADF
Proposed Total	2.00 MGD AADF	2.00 MGD AADF

ii) Disposal Capacity

	Surface Water Discharge Yulee Wetland (62-611, FAC)		Surface Water Discharge Apricot Act (62-610, FAC)	
	Design Capacity	**Permitted Capacity**	**Design Capacity**	**Permitted Capacity**
Existing	0.5 MGD AADF	0.5 MGD AADF	0.315 MGD AADF	0.315 MGD AADF
Proposed Increase	0.0 MGD AADF	0.0 MGD AADF	0.0 MGD AADF	0.0 MGD AADF
Proposed Total	0.5 MGD AADF	0.5 MGD AADF	0.315 MGD AADF	0.315 MGD AADF

iii) Reuse of Effluent:

	Slow-Rate Public Access (Part III Reuse)		Rapid-Rate Infiltration (Part IV Reuse)	
	Design Capacity	**Permitted Capacity**	**Design Capacity**	**Permitted Capacity**
Existing	0.75 MGD AADF	0.75 MGD AADF	0.30 MGD AADF	0.30 MGD AADF
Proposed Increase	0.0 MGD AADF	0.0 MGD AADF	0.0 MGD AADF	0.0 MGD AADF
Proposed Total	0.75 MGD AADF	0.75 MGD AADF	0.30 MGD AADF	0.30 MGD AADF

The overall treatment capacity of the WWTF is limited to 1.55 MGD AADF due to the limited capacity of the disposal and reuse systems.

d. Description of Wastewater Treatment

An existing 2.0 million gallon per day (MGD) annual average daily flow (AADF) design capacity Class I reliability domestic wastewater treatment facility (WWTF) utilizing the membrane bioreactor (MBR) process with ultraviolet (UV) irradiation for high-level disinfection of effluent. The Water Reclamation Facility (WRF) consists of following main treatment units:

- A headworks structure including of two self-contained screening units with each unit containing a 2 mm mechanical center-flow perforated screen. Each screen has a capacity of 2.0 MGD AADF and 6.0 MGD PHF;
- A dual train biological treatment tank (bioreactor) with design capacity of 2.00 MGD AADF and total volume of 427,700 gallons. Each train is sized 72.3’ x 29.2’ x 16.0’ and divided into 38,200-gallons first anoxic, 120,650-gallons aerobic and 55,000-gallons for post anoxic. Air is supplied by 870-SCFM blower.

- Four 69,000-gallon isolatable membrane trains. A flat plate submerged membrane system with design capacity of 2.00 MGD AADF is installed. The system consists of four membrane basins with a total of 22,400 cartridges (8.6 ft^2 each), four 2,300-SCFM membrane scour blowers, four 3,700-GPM mixed liquor recycle pumps, four 1,390-GPM permeate pumps, one lifting device and one sodium hypochlorite/acid cleaning system;
- Two equal ultraviolet (UV) disinfection channels. Twenty-seven (27) modules (8 lamps per module) arranged in three banks are initially installed in one channel for design capacity of 2.0 MGD AADF;
- A sodium aluminates (alum) system consists of a 3,500-gallon alum storage tank and two metering pumps;
- An effluent pumping station with three 3.0-MGD vertical turbine pumps to transfer reclaimed water to reuse system;
- A non-potable water pumping station with two 400-HP pumps for in-plant reuse;
- A plant drain pump station with two 100-GPM pumps;
- A 2,000 KW emergency power generator and fuel system capable of operating all critical process units and providing site safety lighting;
- An electrical service and power distribution system;
- A multipurpose air-conditioned building;
- A 0.40-MG aerobic digester; and
- A flow-equalization tank which has a diameter of 72 feet, a side water depth of 16 feet, a capacity of 0.464 million gallons.

Biosolids are transported to JEA-Buckman Biosolids Treatment Facility (BTF) for further treatment and final disposal or treated to meet Class B biosolids treatment requirements before applied on DEP-approved land application sites.

Permitted capacity of the WWTF is limited to **1.55 MGD AADF** due to the limited reuse and disposal permitted capacity.

Figure 1: Process Diagram

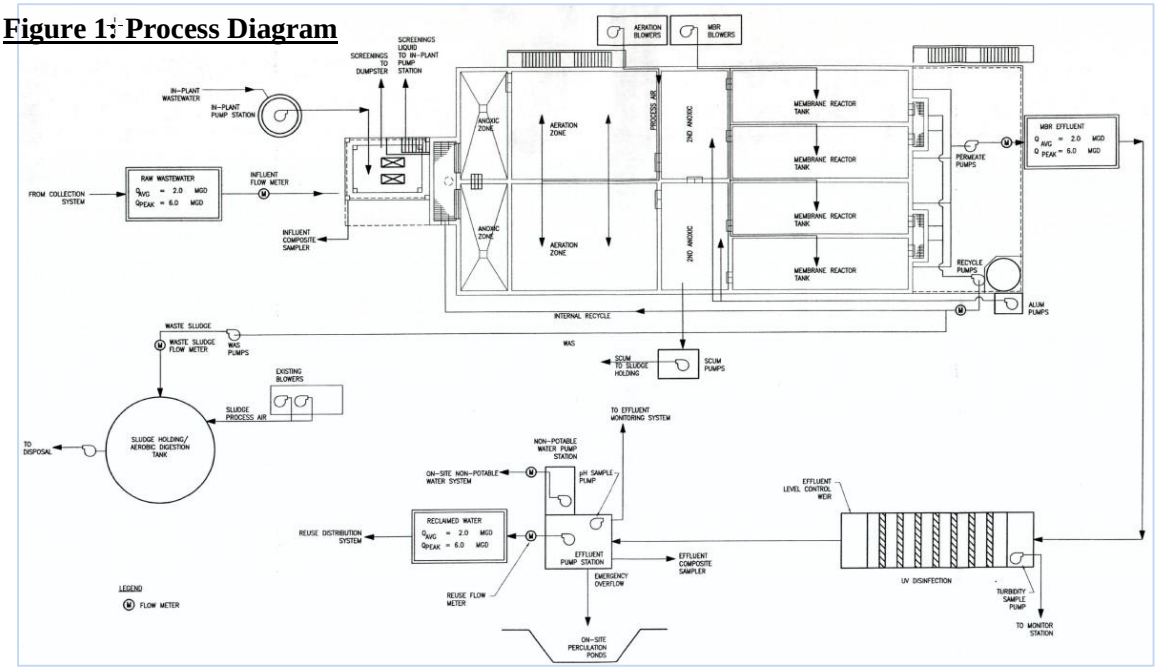
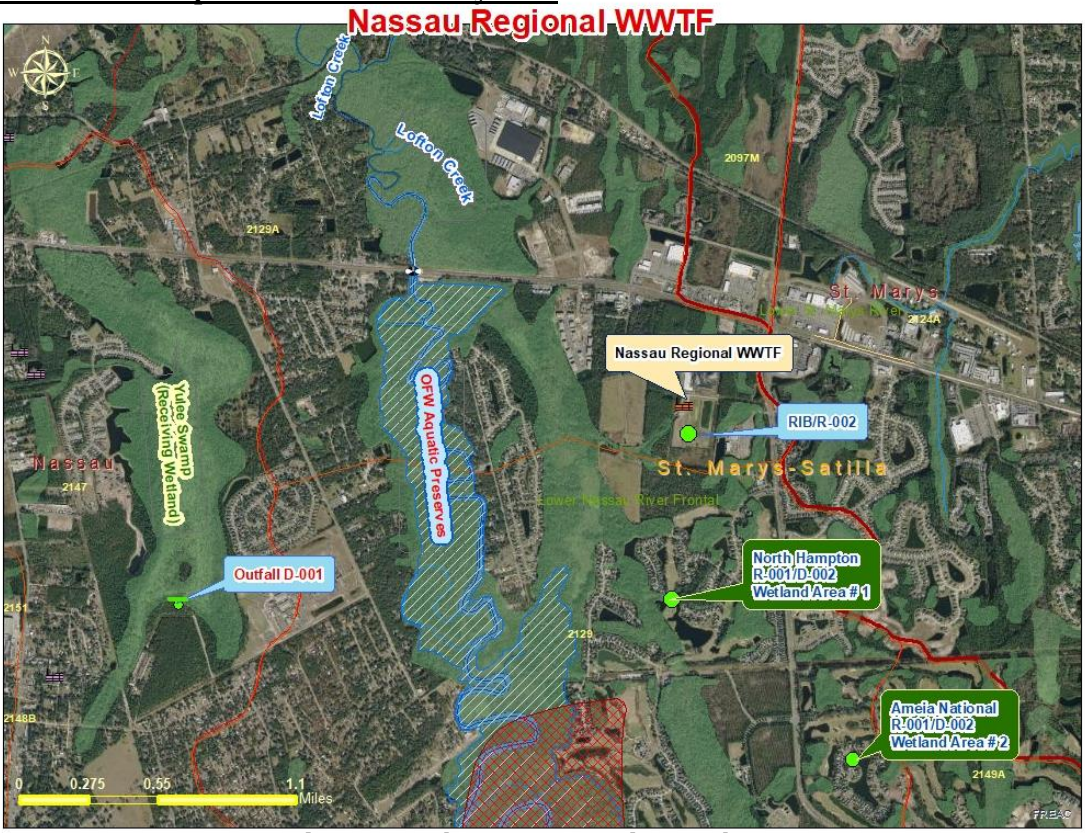


Figure 2: Site Plant – Nassau Regional WWTF

e. Description of Effluent Disposal and Land Application Sites (as reported by applicant)

See the map (figure 3) for effluent disposal and land application site(s).

Figure 3: Effluent Disposal Site and Reuse System:



a) Monitoring Group D-001: Class III Fresh Waters, Grander Creek Basin

Pollutants which are present in significant quantities or which are subject to permit limitations are as follows:

Parameter	Units	Max/ Min	Reported Value	Statistical Basis
pH (min)	su	Min	6.03	Maximum Daily Value
pH (max)	su	Max	8.29	Maximum Daily Value
Flow Rate	MGD	Max	1.598	Maximum Daily Value
			0.906	Average Daily Value
CBOD5	mg/L	Max	6.0	Maximum Daily Value
			1.1	Average Daily Value
TSS	mg/L	Max	66.0	Maximum Daily Value
			1.65	Average Daily Value
Fecal Coliform	#/100mL	Max	880	Maximum Daily Value
			1.28	Average Daily Value
Ammonia (as N)	mg/L	Max	2.083	Maximum Daily Value
			0.212	Average Daily Value
Total Kjeldahl Nitrogen	mg/L	Max	17.28	Maximum Daily Value
			1.09	Average Daily Value
Nitrate Plus Nitrite	mg/L	Max	6.22	Maximum Daily Value
			1.82	Average Daily Value
Nitrogen	mg/L	Max	19.59	Maximum Daily Value
			2.91	Average Daily Value
Oil and Grease	mg/L	Max	1.3	Maximum Daily Value
			0.65	Average Daily Value
Phosphorus	mg/L	Max	9.754	Maximum Daily Value
			1.035	Average Daily Value

**Data reported by the applicant in Form 2A Pages 2A-13 through 2A-14.

b) Monitoring Group D-002:
The discharge flows to an unnamed wetland then drains to Lofton Creek, classified as Class III fresh water, (WBID 2129) in the Lofton Creek Basin.
Since D-002 is an APRICOT discharge which is sampled at the same monitoring locations as outfall D-001, the pollutants which are present in significant quantities or subject to permit limitations at D-002 are equivalent to those at D-001.

2. FACILITY PERFORMANCE - FILE REVIEW:

1) Compliance History of the Facility:

The Department record (From 2014 to 2018) indicates that the facility was rated "Out-Of-Compliance" one time (The Compliance Evaluation Inspection (CEI) which was conducted by the Department on May 01, 2018). All correction actions have been made, and the facility was determined to be in compliance with the Department's wastewater rules and regulations on May 01, 2018.

The permittee has entered a consent order (OGC File No.: 16-0025) for exceedances of the effluent limits for total nitrogen, flow, and the 0.2 mg/L TP annual average for the discharge from WEP-01.

2) Effluent Characteristics:

(a) The Department Sampling Inspection: A Compliance Inspection Sampling was conducted on June 6, 2013 for the effluent discharge through Outfall D-001; the result is summarized following:

(a) Results of the Water Chemistry Sampling:

Total Nitrogen and total Phosphorus were detected in the effluent at 4.01 mg/L and 0.71 mg/L respectively. Which complies with existing permit limits.

(b) Results of the Biological Sampling:

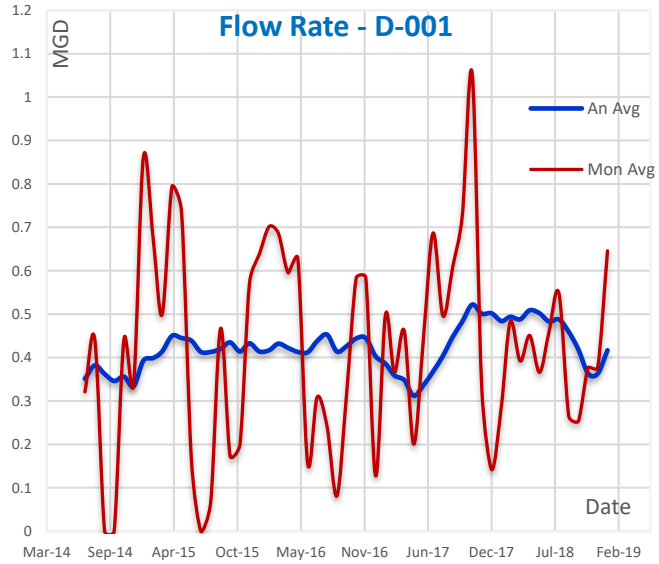
BOD5 and Fecal Coliform were detected in the effluent at 1.1 mg/L and 5 cfu/100mL respectively. Which complies with existing permit limits.

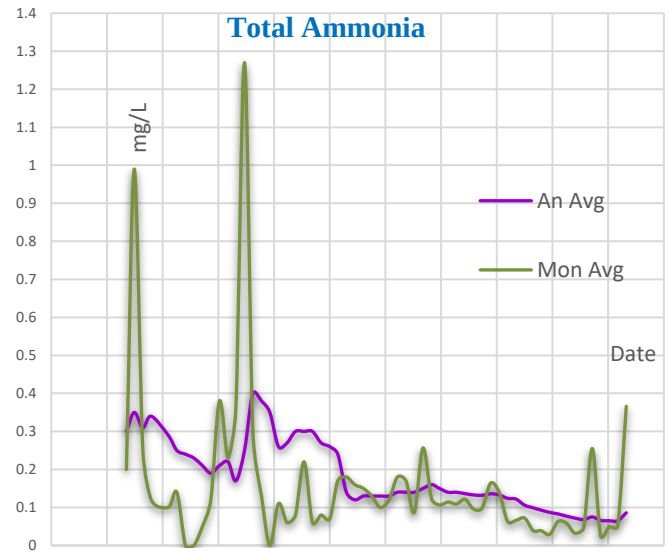
(2) Summary of the Permittee Self – Monitoring Report (DMR Data from January 2014 through December 31, 2018)

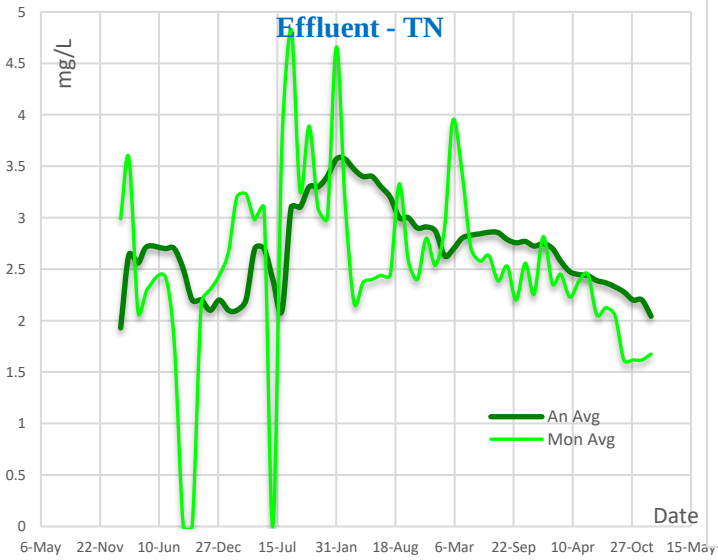
(i) **Outfall D-001:**

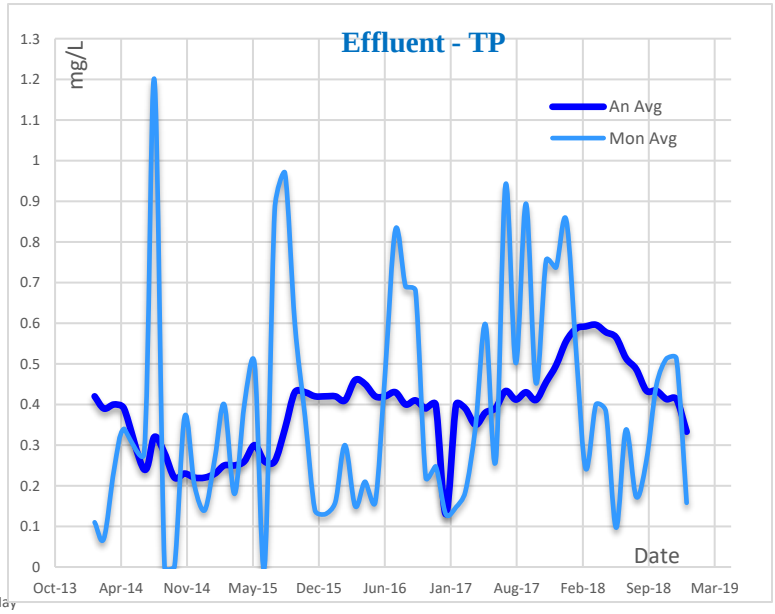
Table 1: Water Quality of the Effluent Discharge to Yulee Swamp

Parameter		Permit Limit	Avg.	Mod	Med.	Max	Stand Dev.	95th Per.
Flow *(MGD)*	AADF	0.50	0.42	0.41	0.42	0.52	0.05	0.50
	MADF	Report	0.43	0.38	0.44	1.05	0.23	0.76
CBOD5 *(mg/L)*	AA	5.0	1.92	2.00	1.96	2.60	0.46	2.60
	MA	6.25	1.89	2.00	2.00	3.00	0.67	2.86
Total Suspended Solids *(mg/L)*	AA	5.0	1.28	0.90	1.20	1.92	0.40	1.90
	MA	6.25	1.26	0.50	1.10	2.80	0.72	2.67
Fecal Coliform (MA) *(#/100mL)*	AA	200	3.46	2.00	2.00	12.00	3.19	9.30
	Geom.	200	1.46	2.00	2.00	4.30	0.87	2.40
Dissolved Oxygen *(mg/L)*	Min	Report	-	-	-	-	-	-
Nitrogen, Total (*mg/L)*	AA	3.0	2.70	2.20	2.70	3.57	0.43	3.42
	MA	3.75	2.63	2.44	2.49	4.83	0.76	3.91
Nitrogen, ammonia, total *(mg/L)*	AA	Report	0.18	0.14	0.14	0.40	0.09	0.32
	MA	Report	0.16	0.05	0.12	1.27	0.21	0.36
Total, Phosphorus (*mg/L)*	AA	1.0	0.39	0.42	0.41	0.60	0.10	0.58
	MA	1.25	0.40	0.40	0.34	1.20	0.27	0.92







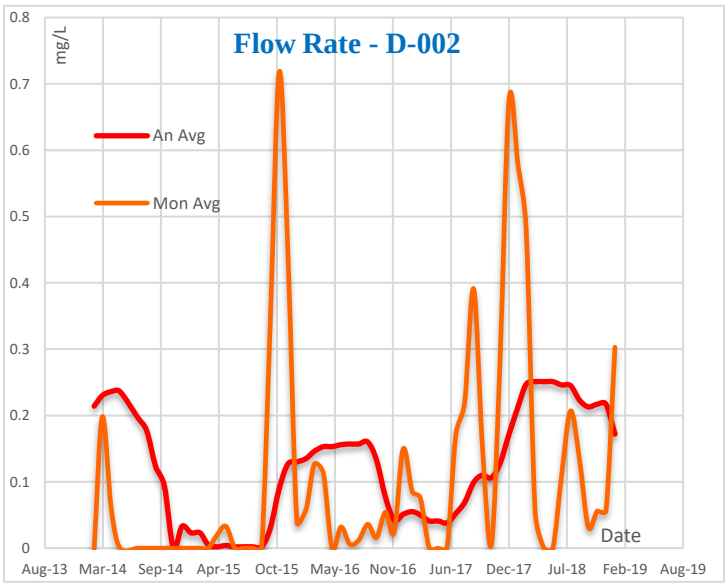


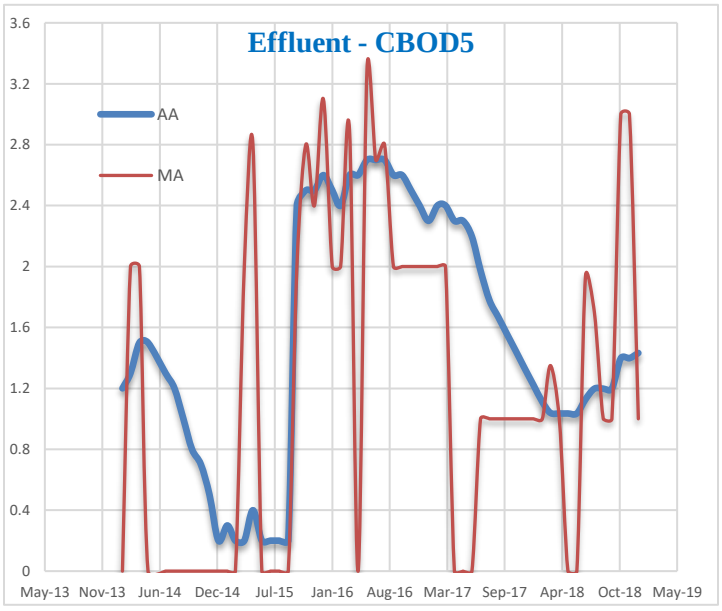
(ii) **Outfall D-002:**

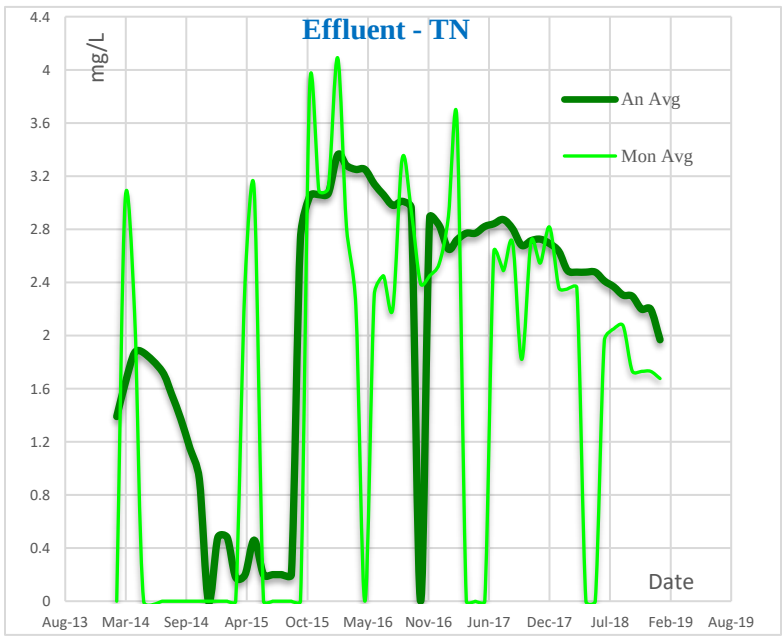
Table 2: Water Quality of the Effluent Discharge under the Apricot Act

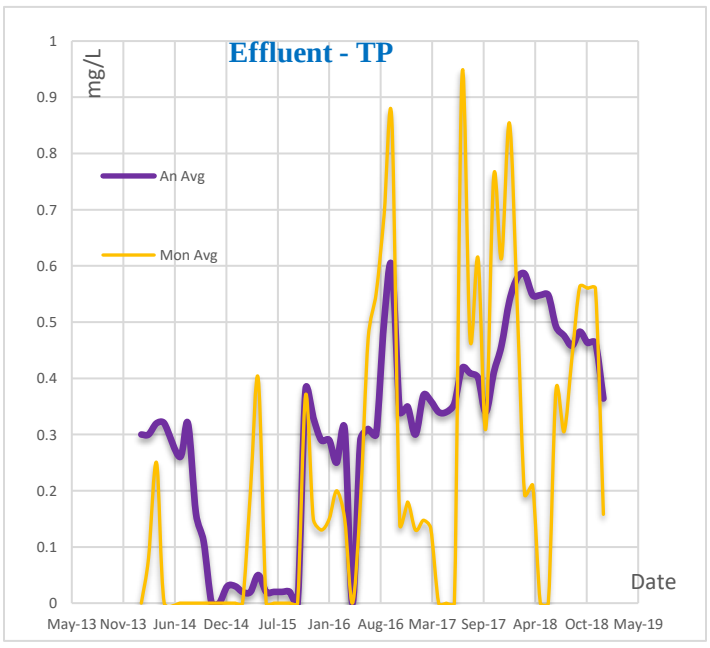
Parameter		Permit Limit	Avg.	Mod	Med.	Max	Stand Dev.	95th Per.
Flow *(MGD)*	AADF	0.50	0.12	0.00	0.13	0.25	0.08	0.25
	MADF	Report	0.14	0.00	0.06	0.72	0.18	0.56
CBOD5 *(mg/L)*	AA	5.0	1.53	0.20	1.42	2.70	0.83	2.63
	MA	6.25	1.75	2.00	2.00	3.30	0.87	3.01
Total Suspended Solids *(mg/L)*	AA	5.0	1.28	0.90	1.20	1.92	0.40	1.90
	MA	6.25	1.26	0.50	1.10	2.80	0.72	2.67
Fecal Coliform (MA) *(#/100mL)*	AA	200	3.46	2.00	2.00	12.00	3.19	9.30

Parameter		Permit Limit	Avg.	Mod	Med.	Max	Stand Dev.	95th Per.
	Geom.	200	1.46	2.00	2.00	4.30	0.87	2.40
Dissolved Oxygen *(mg/L)*	Min	Report	-	-	-	-	-	-
Nitrogen, Total (*mg/L)*	AA	3.0	2.16	0.20	2.48	3.36	0.98	3.25
	MA	3.75	2.43	1.73	2.44	4.09	0.81	3.67
Nitrogen, ammonia, total *(mg/L)*	AA	Report	0.18	0.14	0.14	0.40	0.09	0.32
	MA	Report	0.16	0.05	0.12	1.27	0.21	0.36
Total, Phosphorus (*mg/L)*	AA	1.0	0.33	0.02	0.34	0.60	0.17	0.56
	MA	1.25	0.36	0.15	0.31	0.94	0.25	0.86









(iii) **Water Quality of the Effluent Conveyed to the RIB System (R-001)**

Parameter R-001	Average	Median	Mode	Maximum	Minimum
BOD, CARBONACEOUS 5 DAY, 20C (mg/L)	2.00	2.00	2.00	2.00	2.00
COLIFORM, FECAL (#/100 mL)	2.00	2.00	2.00	2.00	2.00
FLOW Wetland (MGD)	0.24	0.00	0.00	0.78	0.00
FLOW WWTF (MGD)	0.89	0.90	0.85	1.00	0.78
NITROGEN, AMMONIA, TOTAL (AS N)	0.32	0.33	0.05	0.79	0.05
NITROGEN, TOTAL(mg/L)	2.42	2.53	#N/A	3.03	1.70
pH Max(su)	7.39	7.35	#N/A	7.92	7.15
pH Min(su)	6.72	6.68	#N/A	7.02	6.36
PHOSPHORUS, TOTAL (AS P) (mg/L)	0.38	0.44	#N/A	0.66	0.12
SOLIDS, TOTAL SUSPENDED (mg/L)	1.19	1.10	1.00	1.60	1.00
Ultraviolet Light Dosage	12.14	0.00	0.00	100.00	0.00
Ultraviolet Light Intensity	2.28	0.00	0.00	65.00	0.00
Ultraviolet Light Transmittance	56.50	65.00	65.00	70.00	0.00
BOD, CARBONACEOUS 5 DAY, 20C(mg/L) (INF)	218.30	194.00	#N/A	418.00	104.00

(iv) **Water Quality of the Effluent Conveyed to the Public Access Reuse System (R-002)**

Parameter R-002	Average	Median	Mode	Maximum	Minimum
BOD, CARBONACEOUS 5 DAY, 20C (mg/L)	4.49	2.00	2.00	175.00	0.00
COLIFORM, FECAL (#/100 mL)	27.32	2.00	2.00	880.00	2.00
Coliform, Fecal, % less than detection (%)	95.16	100.00	100.00	100.00	0.00
Flow (MGD)	0.42	0.42	0.00	0.96	0.00
NITROGEN, TOTAL(mg/L)	3.79	3.40	2.70	19.59	0.00
pH Max(su)	7.24	7.37	6.90	8.29	0.00
pH Min(su)	6.62	6.80	7.00	7.40	0.00
PHOSPHORUS, TOTAL (AS P) (mg/L)	2.65	2.39	#N/A	6.02	0.47
SOLIDS, TOTAL SUSPENDED (mg/L)	5.63	2.00	2.00	110.00	0.00
Turbidity (ntu)	6.41	9.40	10.00	10.00	0.20
Ultraviolet Light Dosage	54.34	65.00	100.00	101.20	0.00
Ultraviolet Light Intensity	5.06	6.00	0.00	25.00	0.00
Ultraviolet Light Transmittance	60.82	65.00	65.00	75.00	0.00

3) Receiving Waterbody

(1) Outfall D-001 – Yulee Swamp/Lofton Creek

The effluent discharge from JEA-Nassau Regional WWTF goes first to Yulee wetlands then drains to Lofton Creek.

(a) Yulee Swamp

Yulee Swamp is a Class III, freshwater, forested wetland. It is located within the Yulee Service Area near the southeast comer of highways 17 and AlA in Yulee. The Yulee Swamp includes about 185 acres of mixed deciduous swamp and 165 acres of loblolly bay forest for a total of about 350 acres. The discharge from Yulee Swamp flows north under A1A and then turns to the northeast where it joins Lofton Creek. The Creek drains southward to Nassau River, which is a Class III fresh water. Lofton Creek becomes an OFW as it enters the Nassau River-St. Johns River Marshes Aquatic Preserve near the town of Hedges, approximately 8 miles downstream from where it passes under A1A.

The Baseline study report dated 1994 show that Yulee Swamp consisted of a mixed deciduous forested interior and an outer zone dominated by evergreen bay trees. Dominant tree species observed in the interior of Yulee Swamp included blackgum and red maple, along with cypress, sweetgum, slash pine and laurel oak. Dominant trees growing in the bay fringe included redbay, sweetbay, and loblolly bay, with an understory of wax-myrtie. There was some mixture of deciduous and non-deciduous wetiand tree species throughout Yulee Swamp. Wet planted pine forest with fetterbush understory grows to the east and west of the bay fringe around Yulee Swamp.

Recently, the Yulee Swamp has experienced significant changes in canopy and sub canopy cover in response to prolonged inundation above historic water levels caused by a beaver dam near the wetland outflow. This loss was exacerbated by the effects of Hurricane Mathew in October 2016, with significant canopy windrow evident. The tree mortality is largely confined to loblolly bay, a wetland forest species with a relatively narrow hydroperiod relying primarily on soil saturation with only limited periods of inundation. Other species known to be affected in the swamp include laurel oak, black gum, dahoon and red bay. Loblolly bay is one of several species that become dominant in hardwood swamps following extensive logging.

(b) Yulee Swamp-Water Qualities (DMR data from January01, 2014 to December 31, 2018)

Parameter	Avg.	Mod	Med.	Max	Stand Dev.	95th Per.
Water Level (ft)	1.52	1.10	1.50	2.30	0.49	2.20
CBOD5 *(mg/L)*	2.09	2.00	2.00	2.80	0.21	2.46
Chlorophyll A	7.74	2.20	2.90	60.00	13.83	21.68
Fecal Coliform *(#/100mL)*	670.22	120.00	330.00	2000.0	636.93	1666.0
Nitrate plus Nitrate	0.076	0.05	0.05	0.22	0.05	0.20
Nitrogen, ammonia, total *(mg/L)*	0.73	-	0.42	3.10	0.72	1.98
TKN (mg/L)	2.91	-	2.66	7.60	1.52	4.76
Nitrogen, Total (*mg/L)*	2.99	2.71	2.71	7.60	1.50	4.80
Total, Phosphorus (*mg/L)*	0.67	0.69	0.62	1.60	0.39	1.34
Total Suspended Solids *(mg/L)*	19.66	-	5.60	110.00	30.78	92.15
Specific Conductance (μmhos/cm)	245.23	-	243.50	318.00	45.85	306.95

(2) Outfall D-002 – North Hampton/Amelia National Wetland Areas

(a) Reclaimed water is delivered from the WWTF to North Hampton Lakes and Amelia National stomwater ponds when the levels in the ponds are below the crest of the outfalls and no reclaimed water discharges directly to wetlands. Wetland Area #1 (West of Amelia National) discharges are ultimately into Lofton Creek (Class III fresh water, WBID 2129) near the south end of the Hampton Lakes development. Discharges to Wetland Area #2 (North of Amelia National) ultimately flows into Lanceford Creek which is a tributary of the Amelia River (classified as Class III fresh water, WBID 2129, Lofton Creek Basin).

(b) Wetlands – Water Quality

Data is not available. *(The permit did not require monitoring the wetlands since they received backup discharge with Apricot water quality standards.)*

(3) The 303(d) List – Impaired Parameters

Basin	Gardner Creek		Lofton Creek Upper Segment		Lofton Creek	
WBID	2147:		2129A:		2129:	
303(d) List	EPA 303(d)*	FDEP 303(d)**	EPA 303(d)*	FDEP 303(d)**	EPA 303(d)*	FDEP 303(d)**
Impaired Parameter	None	None	Dissolved Oxygen	None	Mercury in fish tissue based on fish consumption	

(4) Surface Water Improvement and Management:

- Lofton Creek (WBID 2129 A (Lofton Creek Upper Segment)) and 2119 (Lofton Creek) is required to meet NNC (Narrative Nutrient Criteria)
- Parts of the Lofton Creek upper segment (WBID 2129) were designated as Outstanding Florida Waters Aquatic Preserves.

3. BASIS FOR PERMIT LIMITATIONS AND MONITORING REQUIREMENTS

a. Discharge from Outfall D-001 to Yulee Swamp:

i. Rational Basis

Parameter	Units	Max/ Min	Limit	Statistical Basis	Rationale
Flow (to Yulee Swamp)	MGD	Max	0.500	Annual Average	62-600.400(3)(b) FAC
		Max	Report	Monthly Average	62-600.400(3)(b) FAC
BOD, Carbonaceous 5 day, 20C	mg/L	Max	5.0	Annual Average	403.086(4)(a)1. FS & 62-600.740(1)(b)2.a. FAC
		Max	6.25	Monthly Average	62-600.740(1)(b)2.b. FAC
		Max	7.5	Weekly Average	62-600.740(1)(b)2.c. FAC
		Max	10.0	Single Sample	62-600.740(1)(b)2.d. FAC
Solids, Total Suspended	mg/L	Max	5.0	Annual Average	403.086(4)(a)2. FS & 62-600.740(1)(b)2.a. FAC

Parameter	Units	Max/ Min	Limit	Statistical Basis	Rationale
		Max	6.25	Monthly Average	62-600.740(1)(b)2.b. FAC
		Max	7.5	Weekly Average	62-600.740(1)(b)2.c. FAC
		Max	10.0	Single Sample	62-600.440(4)(c)4. FAC
pH	s.u.	Min	6.0	Single Sample	62-600.445 FAC
		Max	8.5	Single Sample	62-600.445 FAC
Ultraviolet Light Intensity (For Disinfection)	mW/sqcm	Min	Report	Single Sample	62-600.440(2) FAC
Ultraviolet Light Dosage (For Dechlorination)	mW-s/sqcm	Min	Report	Single Sample	62-600.440(2) FAC
Ultraviolet Light Transmittance	percent	Min	Report	Single Sample	62-600.440(2) FAC
Coliform, Fecal	#/100mL	Max	200	Monthly Geometric Mean	62-600.440(4)(c)2. FAC
		Max	200	Annual Average	62-600.440(4)(c)1. FAC
		Max	800	Single Sample	62-600.440(4)(c)4. FAC
E. Coli	#/100mL	Max	200	Monthly Geometric Mean	62-302.530(6), FAC
	#/100mL	Max	800	Single Sample	
Nitrogen, Total	mg/L	Max	3.0	Annual Average	403.086(4)(a)3. FS & 62-600.740(1)(b)2.a. FAC
		Max	3.75	Monthly Average	62-600.740(1)(b)2.b. FAC
		Max	4.5	Weekly Average	62-600.740(1)(b)2.c. FAC
		Max	6.0	Single Sample	62-600.740(1)(b)2.d. FAC
Nitrogen, Ammonia, Total (as N)	mg/L	Max	Report	Annual Average	62-611 FAC
		Max	2.0	Monthly Average	62-611 FAC
		Max	Report	Single Sample	62-611 FAC
Phosphorus, Total (as P)	mg/L	Max	1.0	Annual Average	403.086(4)(a)4. FS & 62-600.740(1)(b)2.a. FAC
		Max	1.25	Monthly Average	62-600.740(1)(b)2.b. FAC
		Max	1.5	Weekly Average	62-600.740(1)(b)2.c. FAC
		Max	2.0	Single Sample	62-600.740(1)(b)2.d. FAC
Nitrogen, Total	mg/L	Max	3.0	Annual Average	62-611 FAC
		Max	Report	Single Sample	62-611 FAC
Nitrogen, Ammonia, Total unionized (as N)	mg/L	Max	0.02	Annual Average	62-611 FAC
		Max	Report	Single Sample	62-611 FAC
Phosphorus, Total (as P)	mg/L	Max	0.20	Annual Average	62-611 FAC
		Max	Report	Single Sample	62-611 FAC
Nitrogen, Ammonia, Total (as N)	mg/L	Max	Report	Annual Average	62-611 FAC
		Max	Report	Single Sample	62-611 FAC
Temperature (C), Water	Deg C	Max	Report	Single Sample	62-611 FAC
Oxygen, Dissolved (DO)	mg/L	Min	Report	Single Sample	62-611 FAC
pH	s.u.	Max	Report	Single Sample	62-611 FAC
Specific Conductance	umhos/cm	Max	Report	Single Sample	62-611 FAC

Parameter	Units	Max/ Min	Limit	Statistical Basis	Rationale
BOD, Carbonaceous 5 day, 20C	mg/L	Max	Report	Single Sample	62-611 FAC
Solids, Total Suspended	mg/L	Max	Report	Single Sample	62-611 FAC
Phosphorus, Total (as P)	mg/L	Max	Report	Single Sample	62-611 FAC
Nitrogen, Kjeldahl, Total (as N)	mg/L	Max	Report	Single Sample	62-611 FAC
Nitrite plus Nitrate, Total 1 det. (as N)	mg/L	Max	Report	Single Sample	62-611 FAC
Sulfate, Total	mg/L	Max	Report	Single Sample	62-611 FAC
Coliform, Fecal	#/100mL	Max	Report	Single Sample	62-611 FAC
Chlorophyll a	mg/L	Max	Report	Single Sample	62-611 FAC
Stream Stage	feet	Max	Report	Single Sample	62-611 FAC
Water Level at sample collection time	feet	Max	Report	Single Sample	62-611 FAC
		Min	Report	Single Sample	62-611 FAC
Sulfide	mg/L	Max	Report	Single Sample	62-611 FAC

ii. <u>Discussion on the limitations</u>:

Section 301(b)(1)(C) of the Clean Water Act (Act) requires that NPDES permits contain effluent limits more stringent than technology-based limits when necessary to meet water quality standards. Florida water quality standards are composed of use classifications, numeric and/or narrative water quality criteria, and an anti-degradation policy. The use classification system designates the beneficial uses (such as water aquatic life, contact recreation, etc.) that each water body is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the Department to support the beneficial use classification of each water body. The anti-degradation policy represents a three-tiered approach to maintain and protect various levels of water quality and uses

The limits in this permit are based in part on information received in the application, the wastewater characterization reported on the DMR, the results of Third-Year inspection and the receiving water body characterization. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the State of Florida were determined and included in this permit. The Department does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation. Effluent limits are not always developed for pollutants that may be in the discharge but not reported as present in the application. In those circumstances the permit does not authorize discharge of the non-reported pollutants. Effluent discharge conditions may change from the conditions reported in the permit application. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Department. The Permittee may be in violation of the permit until the permit is modified to reflect additional discharge of pollutants.

<u>Technology-Based Effluent Limitations (TBELs)</u>:

The Nassau Regional WWTF, a municipal wastewater treatment facility, is a category of discharger for which technology-based effluent limits have been promulgated by federal and state regulations. These regulations are performance standards that constitute all known available and reasonable assurance of prevention, control, and treatment for municipal wastewater.

- Flow Rate:
  - An existing 0.50 MGD AADF permitted discharge capacity discharge to Yulee Swamp. The permitted capacity shall remain in the new permit.
  - The annual average and monthly average daily shall be monitored and reported in the event of a discharge. The monitoring frequency is being proposed consistent with the previous permit.

- Conventional pollutants:
  - The limitations and conditions of the CBOD5, TSS, pH, have been developed to comply with the technology-based standards of the Clean Water Act and requirements of Chapter 62-611 of the Florida Administrative Code. The limitations and monitoring frequencies of the parameters are proposed to remain as they were in the previous permit.

(a) **Water Quality Based Effluent Limitation (WQBEL)**

Water quality based effluent limitations (WQBELs) are effluent limitations, which may be more stringent than a technology based effluent limitation, that have been determined necessary by the Department to ensure that water quality standards in a receiving body of water will not be violated. WQBELs are developed in accordance with Chapter 62-650, F.A.C., and are based on the characteristics of the discharge, the receiving water characteristics, and the criteria and standards in Chapters 62-4, 62-302, and the 62-600 series, F.A.C. WQBELs are included in the permit for the following pollutants of concern.

(a) Bacteriological Qualities:

- Fecal Coliform:

  At a minimum, the effluent is required to meet basic-level disinfection prior to discharge into Yulee Swamp. i.e. the disinfection requirements for fecal coliform from Rule 62-600.440, FAC.

  Limit and monitoring frequency for fecal coliform is remain as they were in the previous permit.

- Escherichia coli Bacteria:
  - In July 2017, EPA approved Florida's bacteriological water quality standards in Rule 62-302.530, F.A.C.
  - Because there is no well-established relationship between fecal coliform and E. coli bacteria, limitations based on both the basic disinfection standards for fecal coliform from subsection 62-600.440(5), F.A.C., and based on the bacteriological water quality standards for E. coli for discharges to Class III predominately fresh waters under Rule 62-302.530, F.A.C., have been included in the permit.
  - The effluent limitation for E. coli shall be established in consistent with the bacteriological water quality standards for E. Coli in Rule 62-302.530, F.A.C.

(b) Measurement to Protect 303(d) List Impaired Water

The State's 303(d) List indicates that the segment of Lofton Creek to which the Nassau Regional facility discharges (waterbody ID 2147). The listed causes are mercury (based on fish consumption advisory) and Dissolved Oxygen.

(i) Mercury: Mercury (based on fish consumption advisory) is listed. Three effluent samples collected between 2009 and 2013. The lab used EPA Method 1631E with a MDL of 0.000152 µg/L to analyze to mercury and results showed the maximum mercury value of 0.00149 µg/L, which is lower than the fresh water quality criterion of 0.012 µg/L. Since the facility was a minor NPDES and was received almost 100% domestic wastewater (no major industrial users), the operation permit (2014-2019 period) did not require monitoring for mercury. Based on the fact above, the new permit will not require sampling for mercury. However, the Department reserves the right to request for monitoring for mercury, if any evidences to show that the discharge may have a reasonable potential of exceedance the water quality criterion for mercury.

(ii) Dissolved Oxygen:

- Yulee Swamp is classified as Class III (recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife) fresh water which shall meet the Florida's surface water quality standards that are authorized under Section 403.061, Florida Statutes, and adopted om Chapter 62-302 of the Florida Administrative Code.

- However, In accordance with Ambient Water Quality Criteria for Dissolved Oxygen. EPA 440/5-86-003:

  "Naturally-occurring dissolved oxygen concentrations may occasionally fall below target criteria levels due to a combination of low flow, high temperature, and natural oxygen demand. These naturally-occurring conditions represent a normal situation in which the productivity of fish or other aquatic organisms may not be the maximum possible under ideal circumstances, but which represent the maximum productivity under the particular set of natural conditions. Under these circumstances the numerical criteria should be considered unattainable, but naturally-occurring conditions which fail to meet criteria should not be interpreted as violations of criteria. Although further reductions in dissolved oxygen may be inadvisable, effects of any reductions should be compared to natural ambient conditions and not to ideal conditions."

- In addition, in accordance with Technical Support Document: Derivation of Dissolved Oxygen Criteria to Protect Aquatic Life in Florida's Fresh and Marine Waters:

  "Persistent, naturally low DO concentrations below the existing DO criteria have been documented in many of Florida's minimally disturbed and healthy fresh and marine water systems. Natural freshwater systems subject to low DO include those receiving significant drainage from wetlands or marshes, waterbodies downstream of springs or other groundwater sources, and many streams during low or no flow periods.

  Florida's swamp/wetland drainages are characterized by low velocity flows and high color levels resulting from large inputs of Colored Dissolved Organic Matter (CDOM) from humic substances. The highly colored water and heavy shading typical of many Florida wetland limits light penetration, which reduces photosynthetic DO production. In addition to increasing color levels, the high level of dissolved organic matter results

in elevated natural biological oxygen demand that depletes the oxygen in the water. The limited photosynthetic activity and high oxygen demand results in naturally low DO values, with values typically ranging down to 3.0 mg/L or less."

- The permittee is required to monitor and report the dissolved oxygen level in the wetland (i.e. the limit for DO required in Rule 62-302.533, FAC, may be released.).

(c) Water Qualities – Discharge Limits to and from Yulee Swamp (Receiving Wetland)

- Reclaimed water discharged to Yulee Swamp shall meet the limits required by Rule 62-611.420, FAC, which are: Carbonaceous Biochemical Oxygen Demand 5 mg/l; Total Suspended Solids 5 mg/l; Total Nitrogen (as N) 3 mg/l; Total Phosphorus (as P) 1 mg/L on the annual average basis, and total ammonia (N) 2.0 mg/L as a monthly average.
- The discharge from Yulee Swamp shall meet the limits required by Rule 62-611.450, FAC, that shall not have an average annual total nitrogen concentration greater than 3 mg/l (as N) of which no more than 0.02 mg/l (as N) may be as un-ionized ammonia, or an average annual total phosphorus concentration greater than 0.2 mg/l (as P).
- Recent water quality monitoring data reports have shown a typically high nitrogen and phosphorus concentrations of the discharge.
- A consent order agreement (OGC File No.: 16-0025) for exceedances of flow rate and water qualities limits for the reclaimed water discharged to and from the swamp was executed.

(d) Yulee Swamp – Monitoring Receiving Wetland

- The facility is required to monitor the wetland for changes in Woody Vegetation and Threatened and Endangered Plant and Animal Species on an annual basis.
- As discussed in the (2.3)(1)(a), the monitoring reports show that the Yulee Wetland has experienced significant changes in canopy and subcanopy cover in response to prolonged inundation above historic water levels caused by a beaver dam near the wetland outflow.
- JEA is required to develop and Effluent Management Plant that provides actions for recovery of the wetland.

(e) Downstream Waterbody Protection:

- As discussed sections above, discharge from Yulee Swamp flow north under A1A and then turns to the northeast where it joins Lofton Creek which becomes an OFW as it enters the Nassau River-St.

- The reclaimed water discharged to Yulee Swamp is treated to meet AWT (Advanced Wastewater Treatment), and the discharge from the swamp/receiving wetland is required to have an average annual total nitrogen concentration less than 3 mg/l (as N) of which no more than 0.02 mg/l (as N) may be as un-ionized ammonia, or an average annual total phosphorus concentration less than 0.2 mg/l (as P). In addition, with the discharged permitted capacity of 0.5 MGD AADF, the hydraulic loading rate on the Yulee Swamp is less than 2 inches per week.

- Based on the high-water quality of the reclaimed water and low hydraulic loading rate, the ambient water quality monitoring of downstream waterbody (Lofton Creek) was not required. However, the Department reserves the right to request for the ambient water monitoring if having reasonable potential that the discharge will have negative impact to the downstream waterbody.

iii. Conclusion:

The permittee has provided reasonable assurance that the discharge will not adversely affect the designated use of the receiving water.

b. Discharge from Outfall D-002 – APRICOT Act.

i. Rational Basis

This facility is authorized to discharge effluent from Outfall D-002 to Lofton Creek based on the following:

Parameter	Units	Max/ Min	Limit	Statistical Basis	Rationale
Flow (Apricot)	MGD	Max	0.315	Annual Average	62-600.400(3)(b) FAC
		Max	Report	Monthly Average	62-600.400(3)(b) FAC
Flow, Total Volume	Mgal	Max	115.0	Annual Total	62-600.400(3)(b) FAC
		Max	Report	Monthly Total	62-600.400(3)(b) FAC
		Max	Report	Single Sample	62-600.400(3)(b) FAC
BOD, Carbonaceous 5 day, 20C	mg/L	Max	5.0	Annual Average	403.086(4)(a)1. FS & 62-600.740(1)(b)2.a. FAC
		Max	6.25	Monthly Average	62-600.740(1)(b)2.b. FAC
		Max	7.5	Weekly Average	62-600.740(1)(b)2.c. FAC
		Max	10.0	Single Sample	62-600.740(1)(b)2.d. FAC
Solids, Total Suspended	mg/L	Max	5.0	Annual Average	403.086(4)(a)2. FS & 62-600.740(1)(b)2.a. FAC
		Max	6.25	Monthly Average	62-600.740(1)(b)2.b. FAC
		Max	7.5	Weekly Average	62-600.740(1)(b)2.c. FAC
		Max	10.0	Single Sample	62-600.440(4)(c)4. FAC
Ultraviolet Light Intensity (For Disinfection)	mW/ sqcm	Min	Report	Single Sample	62-600.440(4)(b) FAC
Ultraviolet Light Dosage (For Dechlorination)	mW-s/ sqcm	Min	Report	Single Sample	62-600.440(2) & 62-302.530(18) FAC
Ultraviolet Light Transmittance	percent	Min	Report	Single Sample	62-600.440(2) & 62-302.530(18) FAC
pH	s.u.	Min	6.0	Single Sample	62-600.445 FAC
		Max	8.5	Single Sample	62-600.445 FAC
Coliform, Fecal	#/100mL	Max	200	Monthly Geometric Mean	62-600.440(4)(c)2. FAC
		Max	200	Annual Average	62-600.440(4)(c)1. FAC
		Max	800	Single Sample	62-600.440(4)(c)4. FAC
Nitrogen, Total	mg/L	Max	3.0	Annual Average	403.086(4)(a)3. FS & 62-600.740(1)(b)2.a. FAC
		Max	3.75	Monthly Average	62-600.740(1)(b)2.b. FAC
		Max	4.5	Weekly Average	62-600.740(1)(b)2.c. FAC
		Max	6.0	Single Sample	62-600.740(1)(b)2.d. FAC
Phosphorus, Total (as P)	mg/L	Max	1.0	Annual Average	403.086(4)(a)4. FS & 62-600.740(1)(b)2.a. FAC
		Max	1.25	Monthly Average	62-600.740(1)(b)2.b. FAC
		Max	1.5	Weekly Average	62-600.740(1)(b)2.c. FAC
		Max	2.0	Single Sample	62-600.740(1)(b)2.d. FAC

Parameter	Units	Max/ Min	Limit	Statistical Basis	Rationale
Chronic Whole Effluent Toxicity, 7-Day IC25 (*Ceriodaphnia dubia*)	percent	Min	100	Single Sample	62-302.530(20) & (61) FAC and 62-4.241(1)(b) FAC
Chronic Whole Effluent Toxicity, 7-Day IC25 (*Pimephales promelas*)	percent	Min	100	Single Sample	62-302.530(20) & (61) FAC and 62-4.241(1)(b) FAC

ii. Discussions:

- An existing 0.315 MGD annual average daily flow (AADF) or 115.00 million gallons maximum annual volume (calendar year) APRICOT Act discharge. During wet weather conditions, the reclaimed water overflows from a golf course lake system on Amelia National and North Hampton to an unnamed wetland located west of Amelia National (Called Wetland Area # 1) and/or to an unnamed wetland located in the northeast of North Hampton (Called Wetland Area # 2).
- Quantity and Quality of the Reclaimed Water:
  - Section 403.086(7)(a), F. S., limits a backup discharge permitted under the Act to a maximum of 30 percent of the permitted reuse capacity on an annual basis.
  - Section 403.086(7)(b), F.S., requires that the effluent/reclaimed water is treated to achieve AWT and high-level disinfection.
    - The AWT is defined as annual average limits for $CBOD_5$, total suspended solids, total nitrogen (as N), and total phosphorus of 5, 5, 3, and 1 mg/L, respectively.
    - The high-level disinfection under subsection 62-600.440(6), F.A.C., requires that 75% of the fecal coliform samples collected during a month be below detection limits and that no one sample exceed 25 fecal coliform values per 100 mL of sample.
    - In July 2017, EPA approved Florida's bacteriological water quality standards in Rule 62-302.530, F.A.C., for Class III predominately fresh waters require that the monthly geometric mean of E. coli values not exceed 126 E. coli values per 100 mL of sample and no more than 10% of samples collected during a month exceed 410 E. coli values per 100 mL of sample. Because E. coli bacteria are a type of fecal coliform bacteria and the disinfection standards in Rule 62-600.440, F.A.C., for fecal coliform are more stringent than the water quality standards for E. coli in Rule 62-302.530, F.A.C., if the high-level disinfection requirements are met, the water quality standards for E. coli for discharges to Class III predominately fresh waters will be met as well. For this reason, only limitations based on the high-level disinfection standards for fecal coliform have been included in the permit.
- The anti-degradation policy has been satisfied for a backup discharge proposed under the Act as listed below:
  - Sections 403.064 and 373.250, F.S., clearly state that reuse of reclaimed water is in the public interest. Since backup discharges to be permitted under the Act are integral parts of reuse projects, it is reasonable to assume that the public interest test has been met.
  - The discharge does not impact or be a minimal negative impact to the wetlands.
  - The discharge is not directly going to an Outstanding Florida Water.
  - The increased volume of fresh water contributed by a backup discharge will not seriously alter the natural freshwater balance of receiving waters after reasonable opportunity for mixing.

- The discharge is not to a water body having a pollutant load reduction goal established by a water management district or the Department, and the discharge will not cause or contribute to a violation of the established goal.

❖ Conclusions:

The permittee has provided reasonable assurance that the discharge will not adversely affect the designated use of the receiving water.

c. Reuse of Reclaimed Water Via Rapid-Infiltration Basin – R-001 Site

i. Rational Basis

This facility is authorized to direct reclaimed water to Reuse System R-001, a rapid infiltration basin system, based on the following:

Parameter	Units	Max/ Min	Limit	Statistical Basis	Rationale
Flow (Perc Ponds)	MGD	Max	0.300	Annual Average	62-600.400(3)(b) & 62-610.810(5) FAC
		Max	Report	Monthly Average	62-600.400(3)(b) & 62-610.810(5) FAC
BOD, Carbonaceous 5 day, 20C	mg/L	Max	20.0	Annual Average	62-610.510 & 62-600.740(1)(b)1.a. FAC
		Max	30.0	Monthly Average	62-600.740(1)(b)1.b. FAC
		Max	45.0	Weekly Average	62-600.740(1)(b)1.c. FAC
		Max	60.0	Single Sample	62-600.740(1)(b)1.d. FAC
Solids, Total Suspended	mg/L	Max	20.0	Annual Average	62-610.510 & 62-600.740(1)(b)1.a. FAC
		Max	30.0	Monthly Average	62-600.740(1)(b)1.b. FAC
		Max	45.0	Weekly Average	62-600.740(1)(b)1.c. FAC
		Max	60.0	Single Sample	62-600.740(1)(b)1.d. FAC
Coliform, Fecal	#/100mL	Max	200	Monthly Geometric Mean	62-600.440(4)(c)2. FAC
		Max	200	Annual Average	62-610.510 & 62-600.440(4)(c)1. FAC
		Max	800	Single Sample	62-600.440(4)(c)4. FAC
pH	s.u.	Min	6.0	Single Sample	62-600.445 FAC
		Max	8.5	Single Sample	62-600.445 FAC
Ultraviolet Light Dosage (For Disinfection)	mW-s/ sqcm	Min	Report	Single Sample	62-610.510 & 62-600.440(4)(b) FAC
Ultraviolet Light Transmittance	percent	Max	Report	Single Sample	62-610.510 & 62-600.440(4)(b) FAC
Ultraviolet Light Intensity	mW/sqcm	Max	Report	Single Sample	62-610.510 & 62-600.440(4)(b) FAC
Nitrogen, Total	mg/L	Max	12.0	Single Sample	62-610.510(1) FAC

d. Reuse Reclaimed Water via Slow-Rate Public Access Reuse System

i. Rational Basis

This facility is authorized to direct reclaimed water to Reuse System R-002, a slow-rate/restricted public access system, based on the following:

Parameter	Units	Max/ Min	Limit	Statistical Basis	Rationale
Flow (Public Access Reuse)	MGD	Max	0.750	Annual Average	62-600.400(3)(b) & 62-610.810(5) FAC
		Max	Report	Monthly Average	62-600.400(3)(b) & 62-610.810(5) FAC
BOD, Carbonaceous 5 day, 20C	mg/L	Max	20.0	Annual Average	62-610.410 & 62-600.740(1)(b)1.a. FAC
		Max	30.0	Monthly Average	62-600.740(1)(b)1.b. FAC
		Max	40.0	Weekly Average	62-600.740(1)(b)1.c. FAC
		Max	60.0	Single Sample	62-600.740(1)(b)1.d. FAC
Solids, Total Suspended	mg/L	Max	5.0	Single Sample	62-610.460 & 62-600.440(5)(f)3. FAC
Turbidity	NTU	Max	Report	Single Sample	62-610.460 & 62-600.440(5)(f)3. FAC
Coliform, Fecal	#/100mL	Max	25	Single Sample	62-610.460 & 62-600.440(5)(f)2. FAC
Coliform, Fecal, % less than detection	percent	Min	75	Monthly Total	62-610.460 & 62-600.440(5)(f)1. FAC
pH	s.u.	Min	6.0	Single Sample	62-600.445 FAC
		Max	8.5	Single Sample	62-600.445 FAC
Ultraviolet Light Dosage (For Disinfection)	mW-s/ sqcm	Min	100	Single Sample	62-610.460 & 62-600.440(5)(b) FAC
Ultraviolet Light Transmittance	percent	Min	65	Single Sample	62-610.460 & 62-600.440(5)(b) FAC
Ultraviolet Light Intensity	mW/sqcm	Max	Report	Single Sample	62-610.460 & 62-600.440(5)(b) FAC
Water Level at sample collection time (in UV Reactors)	ft	Min	Report	Single Sample	62-610.460 & 62-600.440(5)(b) FAC
		Max	Report	Single Sample	62-610.460 & 62-600.440(5)(b) FAC
Nitrogen, Total	mg/L	Max	12.0	Single Sample	62-610.460 & 62-600.440(5)(f)3. FAC
Giardia	cysts/ 100L	Max	Report	Single Sample	62-610.460 & 62-600.440(5)(f)3. FAC
Cryptosporidium	oocysts/ 100L	Max	Report	Single Sample	62-610.460 & 62-600.440(5)(f)3. FAC
Primary Drinking Water Standards (Reclaimed Water)[1]	See DMR	Max	Report	Single Sample	62-610.554(4) or 62-610.555(1)(b)&62-550.310 FAC

e. Other Limitations and Monitoring Requirements:

i. Rational Basis

Other Limitations and Monitoring Requirements:

Parameter	Units	Max/ Min	Limit	Statistical Basis	Rationale
Flow	MGD	Max	1.55	Annual Average	62-600.400(3)(b) FAC
		Max	Report	Monthly Average	62-600.400(3)(b) FAC
		Max	Report	Quarterly Average	62-600.400(3)(b) FAC
Percent Capacity, (TMADF/Permitted Capacity) x 100	percent	Max	Report	Monthly Average	62-600.405(4) FAC
BOD, Carbonaceous 5 day, 20C (Influent)	mg/L	Max	Report	Single Sample	62-600 FAC
Solids, Total Suspended (Influent)	mg/L	Max	Report	Single Sample	62-600 FAC
Monitoring Frequencies and Sample Types	-	-	-	All Parameters	62-600 FAC & 62-699 FAC and/or BPJ of permit writer
Sampling Locations	-	-	-	All Parameters	62-600, 62-610.412, 62-610.463(1), 62-610.568, 62-610.613 FAC and/or BPJ of permit writer

4. DISCUSSION OF CHANGES TO PERMIT LIMITATIONS

The current wastewater permit for this facility FL0116793-018-DW1P expired on March 23, 2019 and was administratively extended.

5. BIOSOLIDS MANAGEMENT REQUIREMENTS

Biosolids generated by this facility may be transferred to Buckman BMF or disposed of in a Class I solid waste landfill.

See the table below for the rationale for the biosolids quantities monitoring requirements.

Parameter	Units	Max/ Min	Limit	Statistical Basis	Rationale
Biosolids Quantity (Landfilled)	ton (d)	Max	Report	Monthly Total	62-640.650(5)(a)1. FAC
Biosolids Quantity (Transferred)	ton (d)	Max	Report	Monthly Total	62-640.650(5)(a)1. FAC
Monitoring Frequency		All Parameters			62-640.650(5)(a) FAC

6. GROUND WATER MONITORING REQUIREMENTS

Ground water monitoring requirements are established in accordance with Chapters 62-520, 532, 600, 610, and 620, F.A.C. The discharge site is considered a new site with a 100-foot zone of discharge. Part III of the permit requires quarterly ground water monitoring for seven typical domestic wastewater parameters at four existing monitoring wells around four percolation ponds. The groundwater flow direction is southwest.

The following changes were made from the last permit:

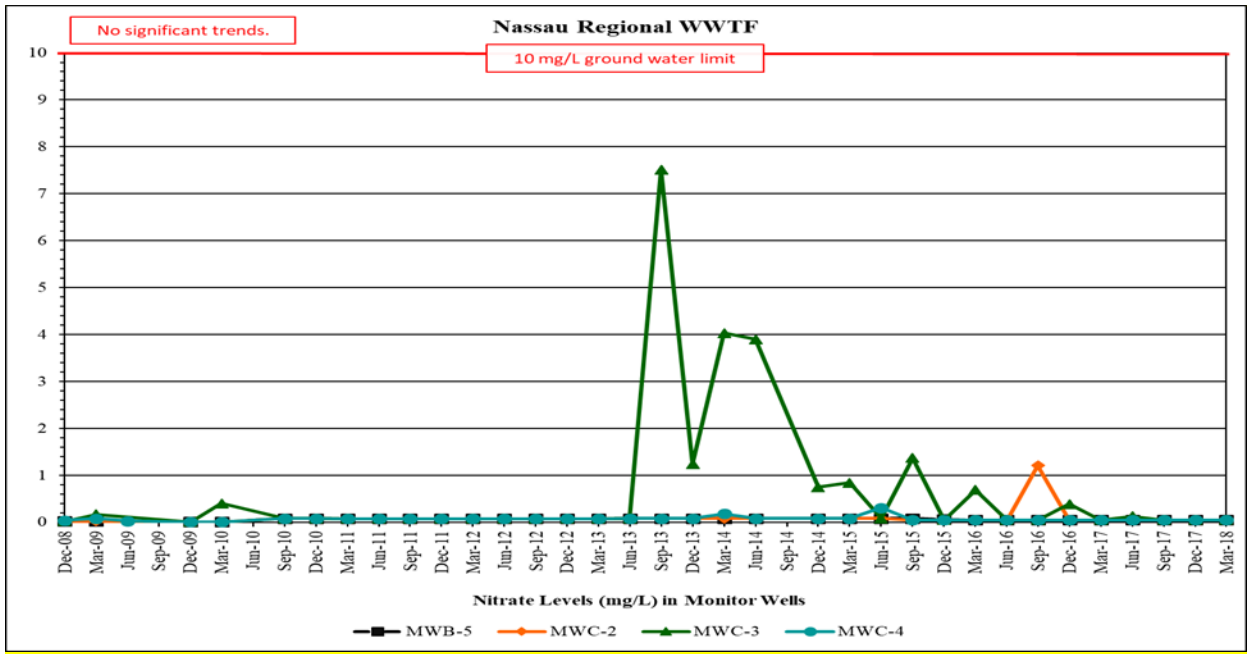
a. Due to a new cell phone tower being installed, background well MWB-5 was abandoned and re-located, and re-named MWB-7.

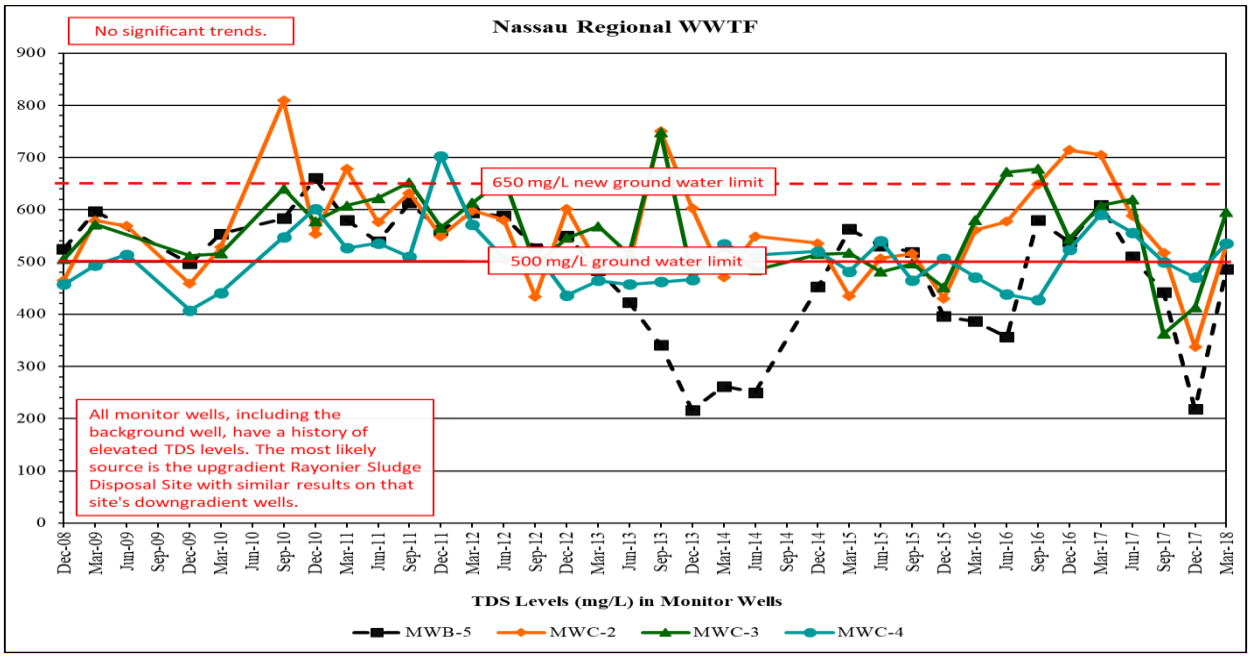
b. The TDS levels in the background well at the Nassau Regional Percolation Pond site are elevated, but the compliance wells at the Yulee Disposal Site are upgradient of the background well, and they are elevated, also. The Yulee site is existing and is exempt from having to meet the TDS limit. Therefore, based on historic values of TDS in the Nassau Regional wells, the TDS compliance well limit was increased to 650 mg/L.

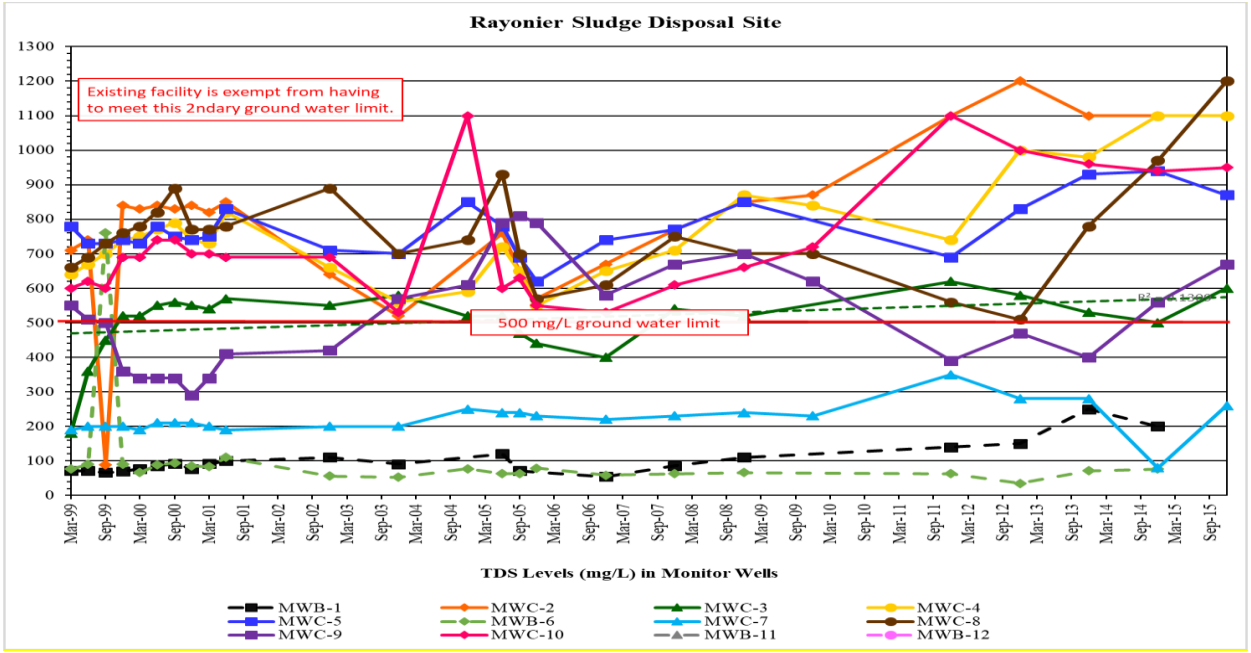
c. Since the pH levels in the monitor wells have historically low levels, and the effluent pH is within the proper range, the compliance well limit was changed to 5.5 – 8.5

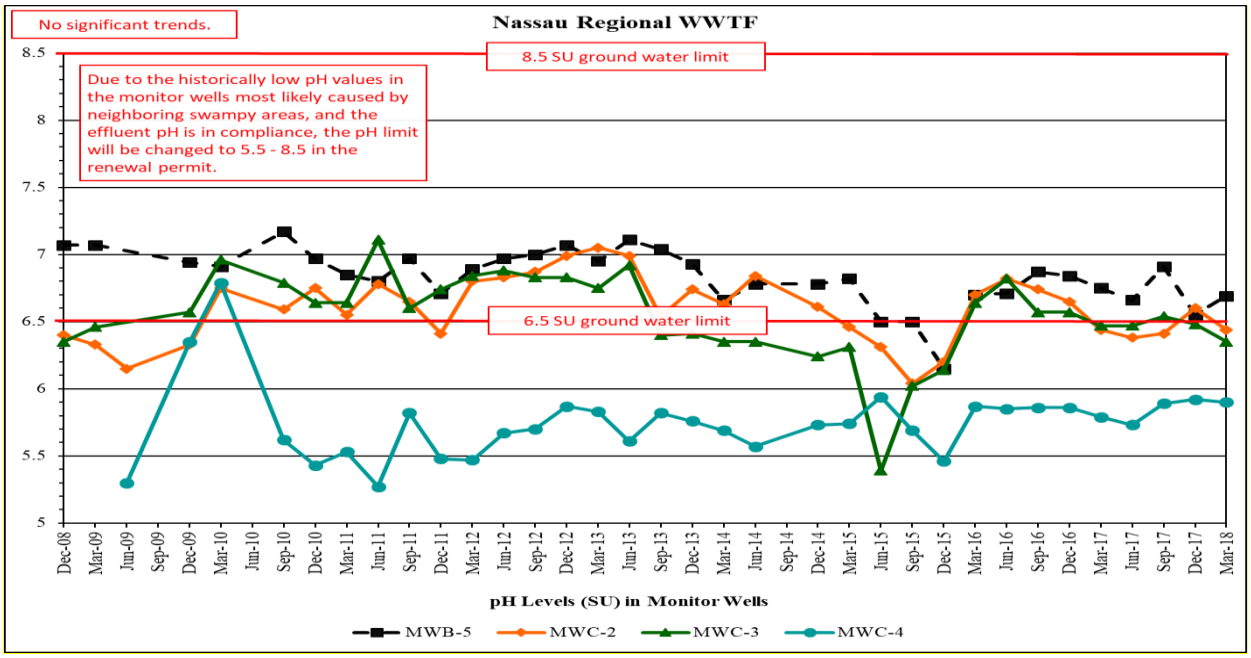
d. Since the 2018 expanded sampling of MWC-3 revealed iron levels were elevated, and the follow-up sampling of the background well MWB-5 revealed elevated iron levels, also, iron was not added to the routine quarterly sampling of all monitor wells.

A review of the nitrite+nitrate levels indicate the facility is in compliance, see chart below.




Nassau Regional WWTF
No significant trends.
650 mg/L new ground water limit
500 mg/L ground water limit
All monitor wells, including the background well, have a history of elevated TDS levels. The most likely source is the upgradient Rayonier Sludge Disposal Site with similar results on that site's downgradient wells.
TDS Levels (mg/L) in Monitor Wells
MWB-5
MWC-2
MWC-3
MWC-4


Rayonier Sludge Disposal Site
Existing facility is exempt from having to meet this 2ndary ground water limit.
500 mg/L ground water limit
TDS Levels (mg/L) in Monitor Wells
MWB-1
MWC-2
MWC-3
MWC-4
MWC-5
MWB-6
MWC-7
MWC-8
MWC-9
MWC-10
MWB-11
MWB-12



7. PERMIT SCHEDULES

The following items were included in the schedule of condition VI.1

a) Repairs to the damaged berm of Percolation Pond #1 shall be completed, and notification of completion submitted to DEP by December 31, 2021. This timeframe allows for evaluation of the ponds.

b) Notify DEP of any leaks from the damaged berm of Percolation Pond #1 within 7 days of observance.

c) If the facility receives more than 2 odor complaints in 30 days or 6 odor complaints in in 180 days, JEA shall begin construction of a new odor control system at the facility within six months from tripping complaint threshold.

8. INDUSTRIAL PRETREATMENT REQUIREMENTS

At this time, the facility is not required to develop an approved industrial pretreatment program. However, the Department reserves the right to require an approved program if future conditions warrant.

9. ADMINISTRATIVE ORDERS (AO) AND CONSENT ORDERS (CO)

The facility has entered into a consent order (OGC File No.: 16-0025) with the Department. This permit is not accompanied by an AO.

10. REQUESTED VARIANCES OR ALTERNATIVES TO REQUIRED STANDARDS

No variances were requested for this facility.

11. THE ADMINISTRATIVE RECORD

The administrative record including application, draft permit, fact sheet, public notice (after release), comments received and additional information is available for public inspection during normal business hours at the location specified in item 13. Copies will be provided at a minimal charge per page.

12. PROPOSED SCHEDULE FOR PERMIT ISSUANCE

Draft Permit and Public Notice to Applicant and EPA	February 14, 2019
Public Comment Period	Beginning: February 14, 2019 Ending: March 18, 2019
Proposed Permit to EPA	February 15, 2019
Notice of Intent to Issue	June 18, 2019
Publish Intent	June 27, 2019
Notice of Permit Issuance	July 31, 2019

13. DEP CONTACT

Additional information concerning the permit and proposed schedule for permit issuance may be obtained during normal business hours from:

D. Anh Vo, P.E.
Professional Engineer
FDEP Northeast District Office
8800 Baymeadows Way West, Suite 100
Jacksonville, Florida 32256
Telephone (904) 256-1618

14. PUBLIC COMMENT PERIOD

The Department of Environmental Protection proposes to issue a wastewater facility permit to this applicant subject to the aforementioned reclaimed water or effluent limitations and conditions. This decision is tentative and open to comment from the public.

Interested persons are invited to submit written comments regarding permit issuance on the draft permit limitations and conditions to the following address:

Department of Environmental Protection
Northeast District Office
8800 Baymeadows Way West, Suite 100
Jacksonville, Florida 32256
Attn: D. Anh Vo

All comments received within 30 days following the date of public notice, pursuant to Rule 62-620.550, F.A.C., will be considered in the formulation of the final decision with regard to permit issuance.

Any interested person may submit written comments on the Department's proposed permitting decision or may submit a written request for a public meeting to the address specified above, in accordance with Rule 62-620.555, F.A.C. The comments or request for a public meeting must contain the information set forth below and must be received in the above named District office of the Department within 30 days of receipt or publication of the public notice. Failure to submit comments or request a public meeting within this time period will constitute a waiver of any right such person may have to submit comments or request a public meeting under Rule 62-620.555, F.A.C.

The comments or request for a public meeting shall contain the following information:

1) The commenter's name, address and telephone number, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

2) A statement of how and when notice of the draft permit was received;

3) A description of any changes the commenter proposes for the draft permit;

4) A full explanation of the factual and legal reasons for each proposed change to the draft permit; and

A request that a public meeting be scheduled (if applicable) including a statement of the nature of the issues proposed to be raised at the meeting.

a. Public Meeting

The Department will hold a public meeting if there is a significant degree of public interest in the draft permit or if it determines that useful information and data may be obtained thereby. Public notice of such a meeting shall be published by the applicant at least 30 days prior to the meeting.

If a public meeting is scheduled the public comment period is extended until the close of the public meeting. If a public meeting is held any person may submit oral or written statements and data at the meeting on the Department's proposed action.

b. Issuance of the Permit

The Department will make its decision regarding permit issuance after consideration of all written comments, including comments from the United States Environmental Protection Agency on surface water discharge aspects of the draft or a proposed permit; the requirements of Chapter 403, F.S. and appropriate rules; and, if a public meeting is held, after consideration of all comments, statements and data presented at the public meeting. The Department will respond to all significant comments in writing. The Department's response to significant comments will be included in the administrative record of the permit and will be available for public inspection at the above named District office of the Department.

Unless a request for an administrative hearing, or an extension of time to file a petition for an administrative hearing, as indicated in d. below, is granted, the Department will take final agency action by issuing the permit or denying the permit application. If an administrative hearing is convened, final agency action will be based on the outcome of the hearing.

c. Administrative Hearing

A person whose substantial interests are affected by the Department's proposed permitting decision has the opportunity to petition for an administrative hearing to challenge the Department's decision in accordance with Section 120.57, F.S.

An administrative hearing is an evidentiary proceeding in which evidence is presented by testimony and exhibits before an independent hearing officer. The result of an administrative hearing is the issuance of the hearing officer's recommended order to the Department, including the hearing officers findings of fact, based on the evidence presented at the hearing. The Department will issue a final order, granting or denying the permit, based on the hearing officer's recommended order.

The petition for an administrative hearing must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of notice of agency action or within 14 days of personal receipt of notice of agency action, whichever occurs first. The petitioner is to mail a copy of the petition to the applicant at the time of filing. Failure to file a petition within this time period will constitute a waiver of any right such person may have to request an administrative determination (hearing) under section 120.57, F.S. The petition is to contain the following information:

1) The name, address and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

2) A statement of how and when each petitioner received notice of the Department's action or proposed action;

3) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

4) A statement of the material facts which the petitioner contends warrant reversal or modification of the Department's action or proposed action;

5) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

6) A statement of the relief sought by the petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in the notice of agency action. Persons whose substantial interests will be affected by any decision of the Department on the application have the right to petition to become a party to the proceeding, regardless of their agreement or disagreement with the Department's proposed action indicated in the notice of agency action.

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed submit this report to: http://www.fldepportal.com/go/

PERMITTEE NAME: JEA
MAILING ADDRESS: 21 W Church St T-8
Jacksonville, Florida 32202- 3155

FACILITY: Nassau Regional WWTF
LOCATION: State Road 200 (A1A) At Chester Road
96237 Amelia Concourse
Yulee, FL 32097-
COUNTY: Nassau
OFFICE: Northeast District

PERMIT NUMBER: FL0116793-019-DW1P
LIMIT: Final
CLASS SIZE: MI
MONITORING GROUP NUMBER: D-001
MONITORING GROUP DESCRIPTION: discharge to Yulee wetland, with Influent
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: _____ To: _____

REPORT FREQUENCY: Monthly
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow (to Yulee Swamp)	Sample Measurement										
PARM Code 50050 Y Mon. Site No. FLW-2	Permit Requirement		0.5 (An.Avg.)	MGD						Continuous	Flow Totalizer
Flow (to Yulee Swamp)	Sample Measurement										
PARM Code 50050 1 Mon. Site No. FLW-2	Permit Requirement		Report (Mo.Avg.)	MGD						Continuous	Flow Totalizer
BOD, Carbonaceous 5 day, 20C	Sample Measurement										
PARM Code 80082 Y Mon. Site No. EFA-1	Permit Requirement					5.0 (An.Avg.)		mg/L		Weekly	24-hr FPC
BOD, Carbonaceous 5 day, 20C	Sample Measurement										
PARM Code 80082 A Mon. Site No. EFA-1	Permit Requirement				10.0 (Max.)	7.5 (Max.Wk.Avg.)	6.25 (Mo.Avg.)	mg/L		Weekly	24-hr FPC
Solids, Total Suspended	Sample Measurement										
PARM Code 00530 Y Mon. Site No. EFA-1	Permit Requirement					5.0 (An.Avg.)		mg/L		Weekly	24-hr FPC
Solids, Total Suspended	Sample Measurement										
PARM Code 00530 A Mon. Site No. EFA-1	Permit Requirement				10.0 (Max.)	7.5 (Max.Wk.Avg.)	6.25 (Mo.Avg.)	mg/L		Weekly	24-hr FPC

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: D-001 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
pH	Sample Measurement										
PARM Code 00400 A Mon. Site No. EFA-1	Permit Requirement				6.0 (Min.)		8.5 (Max.)	s.u.		Continuous	Meter
Ultraviolet Light Intensity (For Disinfection)	Sample Measurement										
PARM Code 49607 J Mon. Site No. PPI-1	Permit Requirement				Report (Min.)			mW/sqcm		Daily; 24 hours	Meter
Ultraviolet Light Dosage (For Dechlorination)	Sample Measurement										
PARM Code 61938 J Mon. Site No. PPI-1	Permit Requirement				Report (Min.)			mW-s/sqcm		Daily; 24 hours	Meter
Ultraviolet Light Transmittance	Sample Measurement										
PARM Code 51043 J Mon. Site No. PPI-1	Permit Requirement				Report (Min.)			percent		Daily; 24 hours	Meter
Coliform, Fecal	Sample Measurement										
PARM Code 74055 Y Mon. Site No. EFA-1	Permit Requirement					200 (An.Avg.)		#/100mL		Weekly	Grab
Coliform, Fecal	Sample Measurement										
PARM Code 74055 A Mon. Site No. EFA-1	Permit Requirement					200 (Mo.Geo.Mn.)	800 (Max.)	#/100mL		Weekly	Grab
E.coli	Sample Measurement										
PARM Code 51040 A Mon. Site No. EFA-1	Permit Requirement					126 (Mo.Geo.Mn.)	410 (90th %)	#/100mL		Weekly	Grab
Temperature (C), Water (Effluent)	Sample Measurement										
PARM Code 00010 A Mon. Site No. EFA-1	Permit Requirement						Report (Max.)	Deg C		Weekly	Meter
Nitrogen, Ammonia, Total (as N) (Effluent)	Sample Measurement										
PARM Code 00610 Y Mon. Site No. EFA-1	Permit Requirement					Report (An.Avg.)		mg/L		Weekly	24-hr FPC
Nitrogen, Ammonia, Total (as N) (Effluent)	Sample Measurement										
PARM Code 00610 A Mon. Site No. EFA-1	Permit Requirement				Report (Max.)	Report (Max.Wk.Avg.)	2.0 (Mo.Avg.)	mg/L		Weekly	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: D-001 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Nitrogen, Total	Sample Measurement										
PARM Code 00600 Y Mon. Site No. EFA-1	Permit Requirement					3.0 (An.Avg.)		mg/L		Weekly	24-hr FPC
Nitrogen, Total	Sample Measurement										
PARM Code 00600 A Mon. Site No. EFA-1	Permit Requirement				6.0 (Max.)	4.5 (Max.Wk.Avg.)	3.75 (Mo.Avg.)	mg/L		Weekly	24-hr FPC
Phosphorus, Total (as P)	Sample Measurement										
PARM Code 00665 Y Mon. Site No. EFA-1	Permit Requirement					1.0 (An.Avg.)		mg/L		Weekly	24-hr FPC
Phosphorus, Total (as P)	Sample Measurement										
PARM Code 00665 A Mon. Site No. EFA-1	Permit Requirement				2.0 (Max.)	1.5 (Max.Wk.Avg.)	1.25 (Mo.Avg.)	mg/L		Weekly	24-hr FPC
Stream Stage	Sample Measurement										
PARM Code 34782 P Mon. Site No. WEP-01	Permit Requirement		Report (Max.)	ft						Continuous	Meter
7-DAY CHRONIC STATRE Ceriodaphnia dubia (Routine)	Sample Measurement										
PARM Code TRP3B P Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		Semi-Annually; twice per year	Grab
7-DAY CHRONIC STATRE Ceriodaphnia dubia (Additional)	Sample Measurement										
PARM Code TRP3B Q Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		As needed	As required by the permit
7-DAY CHRONIC STATRE Ceriodaphnia dubia (Additional)	Sample Measurement										
PARM Code TRP3B R Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		As needed	As required by the permit
7-DAY CHRONIC STATRE Pimephales promelas (Routine)	Sample Measurement										
PARM Code TRP6C P Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		Semi-Annually; twice per year	Grab
7-DAY CHRONIC STATRE Pimephales promelas (Additional)	Sample Measurement										
PARM Code TRP6C Q Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		As needed	As required by the permit

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: D-001 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
7-DAY CHRONIC STATRE Pimephales promelas (Additional)	Sample Measurement										
PARM Code TRP6C R Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		As needed	As required by the permit
Nitrogen, Ammonia, Total (as N)	Sample Measurement										
PARM Code 00610 P Mon. Site No. EFA-1	Permit Requirement					Report (An.Avg.)		mg/L		Weekly	24-hr FPC
Nitrogen, Ammonia, Total (as N)	Sample Measurement										
PARM Code 00610 Q Mon. Site No. EFA-1	Permit Requirement					2.0 (Mo.Avg.)	Report (Max.)	mg/L		Weekly	24-hr FPC
Flow	Sample Measurement										
PARM Code 50050 G Mon. Site No. INF-1	Permit Requirement		1.55 (An.Avg.)	MGD						Continuous	Flow Totalizer
Flow	Sample Measurement										
PARM Code 50050 P Mon. Site No. INF-1	Permit Requirement	Report (Qt.Avg.)	Report (Mo.Avg.)	MGD						Continuous	Flow Totalizer
Percent Capacity, (TMADF/Permitted Capacity) x 100	Sample Measurement										
PARM Code 00180 P Mon. Site No. CAL-5	Permit Requirement						Report (Mo.Avg.)	percent		Monthly	Calculated
BOD, Carbonaceous 5 day, 20C (Influent)	Sample Measurement										
PARM Code 80082 G Mon. Site No. INF-1	Permit Requirement						Report (Max.)	mg/L		Weekly	24-hr FPC
Solids, Total Suspended (Influent)	Sample Measurement										
PARM Code 00530 G Mon. Site No. INF-1	Permit Requirement						Report (Max.)	mg/L		Weekly	24-hr FPC

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed submit this report to: http://www.fldepportal.com/go/

PERMITTEE NAME: JEA
MAILING ADDRESS: 21 W Church St T-8
Jacksonville, Florida 32202- 3155

FACILITY: Nassau Regional WWTF
LOCATION: State Road 200 (A1A) At Chester Road
96237 Amelia Concourse
Yulee, FL 32097-

COUNTY: Nassau
OFFICE: Northeast District

PERMIT NUMBER: FL0116793-019-DW1P

LIMIT: Final
CLASS SIZE: MI
MONITORING GROUP NUMBER: D-001
MONITORING GROUP DESCRIPTION: discharge to Yulee wetland
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: _____ To: _____

REPORT FREQUENCY: Quarterly
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Nitrogen, Total	Sample Measurement										
PARM Code 00600 Y Mon. Site No. WEP-01	Permit Requirement					3.0 (An.Avg.)		mg/L		Quarterly	Grab
Nitrogen, Total	Sample Measurement										
PARM Code 00600 P Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Nitrogen, Ammonia, Total unionized (as N)	Sample Measurement										
PARM Code 00612 Y Mon. Site No. CAL-1	Permit Requirement					0.02 (An.Avg.)		mg/L		Quarterly	Calculated
Nitrogen, Ammonia, Total unionized (as N)	Sample Measurement										
PARM Code 00612 P Mon. Site No. CAL-1	Permit Requirement						Report (Max.)	mg/L		Quarterly	Calculated
Phosphorus, Total (as P)	Sample Measurement										
PARM Code 00665 Y Mon. Site No. WEP-01	Permit Requirement					0.20 (An.Avg.)		mg/L		Quarterly	Grab
Phosphorus, Total (as P)	Sample Measurement										
PARM Code 00665 P Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

ISSUANCE/REISSUANCE DATE:
DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: D-001 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Nitrogen, Ammonia, Total (as N)	Sample Measurement										
PARM Code 00610 Y Mon. Site No. WIM-01	Permit Requirement					Report (An.Avg.)		mg/L		Quarterly	Grab
Nitrogen, Ammonia, Total (as N)	Sample Measurement										
PARM Code 00610 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Nitrogen, Ammonia, Total (as N)	Sample Measurement										
PARM Code 00610 Q Mon. Site No. WEP-01	Permit Requirement					Report (An.Avg.)		mg/L		Quarterly	Grab
Nitrogen, Ammonia, Total (as N)	Sample Measurement										
PARM Code 00610 R Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Temperature (C), Water	Sample Measurement										
PARM Code 00010 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	Deg C		Quarterly	Meter
Temperature (C), Water	Sample Measurement										
PARM Code 00010 Q Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	Deg C		Quarterly	Meter
Oxygen, Dissolved (DO)	Sample Measurement										
PARM Code 00300 P Mon. Site No. WIM-01	Permit Requirement				Report (Min.)			mg/L		Quarterly	Meter
Oxygen, Dissolved (DO)	Sample Measurement										
PARM Code 00300 Q Mon. Site No. WEP-01	Permit Requirement				Report (Min.)			mg/L		Quarterly	Meter
pH	Sample Measurement										
PARM Code 00400 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	s.u.		Quarterly	Meter
pH	Sample Measurement										
PARM Code 00400 Q Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	s.u.		Quarterly	Meter

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: D-001 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Specific Conductance	Sample Measurement										
PARM Code 00095 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	umhos/cm		Quarterly	Meter
Specific Conductance	Sample Measurement										
PARM Code 00095 Q Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	umhos/cm		Quarterly	Meter
BOD, Carbonaceous 5 day, 20C	Sample Measurement										
PARM Code 80082 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
BOD, Carbonaceous 5 day, 20C	Sample Measurement										
PARM Code 80082 Q Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Solids, Total Suspended	Sample Measurement										
PARM Code 00530 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Solids, Total Suspended	Sample Measurement										
PARM Code 00530 Q Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Phosphorus, Total (as P)	Sample Measurement										
PARM Code 00665 Q Mon. Site No. WEP-01	Permit Requirement					0.20 (An.Avg.)		mg/L		Quarterly	Grab
Phosphorus, Total (as P)	Sample Measurement										
PARM Code 00665 R Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Nitrogen, Kjeldahl, Total (as N)	Sample Measurement										
PARM Code 00625 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Nitrogen, Kjeldahl, Total (as N)	Sample Measurement										
PARM Code 00625 Q Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: D-001 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Nitrite plus Nitrate, Total 1 det. (as N)	Sample Measurement										
PARM Code 00630 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Nitrite plus Nitrate, Total 1 det. (as N)	Sample Measurement										
PARM Code 00630 Q Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Sulfate, Total	Sample Measurement										
PARM Code 00945 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Sulfate, Total	Sample Measurement										
PARM Code 00945 Q Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Coliform, Fecal	Sample Measurement										
PARM Code 74055 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	#/100mL		Quarterly	Grab
Coliform, Fecal	Sample Measurement										
PARM Code 74055 Q Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	#/100mL		Quarterly	Grab
Chlorophyll a	Sample Measurement										
PARM Code 32230 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Chlorophyll a	Sample Measurement										
PARM Code 32230 Q Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	mg/L		Quarterly	Grab
Water Level at samp. collection time	Sample Measurement										
PARM Code 85327 P Mon. Site No. WEP-01	Permit Requirement	Report (Min.)	Report (Max.)	ft						Quarterly	Grab

ISSUANCE/REISSUANCE DATE:

DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed submit this report to: http://www.fldepportal.com/go/

PERMITTEE NAME: JEA
MAILING ADDRESS: 21 W Church St T-8
Jacksonville, Florida 32202- 3155

FACILITY: Nassau Regional WWTF
LOCATION: State Road 200 (A1A) At Chester Road
96237 Amelia Concourse
Yulee, FL 32097-

COUNTY: Nassau
OFFICE: Northeast District

PERMIT NUMBER: FL0116793-019-DW1P

LIMIT: Final
CLASS SIZE: MI
MONITORING GROUP NUMBER: D-001
MONITORING GROUP DESCRIPTION: discharge to Yulee wetland
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: _____ To: _____

REPORT FREQUENCY: Annually
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Sulfide	Sample Measurement										
PARM Code 00745 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	mg/L		Annually	Grab
Sulfide	Sample Measurement										
PARM Code 00745 Q Mon. Site No. WIM-02	Permit Requirement						Report (Max.)	mg/L		Annually	Grab
Sulfide	Sample Measurement										
PARM Code 00745 R Mon. Site No. WEP-01	Permit Requirement						Report (Max.)	mg/L		Annually	Grab
Woody Vegetation	Sample Measurement										
PARM Code 51053 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Woody Vegetation	Sample Measurement										
PARM Code 51053 Q Mon. Site No. WIM-02	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Woody Vegetation	Sample Measurement										
PARM Code 51053 R Mon. Site No. WIM-03	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: D-001 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Threatnd & Endangerd Species, Presence	Sample Measurement										
PARM Code 51056 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Threatnd & Endangerd Species, Presence	Sample Measurement										
PARM Code 51056 Q Mon. Site No. WIM-02	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Threatnd & Endangerd Species, Presence	Sample Measurement										
PARM Code 51056 R Mon. Site No. WIM-03	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Herbaceous Vegetation	Sample Measurement										
PARM Code 51052 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Herbaceous Vegetation	Sample Measurement										
PARM Code 51052 Q Mon. Site No. WIM-02	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Herbaceous Vegetation	Sample Measurement										
PARM Code 51052 R Mon. Site No. WIM-03	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab

ISSUANCE/REISSUANCE DATE:

DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed submit this report to: http://www.fldepportal.com/go/

PERMITTEE NAME:	JEA	PERMIT NUMBER:	FL0116793-019-DW1P		
MAILING ADDRESS:	21 W Church St T-8 Jacksonville, Florida 32202- 3155	LIMIT: CLASS SIZE:	Final MI	REPORT FREQUENCY: PROGRAM:	Monthly Domestic
FACILITY:	Nassau Regional WWTF	MONITORING GROUP NUMBER:	D-002		
LOCATION:	State Road 200 (A1A) At Chester Road 96237 Amelia Concourse Yulee, FL 32097-	MONITORING GROUP DESCRIPTION: RE-SUBMITTED DMR: ☐ NO DISCHARGE FROM SITE: ☐	APRICOT ACT discharge		
COUNTY:	Nassau	MONITORING PERIOD From:	_____ To: _____		
OFFICE:	Northeast District				

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow (Apricot)	Sample Measurement										
PARM Code 50050 Y Mon. Site No. EFD-1	Permit Requirement		0.315 (An.Avg.)	MGD						Continuous	Flow Totalizer
Flow (Apricot)	Sample Measurement										
PARM Code 50050 1 Mon. Site No. EFD-1	Permit Requirement		Report (Mo.Avg.)	MGD						Continuous	Flow Totalizer
Flow, Total Volume	Sample Measurement										
PARM Code 82220 P Mon. Site No. CAL-2	Permit Requirement	Report (Day.Max.)	Report (Mo.Total)	Mgal						Monthly	Calculated
Flow, Total Volume	Sample Measurement										
PARM Code 82220 Q Mon. Site No. CAL-2	Permit Requirement		115.0 (An.Total)	Mgal						Monthly	Calculated
BOD, Carbonaceous 5 day, 20C	Sample Measurement										
PARM Code 80082 Y Mon. Site No. EFA-1	Permit Requirement					5.0 (An.Avg.)		mg/L		Weekly	24-hr FPC
BOD, Carbonaceous 5 day, 20C	Sample Measurement										
PARM Code 80082 A Mon. Site No. EFA-1	Permit Requirement				10.0 (Max.)	7.5 (Max.Wk.Avg.)	6.25 (Mo.Avg.)	mg/L		Weekly	24-hr FPC

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: D-002 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Solids, Total Suspended	Sample Measurement										
PARM Code 00530 B Mon. Site No. EFB-1	Permit Requirement						5.0 (Max.)	mg/L		Daily; 24 hours	Grab
Ultraviolet Light Intensity	Sample Measurement										
PARM Code 49607 J Mon. Site No. PPI-1	Permit Requirement				Report (Min.)			mW/sqcm		Continuous	Meter
Ultraviolet Light Dosage	Sample Measurement										
PARM Code 61938 J Mon. Site No. PPI-1	Permit Requirement				100 (Min.)			mW-s/sqcm		Continuous	Meter
Ultraviolet Light Transmittance	Sample Measurement										
PARM Code 51043 J Mon. Site No. PPI-1	Permit Requirement				65 (Min.)			percent		Continuous	Meter
pH	Sample Measurement										
PARM Code 00400 A Mon. Site No. EFA-1	Permit Requirement				6.0 (Min.)		8.5 (Max.)	s.u.		Continuous	Meter
Coliform, Fecal	Sample Measurement										
PARM Code 74055 A Mon. Site No. EFA-2	Permit Requirement						25 (Max.)	#/100mL		Daily; 24 hours	Grab
Coliform, Fecal, % less than detection	Sample Measurement										
PARM Code 51005 P Mon. Site No. CAL-4	Permit Requirement				75 (Min.Mo.Total)			percent		Monthly	Calculated
E.coli	Sample Measurement										
PARM Code 51040 A Mon. Site No. EFA-1	Permit Requirement					126 (Mo.Geo.Mn.)	410 (90th %)	#/100mL		Weekly	Grab
Oxygen, Dissolved (DO)	Sample Measurement										
PARM Code 00300 A Mon. Site No. EFA-1	Permit Requirement				Report (Min.)			mg/L		Daily; 24 hours	Meter
Nitrogen, Total	Sample Measurement										
PARM Code 00600 Y Mon. Site No. EFA-1	Permit Requirement					3.0 (An.Avg.)		mg/L		Weekly	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: D-002 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Nitrogen, Total	Sample Measurement										
PARM Code 00600 A Mon. Site No. EFA-1	Permit Requirement				6.0 (Max.)	4.5 (Max.Wk.Avg.)	3.75 (Mo.Avg.)	mg/L		Weekly	24-hr FPC
Phosphorus, Total (as P)	Sample Measurement										
PARM Code 00665 Y Mon. Site No. EFA-1	Permit Requirement					1.0 (An.Avg.)		mg/L		Weekly	24-hr FPC
Phosphorus, Total (as P)	Sample Measurement										
PARM Code 00665 A Mon. Site No. EFA-1	Permit Requirement				2.0 (Max.)	1.5 (Max.Wk.Avg.)	1.25 (Mo.Avg.)	mg/L		Weekly	24-hr FPC
7-DAY CHRONIC STATRE Ceriodaphnia dubia (Routine)	Sample Measurement										
PARM Code TRP3B P Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		Semi-Annually; twice per year	Grab
7-DAY CHRONIC STATRE Ceriodaphnia dubia (Additional)	Sample Measurement										
PARM Code TRP3B Q Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		As needed	As required by the permit
7-DAY CHRONIC STATRE Ceriodaphnia dubia (Additional)	Sample Measurement										
PARM Code TRP3B R Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		As needed	As required by the permit
7-DAY CHRONIC STATRE Pimephales promelas (Routine)	Sample Measurement										
PARM Code TRP6C P Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		Semi-Annually; twice per year	Grab
7-DAY CHRONIC STATRE Pimephales promelas (Additional)	Sample Measurement										
PARM Code TRP6C Q Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		As needed	As required by the permit
7-DAY CHRONIC STATRE Pimephales promelas (Additional)	Sample Measurement										
PARM Code TRP6C R Mon. Site No. EFA-1	Permit Requirement				100 (Min.)			percent		As needed	As required by the permit

ISSUANCE/REISSUANCE DATE:

DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed submit this report to: http://www.fldepportal.com/go/

PERMITTEE NAME: JEA
MAILING ADDRESS: 21 W Church St T-8
Jacksonville, Florida 32202- 3155

FACILITY: Nassau Regional WWTF
LOCATION: State Road 200 (A1A) At Chester Road
96237 Amelia Concourse
Yulee, FL 32097-
COUNTY: Nassau
OFFICE: Northeast District

PERMIT NUMBER: FL0116793-019-DW1P
LIMIT: Final
CLASS SIZE: MI
MONITORING GROUP NUMBER: R-001
MONITORING GROUP DESCRIPTION: Discharge to percolation pond, including Influent
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: _____ To: _____

REPORT FREQUENCY: Monthly
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow (Perc Ponds)	Sample Measurement										
PARM Code 50050 Y Mon. Site No. CAL-3	Permit Requirement		0.300 (An.Avg.)	MGD						Daily; 24 hours	Calculated
Flow (Perc Ponds)	Sample Measurement										
PARM Code 50050 P Mon. Site No. CAL-3	Permit Requirement		Report (Mo.Avg.)	MGD						Daily; 24 hours	Calculated
BOD, Carbonaceous 5 day, 20C	Sample Measurement										
PARM Code 80082 Y Mon. Site No. EFA-2	Permit Requirement					20.0 (An.Avg.)		mg/L		Weekly	24-hr FPC
BOD, Carbonaceous 5 day, 20C	Sample Measurement										
PARM Code 80082 A Mon. Site No. EFA-2	Permit Requirement				60.0 (Max.)	45.0 (Max.Wk.Avg.)	30.0 (Mo.Avg.)	mg/L		Weekly	24-hr FPC
Solids, Total Suspended	Sample Measurement										
PARM Code 00530 Y Mon. Site No. EFA-2	Permit Requirement					20.0 (An.Avg.)		mg/L		Daily; 24 hours	24-hr FPC
Solids, Total Suspended	Sample Measurement										
PARM Code 00530 A Mon. Site No. EFA-2	Permit Requirement				60.0 (Max.)	45.0 (Max.Wk.Avg.)	30.0 (Mo.Avg.)	mg/L		Daily; 24 hours	24-hr FPC

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

ISSUANCE/REISSUANCE DATE:
DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: R-001 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Coliform, Fecal	Sample Measurement										
PARM Code 74055 Y Mon. Site No. EFA-2	Permit Requirement					200 (An.Avg.)		#/100mL		Weekly	Grab
Coliform, Fecal	Sample Measurement										
PARM Code 74055 A Mon. Site No. EFA-2	Permit Requirement					200 (Mo.Geo.Mn.)	800 (Max.)	#/100mL		Weekly	Grab
pH	Sample Measurement										
PARM Code 00400 A Mon. Site No. EFA-2	Permit Requirement				6.0 (Min.)		8.5 (Max.)	s.u.		Continuous	Meter
Nitrogen, Total	Sample Measurement										
PARM Code 00600 A Mon. Site No. EFA-2	Permit Requirement						12.0 (Max.)	mg/L		Weekly	24-hr FPC
Ultraviolet Light Dosage (For Disinfection)	Sample Measurement										
PARM Code 61938 J Mon. Site No. PPI-1	Permit Requirement				Report (Min.)			mW-s/sqcm		Continuous	Meter
Ultraviolet Light Transmittance	Sample Measurement										
PARM Code 51043 J Mon. Site No. PPI-1	Permit Requirement				Report (Min.)			percent		Continuous	Meter
Ultraviolet Light Intensity	Sample Measurement										
PARM Code 49607 J Mon. Site No. PPI-1	Permit Requirement				Report (Min.)			mW/sqcm		Continuous	Meter

ISSUANCE/REISSUANCE DATE:

DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed submit this report to: http://www.fldepportal.com/go/

PERMITTEE NAME: JEA
MAILING ADDRESS: 21 W Church St T-8
Jacksonville, Florida 32202- 3155

FACILITY: Nassau Regional WWTF
LOCATION: State Road 200 (A1A) At Chester Road
96237 Amelia Concourse
Yulee, FL 32097-
COUNTY: Nassau
OFFICE: Northeast District

PERMIT NUMBER: FL0116793-019-DW1P

LIMIT: Final
CLASS SIZE: MI
MONITORING GROUP NUMBER: R-001
MONITORING GROUP DESCRIPTION: Discharge to percolation pond, including Influent
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: _____ To: _____

REPORT FREQUENCY: Annually
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Threatnd & Endangerd Species, Presence	Sample Measurement										
PARM Code 51056 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Threatnd & Endangerd Species, Presence	Sample Measurement										
PARM Code 51056 Q Mon. Site No. WIM-02	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Threatnd & Endangerd Species, Presence	Sample Measurement										
PARM Code 51056 R Mon. Site No. WIM-03	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Herbaceous Vegetation	Sample Measurement										
PARM Code 51052 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Herbaceous Vegetation	Sample Measurement										
PARM Code 51052 Q Mon. Site No. WIM-02	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Herbaceous Vegetation	Sample Measurement										
PARM Code 51052 R Mon. Site No. WIM-03	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab

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NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

ISSUANCE/REISSUANCE DATE:
DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: R-001 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Woody Vegetation	Sample Measurement										
PARM Code 51053 P Mon. Site No. WIM-01	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Woody Vegetation	Sample Measurement										
PARM Code 51053 Q Mon. Site No. WIM-02	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab
Woody Vegetation	Sample Measurement										
PARM Code 51053 R Mon. Site No. WIM-03	Permit Requirement						Report (Max.)	Yes=1; No=0		Annually	Grab

ISSUANCE/REISSUANCE DATE:

DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed submit this report to: http://www.fldepportal.com/go/

PERMITTEE NAME: JEA
MAILING ADDRESS: 21 W Church St T-8
Jacksonville, Florida 32202- 3155

FACILITY: Nassau Regional WWTF
LOCATION: State Road 200 (A1A) At Chester Road
96237 Amelia Concourse
Yulee, FL 32097-

COUNTY: Nassau
OFFICE: Northeast District

PERMIT NUMBER: FL0116793-019-DW1P

LIMIT: Final
CLASS SIZE: MI
MONITORING GROUP NUMBER: R-002
MONITORING GROUP DESCRIPTION: Discharge to public access reuse system, includes influent
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: _____ To: _____

REPORT FREQUENCY: Monthly
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow	Sample Measurement										
PARM Code 50050 Y Mon. Site No. FLW-3	Permit Requirement		0.750 (An.Avg.)	MGD						Continuous	Flow Totalizer
Flow	Sample Measurement										
PARM Code 50050 1 Mon. Site No. FLW-3	Permit Requirement		Report (Mo.Avg.)	MGD						Continuous	Flow Totalizer
BOD, Carbonaceous 5 day, 20C	Sample Measurement										
PARM Code 80082 Y Mon. Site No. EFA-2	Permit Requirement					20.0 (An.Avg.)		mg/L		Weekly	16-hr FPC
BOD, Carbonaceous 5 day, 20C	Sample Measurement										
PARM Code 80082 A Mon. Site No. EFA-2	Permit Requirement				60.0 (Max.)	45.0 (Max.Wk.Avg.)	30.0 (Mo.Avg.)	mg/L		Weekly	16-hr FPC
Solids, Total Suspended	Sample Measurement										
PARM Code 00530 B Mon. Site No. EFB-1	Permit Requirement						5.0 (Max.)	mg/L		Daily; 24 hours	Grab
Turbidity	Sample Measurement										
PARM Code 00070 B Mon. Site No. EFB-1	Permit Requirement						Report (Max.)	NTU		Continuous	Meter

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NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: R-002 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Nitrogen, Total	Sample Measurement										
PARM Code 00600 A Mon. Site No. EFA-2	Permit Requirement						12.0 (Max.)	mg/L		Weekly	24-hr FPC
Coliform, Fecal	Sample Measurement										
PARM Code 74055 A Mon. Site No. EFA-2	Permit Requirement						25 (Max.)	#/100mL		Daily; 24 hours	Grab
Coliform, Fecal, % less than detection	Sample Measurement										
PARM Code 51005 P Mon. Site No. CAL-1	Permit Requirement				75 (Min.Mo.Total)			percent		Daily; 24 hours	Calculated
pH	Sample Measurement										
PARM Code 00400 A Mon. Site No. EFA-2	Permit Requirement				6.0 (Min.)		8.5 (Max.)	s.u.		Continuous	Meter
Ultraviolet Light Dosage	Sample Measurement										
PARM Code 61938 J Mon. Site No. PPI-1	Permit Requirement						100 (Min.)	mW-s/sqcm		Continuous	Meter
Ultraviolet Light Transmittance	Sample Measurement										
PARM Code 51043 J Mon. Site No. PPI-1	Permit Requirement				65 (Min.)			percent		Continuous	Meter
Ultraviolet Light Intensity	Sample Measurement										
PARM Code 49607 J Mon. Site No. PPI-1	Permit Requirement						Report (Min.)	mW/sqcm		Continuous	Meter
Water Level at samp. collection time (in UV Reactors)	Sample Measurement										
PARM Code 85327 J Mon. Site No. PPI-1	Permit Requirement	Report (Min.)	Report (Max.)	ft						Continuous	Meter

ISSUANCE/REISSUANCE DATE:

DMR EFFECTIVE DATE: 05/01/2014 - 02/28/2019, 03/01/2019 - Permit expiration

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed submit this report to: http://www.fldepportal.com/go/

PERMITTEE NAME: JEA
MAILING ADDRESS: 21 W Church St T-8
Jacksonville, Florida 32202- 3155

FACILITY: Nassau Regional WWTF
LOCATION: State Road 200 (A1A) At Chester Road
96237 Amelia Concourse
Yulee, FL 32097-

COUNTY: Nassau
OFFICE: Northeast District

PERMIT NUMBER: FL0116793-019-DW1P

LIMIT: Final
CLASS SIZE: MI
MONITORING GROUP NUMBER: R-002
MONITORING GROUP DESCRIPTION: Discharge to public access reuse system, includes influent
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: _____ To: _____

REPORT FREQUENCY: Annually
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Aluminum, Total Recoverable	Sample Measurement										
PARM Code 01104 A Mon. Site No. EFA-2	Permit Requirement				0.2 (An.Avg.)	0.4 (Max.)		mg/L		Annually	24-hr FPC
Chloride (as Cl)	Sample Measurement										
PARM Code 00940 A Mon. Site No. EFA-2	Permit Requirement				250 (An.Avg.)	500 (Max.)		mg/L		Annually	24-hr FPC
Fluoride, Total (as F)	Sample Measurement										
PARM Code 00951 A Mon. Site No. EFA-2	Permit Requirement				2.0 (An.Avg.)	4.0 (Max.)		mg/L		Annually	24-hr FPC
Iron, Total Recoverable	Sample Measurement										
PARM Code 00980 A Mon. Site No. EFA-2	Permit Requirement				0.3 (An.Avg.)	0.6 (Max.)		mg/L		Annually	24-hr FPC
Copper, Total Recoverable	Sample Measurement										
PARM Code 01119 A Mon. Site No. EFA-2	Permit Requirement				1 (An.Avg.)	2 (Max.)		mg/L		Annually	24-hr FPC
Manganese, Total Recoverable	Sample Measurement										
PARM Code 11123 A Mon. Site No. EFA-2	Permit Requirement				0.05 (An.Avg.)	0.10 (Max.)		mg/L		Annually	24-hr FPC

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NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

ISSUANCE/REISSUANCE DATE:
DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: R-002 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Silver, Total Recoverable	Sample Measurement										
PARM Code 01079 A Mon. Site No. EFA-2	Permit Requirement				0.1 (An.Avg.)	0.2 (Max.)		mg/L		Annually	24-hr FPC
Sulfate, Total	Sample Measurement										
PARM Code 00945 A Mon. Site No. EFA-2	Permit Requirement				250 (An.Avg.)	500 (Max.)		mg/L		Annually	24-hr FPC
Zinc, Total Recoverable	Sample Measurement										
PARM Code 01094 A Mon. Site No. EFA-2	Permit Requirement				5 (An.Avg.)	10 (Max.)		mg/L		Annually	24-hr FPC
Color	Sample Measurement										
PARM Code 00080 A Mon. Site No. EFA-2	Permit Requirement				15 (An.Avg.)	30 (Max.)		PCU		Annually	24-hr FPC
Odor (threshold no. at room temperature)	Sample Measurement										
PARM Code 00085 A Mon. Site No. EFA-2	Permit Requirement				3 (An.Avg.)	6 (Max.)		threshold number		Annually	24-hr FPC
pH	Sample Measurement										
PARM Code 00400 A Mon. Site No. EFA-2	Permit Requirement				6.5 (Min.)	8.5 (Max.)		s.u.		Annually	24-hr FPC
Solids, Total Dissolved (TDS)	Sample Measurement										
PARM Code 70295 A Mon. Site No. EFA-2	Permit Requirement				500 (An.Avg.)	1000 (Max.)		mg/L		Annually	24-hr FPC
Foaming Agents	Sample Measurement										
PARM Code 01288 A Mon. Site No. EFA-2	Permit Requirement				0.5 (An.Avg.)	1.0 (Max.)		mg/L		Annually	24-hr FPC
Antimony, Total Recoverable	Sample Measurement										
PARM Code 01268 A Mon. Site No. EFA-2	Permit Requirement				0.006 (Max.)			mg/L		Annually	24-hr FPC
Arsenic, Total Recoverable	Sample Measurement										
PARM Code 00978 A Mon. Site No. EFA-2	Permit Requirement				0.010 (Max.)			mg/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: R-002 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Barium, Total Recoverable	Sample Measurement										
PARM Code 01009 A Mon. Site No. EFA-2	Permit Requirement				2 (Max.)			mg/L		Annually	24-hr FPC
Beryllium, Total Recoverable	Sample Measurement										
PARM Code 00998 A Mon. Site No. EFA-2	Permit Requirement				0.004 (Max.)			mg/L		Annually	24-hr FPC
Cadmium, Total Recoverable	Sample Measurement										
PARM Code 01113 A Mon. Site No. EFA-2	Permit Requirement				0.005 (Max.)			mg/L		Annually	24-hr FPC
Chromium, Total Recoverable	Sample Measurement										
PARM Code 01118 A Mon. Site No. EFA-2	Permit Requirement				0.1 (Max.)			mg/L		Annually	24-hr FPC
Cyanide, Total Recoverable	Sample Measurement										
PARM Code 78248 A Mon. Site No. EFA-2	Permit Requirement				0.2 (Max.)			mg/L		Annually	24-hr FPC
Lead, Total Recoverable	Sample Measurement										
PARM Code 01114 A Mon. Site No. EFA-2	Permit Requirement				0.015 (Max.)			mg/L		Annually	24-hr FPC
Mercury, Total Recoverable	Sample Measurement										
PARM Code 71901 A Mon. Site No. EFA-2	Permit Requirement				0.002 (Max.)			mg/L		Annually	24-hr FPC
Nickel, Total Recoverable	Sample Measurement										
PARM Code 01074 A Mon. Site No. EFA-2	Permit Requirement				0.1 (Max.)			mg/L		Annually	24-hr FPC
Nitrogen, Nitrate, Total (as N)	Sample Measurement										
PARM Code 00620 A Mon. Site No. EFA-2	Permit Requirement				10 (Max.)			mg/L		Annually	24-hr FPC
Nitrogen, Nitrite, Total (as N)	Sample Measurement										
PARM Code 00615 A Mon. Site No. EFA-2	Permit Requirement				1 (Max.)			mg/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: R-002 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Nitrite plus Nitrate, Total 1 det. (as N)	Sample Measurement										
PARM Code 00630 A Mon. Site No. EFA-2	Permit Requirement				10 (Max.)			mg/L		Annually	24-hr FPC
Selenium, Total Recoverable	Sample Measurement										
PARM Code 00981 A Mon. Site No. EFA-2	Permit Requirement				0.05 (Max.)			mg/L		Annually	24-hr FPC
Sodium, Total Recoverable	Sample Measurement										
PARM Code 00923 A Mon. Site No. EFA-2	Permit Requirement				160 (An.Avg.)	200 (Mo.Avg.)	320 (Max.)	mg/L		Annually	24-hr FPC
Thallium, Total Recoverable	Sample Measurement										
PARM Code 00982 A Mon. Site No. EFA-2	Permit Requirement				0.002 (Max.)			mg/L		Annually	24-hr FPC
1,1-dichloroethylene	Sample Measurement										
PARM Code 34501 A Mon. Site No. EFA-2	Permit Requirement				0.007 (Max.)			mg/L		Annually	24-hr FPC
1,1,1-trichloroethane	Sample Measurement										
PARM Code 34506 A Mon. Site No. EFA-2	Permit Requirement				0.2 (Max.)			mg/L		Annually	24-hr FPC
1,1,2-trichloroethane	Sample Measurement										
PARM Code 34511 A Mon. Site No. EFA-2	Permit Requirement				0.005 (Max.)			mg/L		Annually	24-hr FPC
1,2-dichloroethane	Sample Measurement										
PARM Code 32103 A Mon. Site No. EFA-2	Permit Requirement				0.003 (Max.)			mg/L		Annually	24-hr FPC
1,2-dichloropropane	Sample Measurement										
PARM Code 34541 A Mon. Site No. EFA-2	Permit Requirement				0.005 (Max.)			mg/L		Annually	24-hr FPC
1,2,4-trichlorobenzene	Sample Measurement										
PARM Code 34551 A Mon. Site No. EFA-2	Permit Requirement				0.07 (Max.)			mg/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: R-002 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Benzene	Sample Measurement										
PARM Code 34030 A Mon. Site No. EFA-2	Permit Requirement				0.001 (Max.)			mg/L		Annually	24-hr FPC
Carbon tetrachloride	Sample Measurement										
PARM Code 32102 A Mon. Site No. EFA-2	Permit Requirement				0.003 (Max.)			mg/L		Annually	24-hr FPC
Cis-1,2-dichloroethene	Sample Measurement										
PARM Code 81686 A Mon. Site No. EFA-2	Permit Requirement				0.07 (Max.)			mg/L		Annually	24-hr FPC
Dichloromethane (methylene chloride)	Sample Measurement										
PARM Code 03821 A Mon. Site No. EFA-2	Permit Requirement				0.005 (Max.)			mg/L		Annually	24-hr FPC
Ethylbenzene	Sample Measurement										
PARM Code 34371 A Mon. Site No. EFA-2	Permit Requirement				0.7 (Max.)			mg/L		Annually	24-hr FPC
Monochlorobenzene	Sample Measurement										
PARM Code 34031 A Mon. Site No. EFA-2	Permit Requirement				0.1 (Max.)			mg/L		Annually	24-hr FPC
1,2-dichlorobenzene	Sample Measurement										
PARM Code 34536 A Mon. Site No. EFA-2	Permit Requirement				0.6 (Max.)			mg/L		Annually	24-hr FPC
1,4-dichlorobenzene	Sample Measurement										
PARM Code 34571 A Mon. Site No. EFA-2	Permit Requirement				0.075 (Max.)			mg/L		Annually	24-hr FPC
Styrene, Total	Sample Measurement										
PARM Code 77128 A Mon. Site No. EFA-2	Permit Requirement				0.1 (Max.)			mg/L		Annually	24-hr FPC
Tetrachloroethylene	Sample Measurement										
PARM Code 34475 A Mon. Site No. EFA-2	Permit Requirement				0.003 (Max.)			mg/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: R-002 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Toluene	Sample Measurement										
PARM Code 34010 A Mon. Site No. EFA-2	Permit Requirement				1 (Max.)			mg/L		Annually	24-hr FPC
1,2-trans-dichloroethylene	Sample Measurement										
PARM Code 34546 A Mon. Site No. EFA-2	Permit Requirement				0.1 (Max.)			mg/L		Annually	24-hr FPC
Trichloroethylene	Sample Measurement										
PARM Code 39180 A Mon. Site No. EFA-2	Permit Requirement				0.003 (Max.)			mg/L		Annually	24-hr FPC
Vinyl chloride	Sample Measurement										
PARM Code 39175 A Mon. Site No. EFA-2	Permit Requirement				0.001 (Max.)			mg/L		Annually	24-hr FPC
Xylenes	Sample Measurement										
PARM Code 81551 A Mon. Site No. EFA-2	Permit Requirement				10 (Max.)			mg/L		Annually	24-hr FPC
2,3,7,8-tetrachlorodibenzo-p-dioxin	Sample Measurement										
PARM Code 34675 A Mon. Site No. EFA-2	Permit Requirement				0.00003 (Max.)			ug/L		Annually	24-hr FPC
2,4-dichlorophenoxyacetic acid	Sample Measurement										
PARM Code 39730 A Mon. Site No. EFA-2	Permit Requirement				0.07 (Max.)			mg/L		Annually	24-hr FPC
Silvex	Sample Measurement										
PARM Code 39760 A Mon. Site No. EFA-2	Permit Requirement				0.05 (Max.)			mg/L		Annually	24-hr FPC
Alachlor	Sample Measurement										
PARM Code 39161 A Mon. Site No. EFA-2	Permit Requirement				0.002 (Max.)			mg/L		Annually	24-hr FPC
Atrazine	Sample Measurement										
PARM Code 39033 A Mon. Site No. EFA-2	Permit Requirement				0.003 (Max.)			mg/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: R-002 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Benzo(a)pyrene	Sample Measurement										
PARM Code 34247 A Mon. Site No. EFA-2	Permit Requirement				0.2 (Max.)			ug/L		Annually	24-hr FPC
Carbofuran	Sample Measurement										
PARM Code 81405 A Mon. Site No. EFA-2	Permit Requirement				0.04 (Max.)			mg/L		Annually	24-hr FPC
Chlordane (tech mix. and metabolites)	Sample Measurement										
PARM Code 39350 A Mon. Site No. EFA-2	Permit Requirement				0.002 (Max.)			mg/L		Annually	24-hr FPC
Dalapon	Sample Measurement										
PARM Code 38432 A Mon. Site No. EFA-2	Permit Requirement				0.2 (Max.)			mg/L		Annually	24-hr FPC
Bis(2-ethylhexyl)adipate	Sample Measurement										
PARM Code 77903 A Mon. Site No. EFA-2	Permit Requirement				0.4 (Max.)			mg/L		Annually	24-hr FPC
Bis (2-ethylhexyl) phthalate	Sample Measurement										
PARM Code 39100 A Mon. Site No. EFA-2	Permit Requirement				0.006 (Max.)			mg/L		Annually	24-hr FPC
Dibromochloropropane (DBCP)	Sample Measurement										
PARM Code 82625 A Mon. Site No. EFA-2	Permit Requirement				0.2 (Max.)			ug/L		Annually	24-hr FPC
Dinoseb	Sample Measurement										
PARM Code 30191 A Mon. Site No. EFA-2	Permit Requirement				0.007 (Max.)			mg/L		Annually	24-hr FPC
Diquat	Sample Measurement										
PARM Code 04443 A Mon. Site No. EFA-2	Permit Requirement				0.02 (Max.)			mg/L		Annually	24-hr FPC
Endothall	Sample Measurement										
PARM Code 38926 A Mon. Site No. EFA-2	Permit Requirement				0.1 (Max.)			mg/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: R-002 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Endrin	Sample Measurement										
PARM Code 39390 A Mon. Site No. EFA-2	Permit Requirement				0.002 (Max.)			mg/L		Annually	24-hr FPC
Ethylene dibromide (1,2-dibromoethane)	Sample Measurement										
PARM Code 77651 A Mon. Site No. EFA-2	Permit Requirement				0.02 (Max.)			ug/L		Annually	24-hr FPC
Glyphosate	Sample Measurement										
PARM Code 79743 A Mon. Site No. EFA-2	Permit Requirement				0.7 (Max.)			mg/L		Annually	24-hr FPC
Heptachlor	Sample Measurement										
PARM Code 39410 A Mon. Site No. EFA-2	Permit Requirement				0.4 (Max.)			ug/L		Annually	24-hr FPC
Heptachlor epoxide	Sample Measurement										
PARM Code 39420 A Mon. Site No. EFA-2	Permit Requirement				0.2 (Max.)			ug/L		Annually	24-hr FPC
Hexachlorobenzene	Sample Measurement										
PARM Code 39700 A Mon. Site No. EFA-2	Permit Requirement				0.001 (Max.)			mg/L		Annually	24-hr FPC
Hexachlorocyclopentadiene	Sample Measurement										
PARM Code 34386 A Mon. Site No. EFA-2	Permit Requirement				0.05 (Max.)			mg/L		Annually	24-hr FPC
Gamma BHC (Lindane)	Sample Measurement										
PARM Code 39782 A Mon. Site No. EFA-2	Permit Requirement				0.2 (Max.)			ug/L		Annually	24-hr FPC
Methoxychlor	Sample Measurement										
PARM Code 39480 A Mon. Site No. EFA-2	Permit Requirement				0.04 (Max.)			mg/L		Annually	24-hr FPC
Oxamyl (vydate)	Sample Measurement										
PARM Code 38865 A Mon. Site No. EFA-2	Permit Requirement				0.2 (Max.)			mg/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: R-002 PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Pentachlorophenol	Sample Measurement										
PARM Code 39032 A Mon. Site No. EFA-2	Permit Requirement				0.001 (Max.)			mg/L		Annually	24-hr FPC
Picloram	Sample Measurement										
PARM Code 39720 A Mon. Site No. EFA-2	Permit Requirement				0.5 (Max.)			mg/L		Annually	24-hr FPC
Polychlorinated Biphenyls (PCBs)	Sample Measurement										
PARM Code 39516 A Mon. Site No. EFA-2	Permit Requirement				0.5 (Max.)			ug/L		Annually	24-hr FPC
Simazine	Sample Measurement										
PARM Code 39055 A Mon. Site No. EFA-2	Permit Requirement				0.004 (Max.)			mg/L		Annually	24-hr FPC
Toxaphene	Sample Measurement										
PARM Code 39400 A Mon. Site No. EFA-2	Permit Requirement				0.003 (Max.)			mg/L		Annually	24-hr FPC
Trihalomethane, Total by summation	Sample Measurement										
PARM Code 82080 A Mon. Site No. EFA-2	Permit Requirement				0.080 (Max.)			mg/L		Annually	24-hr FPC
Radium 226 + Radium 228, Total	Sample Measurement										
PARM Code 11503 A Mon. Site No. EFA-2	Permit Requirement				5 (Max.)			pCi/L		Annually	24-hr FPC
Alpha, Gross Particle Activity	Sample Measurement										
PARM Code 80045 A Mon. Site No. EFA-2	Permit Requirement				15 (Max.)			pCi/L		Annually	24-hr FPC

ISSUANCE/REISSUANCE DATE:

DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed submit this report to: http://www.fldepportal.com/go/

PERMITTEE NAME: JEA
MAILING ADDRESS: 21 W Church St T-8
Jacksonville, Florida 32202- 3155

FACILITY: Nassau Regional WWTF
LOCATION: State Road 200 (A1A) At Chester Road
96237 Amelia Concourse
Yulee, FL 32097-
COUNTY: Nassau
OFFICE: Northeast District

PERMIT NUMBER: FL0116793-019-DW1P
LIMIT: Final
CLASS SIZE: MI
MONITORING GROUP NUMBER: RMP-Q
MONITORING GROUP DESCRIPTION: Biosolids Quantity
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: _____ To: _____

REPORT FREQUENCY: Monthly
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Biosolids Quantity (Transferred)	Sample Measurement										
PARM Code B0007 + Mon. Site No. RMP-1	Permit Requirement		Report (Mo.Total)	dry tons						Monthly	Calculated
Biosolids Quantity (Landfilled)	Sample Measurement										
PARM Code B0008 + Mon. Site No. RMP-2	Permit Requirement		Report (Mo.Total)	dry tons						Monthly	Calculated

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

ISSUANCE/REISSUANCE DATE:
DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed submit this report to: http://www.fldepportal.com/go/

PERMITTEE NAME: JEA
MAILING ADDRESS: 21 W Church St T-8
Jacksonville, Florida 32202- 3155

FACILITY: Nassau Regional WWTF
LOCATION: State Road 200 (A1A) At Chester Road
96237 Amelia Concourse
Yulee, FL 32097-

COUNTY: Nassau
OFFICE: Northeast District

PERMIT NUMBER: FL0116793-019-DW1P

LIMIT: Final
CLASS SIZE: MI
MONITORING GROUP NUMBER: RWS-A
MONITORING GROUP DESCRIPTION: Annual Reclaimed Water or Effluent Analysis
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING NOT REQUIRED:* ☐
MONITORING PERIOD From: _____ To: _____

REPORT FREQUENCY: Annually
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Antimony, Total Recoverable (GWS = 6)**	Sample Measurement										
PARM Code 01268 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Arsenic, Total Recoverable (GWS = 10)	Sample Measurement										
PARM Code 00978 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Barium, Total Recoverable (GWS = 2,000)	Sample Measurement										
PARM Code 01009 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Beryllium, Total Recoverable (GWS = 4)	Sample Measurement										
PARM Code 00998 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Cadmium, Total Recoverable (GWS = 5)	Sample Measurement										
PARM Code 01113 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Chromium, Total Recoverable (GWS =100)	Sample Measurement										
PARM Code 01118 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC

*THE "MONITORING NOT REQUIRED" CHECKBOX SHOULD BE SELECTED WHEN A CERTIFICATION STATEMENT IN ACCORDANCE WITH SUBSECTION 62-600.680(2), F.A.C., IS SUBMITTED WITH THIS DMR. SEE CERTIFICATION STATEMENT IN COMMENTS SECTION BELOW.
**GROUND WATER STANDARD (GWS) FOR REFERENCE AND REVIEW ONLY.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):
☐ NO NEW NON-DOMESTIC WASTEWATER DISCHARGERS HAVE BEEN ADDED TO THE COLLECTION SYSTEM SINCE THE LAST RECLAIMED WATER OR EFFLUENT ANALYSIS WAS CONDUCTED.
SIGN AND DATE:

ISSUANCE/REISSUANCE DATE:
DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: RWS-A PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Cyanide, Free (amen. to chlorination)(GWS = 200)	Sample Measurement										
PARM Code 00722 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Fluoride, Total (as F) (GWS = 4.0/2.0)	Sample Measurement										
PARM Code 00951 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC
Lead, Total Recoverable (GWS = 15)	Sample Measurement										
PARM Code 01114 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Mercury, Total Recoverable (GWS = 2)	Sample Measurement										
PARM Code 71901 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Nickel, Total Recoverable (GWS = 100)	Sample Measurement										
PARM Code 01074 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Nitrogen, Nitrate, Total (as N) (GWS = 10)	Sample Measurement										
PARM Code 00620 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC
Nitrogen, Nitrite, Total (as N) (GWS = 1)	Sample Measurement										
PARM Code 00615 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC
Nitrite plus Nitrate, Total 1 det. (as N)(GWS = 10)	Sample Measurement										
PARM Code 00630 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC
Selenium, Total Recoverable (GWS =50)	Sample Measurement										
PARM Code 00981 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Sodium, Total Recoverable (GWS = 160)	Sample Measurement										
PARM Code 00923 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: RWS-A PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Thallium, Total Recoverable (GWS = 2)	Sample Measurement										
PARM Code 00982 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
1,1-dichloroethylene (GWS = 7)	Sample Measurement										
PARM Code 34501 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
1,1,1-trichloroethane (GWS = 200)	Sample Measurement										
PARM Code 34506 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
1,1,2-trichloroethane (GWS = 5)	Sample Measurement										
PARM Code 34511 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
1,2-dichloroethane (GWS = 3)	Sample Measurement										
PARM Code 32103 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
1,2-dichloropropane (GWS = 5)	Sample Measurement										
PARM Code 34541 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
1,2,4-trichlorobenzene (GWS = 70)	Sample Measurement										
PARM Code 34551 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Benzene (GWS = 1)	Sample Measurement										
PARM Code 34030 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Carbon tetrachloride (GWS = 3)	Sample Measurement										
PARM Code 32102 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Cis-1,2-dichloroethene (GWS = 70)	Sample Measurement										
PARM Code 81686 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: RWS-A PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Dichloromethane (methylene chloride)(GWS = 5)	Sample Measurement										
PARM Code 03821 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Ethylbenzene (GWS = 700)	Sample Measurement										
PARM Code 34371 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Monochlorobenzene (GWS = 100)	Sample Measurement										
PARM Code 34031 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
1,2-dichlorobenzene (GWS = 600)	Sample Measurement										
PARM Code 34536 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
1,4-dichlorobenzene (GWS = 75)	Sample Measurement										
PARM Code 34571 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Styrene, Total (GWS = 100)	Sample Measurement										
PARM Code 77128 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Tetrachloroethylene (GWS = 3)	Sample Measurement										
PARM Code 34475 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Toluene (GWS = 1,000)	Sample Measurement										
PARM Code 34010 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
1,2-trans-dichloroethylene (GWS = 100)	Sample Measurement										
PARM Code 34546 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Trichloroethylene (GWS = 3)	Sample Measurement										
PARM Code 39180 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: RWS-A PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Vinyl chloride (GWS = 1)	Sample Measurement										
PARM Code 39175 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Xylenes (GWS = 10,000)	Sample Measurement										
PARM Code 81551 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
2,3,7,8-tetrachlorodibenzo-p-dioxin(GWS = 3x10^-5)	Sample Measurement										
PARM Code 34675 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
2,4-dichlorophenoxyacetic acid (GWS = 70)	Sample Measurement										
PARM Code 39730 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Silvex (GWS = 50)	Sample Measurement										
PARM Code 39760 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Alachlor (GWS = 2)	Sample Measurement										
PARM Code 39161 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Atrazine (GWS = 3)	Sample Measurement										
PARM Code 39033 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Benzo(a)pyrene (GWS = 0.2)	Sample Measurement										
PARM Code 34247 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Carbofuran (GWS = 40)	Sample Measurement										
PARM Code 81405 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Chlordane (tech mix. and metabolites)(GWS = 2)	Sample Measurement										
PARM Code 39350 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: RWS-A PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Dalapon (GWS = 200)	Sample Measurement										
PARM Code 38432 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Bis(2-ethylhexyl)adipate (GWS = 400)	Sample Measurement										
PARM Code 77903 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Bis (2-ethylhexyl) phthalate (GWS = 6)	Sample Measurement										
PARM Code 39100 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Dibromochloropropane (DBCP) (GWS = 0.2)	Sample Measurement										
PARM Code 82625 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Dinoseb (GWS = 7)	Sample Measurement										
PARM Code 30191 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Diquat (GWS = 20)	Sample Measurement										
PARM Code 04443 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Endothall (GWS = 100)	Sample Measurement										
PARM Code 38926 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Endrin (GWS = 2)	Sample Measurement										
PARM Code 39390 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Ethylene dibromide (1,2-dibromoethane)(GWS = 0.02)	Sample Measurement										
PARM Code 77651 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	Grab
Glyphosate (GWS = 0.7)	Sample Measurement										
PARM Code 79743 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: RWS-A PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Heptachlor (GWS = 0.4)	Sample Measurement										
PARM Code 39410 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Heptachlor epoxide (GWS = 0.2)	Sample Measurement										
PARM Code 39420 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Hexachlorobenzene (GWS = 1)	Sample Measurement										
PARM Code 39700 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Hexachlorocyclopentadiene (GWS = 50)	Sample Measurement										
PARM Code 34386 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Gamma BHC (Lindane) (GWS = 0.2)	Sample Measurement										
PARM Code 39782 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Methoxychlor (GWS = 40)	Sample Measurement										
PARM Code 39480 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Oxamyl (vydate) (GWS = 200)	Sample Measurement										
PARM Code 38865 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Pentachlorophenol (GWS = 1)	Sample Measurement										
PARM Code 39032 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Picloram (GWS = 500)	Sample Measurement										
PARM Code 39720 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Polychlorinated Biphenyls (PCBs)(GWS = 0.5)	Sample Measurement										
PARM Code 39516 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: RWS-A PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Simazine (GWS = 4)	Sample Measurement										
PARM Code 39055 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Toxaphene (GWS = 3)	Sample Measurement										
PARM Code 39400 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Trihalomethane, Total by summation(GWS = 0.080)	Sample Measurement										
PARM Code 82080 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	Grab
Radium 226 + Radium 228, Total (GWS = 5)	Sample Measurement										
PARM Code 11503 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	pCi/L		Annually	24-hr FPC
Alpha, Gross Particle Activity (GWS = 15)	Sample Measurement										
PARM Code 80045 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	pCi/L		Annually	24-hr FPC
Aluminum, Total Recoverable (GWS = 0.2)	Sample Measurement										
PARM Code 01104 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC
Chloride (as Cl) (GWS = 250)	Sample Measurement										
PARM Code 00940 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC
Iron, Total Recoverable (GWS = 0.3)	Sample Measurement										
PARM Code 00980 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC
Copper, Total Recoverable (GWS = 1,000)	Sample Measurement										
PARM Code 01119 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Manganese, Total Recoverable (GWS = 50)	Sample Measurement										
PARM Code 11123 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Nassau Regional WWTF MONITORING GROUP NUMBER: RWS-A PERMIT NUMBER: FL0116793-019-DW1P

MONITORING PERIOD From: _____ To: _____

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Silver, Total Recoverable (GWS = 100)	Sample Measurement										
PARM Code 01079 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
Sulfate, Total (GWS = 250)	Sample Measurement										
PARM Code 00945 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC
Zinc, Total Recoverable (GWS = 5,000)	Sample Measurement										
PARM Code 01094 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	ug/L		Annually	24-hr FPC
pH (GWS = 6.5-8.5)	Sample Measurement										
PARM Code 00400 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	s.u.		Annually	Grab
Solids, Total Dissolved (TDS) (GWS = 500)	Sample Measurement										
PARM Code 70295 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC
Foaming Agents (GWS = 0.5)	Sample Measurement										
PARM Code 01288 P Mon. Site No. RWS-A	Permit Requirement						Report (Max.)	mg/L		Annually	24-hr FPC

ISSUANCE/REISSUANCE DATE:

DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

DAILY SAMPLE RESULTS - PART B

Permit Number: FL0116793-019-DW1P Facility: Nassau Regional WWTF
Monitoring Period From: _____ To: _____

	BOD, Carbonaceous 5 day, 20C mg/L	Coliform, Fecal #/100mL	E.coli #/100mL	Nitrogen, Ammonia, Total (as N) mg/L	Nitrogen, Total mg/L	Oxygen, Dissolved (DO) mg/L	Phosphorus, Total (as P) mg/L	Solids, Total Suspended mg/L	Temperature (C), Water (Effluent) Deg C	pH s.u.	BOD, Carbonaceous 5 day, 20C mg/L
Code	80082	74055	51040	00610	00600	00300	00665	00530	00010	00400	80082
Mon. Site	EFA-1	EFA-1	EFA-1	EFA-1	EFA-1	EFA-1	EFA-1	EFA-1	EFA-1	EFA-1	EFA-2
1											
2											
3											
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25											
26											
27											
28											
29											
30											
31											
Total											
Mo. Avg.											

PLANT STAFFING:

Day Shift Operator Class: _____ Certificate No: _____ Name: _____

Evening Shift Operator Class: _____ Certificate No: _____ Name: _____

Night Shift Operator Class: _____ Certificate No: _____ Name: _____

Lead Operator Class: _____ Certificate No: _____ Name: _____

DAILY SAMPLE RESULTS - PART B

Permit Number: FL0116793-019-DW1P Facility: Nassau Regional WWTF
Monitoring Period From: _____ To: _____

	BOD, Carbonaceous 5 day, 20C mg/L	Coliform, Fecal #/100mL	Nitrogen, Total mg/L	Solids, Total Suspended mg/L	pH s.u.	Solids, Total Suspended mg/L	Turbidity NTU	Flow (Apricot) MGD	Flow (to Yulee Swamp) MGD	Flow MGD	BOD, Carbonaceous 5 day, 20C (Influent) mg/L
Code	80082	74055	00600	00530	00400	00530	00070	50050	50050	50050	80082
Mon. Site	EFA-2	EFA-2	EFA-2	EFA-2	EFA-2	EFB-1	EFB-1	EFD-1	FLW-2	FLW-3	INF-1
1											
2											
3											
4											
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Total											
Mo. Avg.											

PLANT STAFFING:

Day Shift Operator Class: _____ Certificate No: _____ Name: _____

Evening Shift Operator Class: _____ Certificate No: _____ Name: _____

Night Shift Operator Class: _____ Certificate No: _____ Name: _____

Lead Operator Class: _____ Certificate No: _____ Name: _____

DAILY SAMPLE RESULTS - PART B

Permit Number: FL0116793-019-DW1P Facility: Nassau Regional WWTF
Monitoring Period From: _____ To: _____

	Flow MGD	Solids, Total Suspended (Influent) mg/L	Ultraviolet Light Dosage mW-s/sqcm	Ultraviolet Light Intensity (For Disinfection) mW/sqcm	Ultraviolet Light Transmittance percent	Water Level at samp. collection time (in UV Reactors) ft	Stream Stage ft				
Code	50050	00530	61938	49607	51043	85327	34782				
Mon. Site	INF-1	INF-1	PPI-1	PPI-1	PPI-1	PPI-1	WEP-01				
1											
2											
3											
4											
5											
6											
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31											
Total											
Mo. Avg.											

PLANT STAFFING:

Day Shift Operator Class: _____ Certificate No: _____ Name: _____

Evening Shift Operator Class: _____ Certificate No: _____ Name: _____

Night Shift Operator Class: _____ Certificate No: _____ Name: _____

Lead Operator Class: _____ Certificate No: _____ Name: _____

GROUNDWATER MONITORING REPORT - PART D

Facility Name: Nassau Regional WWTF
Permit Number: FL0116793-019-DW1P
County: Nassau

Office: Northeast District

Monitoring Well ID: MWB-7
Well Type: Background
Description: Northeast corner of Percolation Pond System.

Report Frequency: Quarterly
Program: Domestic

Re-submitted DMR: ☐

Monitoring Period From: _____ To: _____

Date Sample Obtained: _____

Time Sample Obtained: _____

Was the well purged before sampling? ___Yes ___ No

Parameter	PARM Code	Sample Measurement	Permit Requirement	Units	Sample Type	Frequency of Analysis	Detection Limits	Analysis Method	Sampling Equipment Used	Samples Filtered (L/F/N)
Water Level Relative to NGVD	82545		Report	ft	In Situ	Quarterly				
Nitrite plus Nitrate, Total 1 det. (as N)	00630		Report	mg/L	Grab	Quarterly				
Solids, Total Dissolved (TDS)	70295		Report	mg/L	Grab	Quarterly				
Chloride (as Cl)	00940		Report	mg/L	Grab	Quarterly				
Coliform, Fecal	74055		Report	#/100mL	Grab	Quarterly				
pH	00400		Report	s.u.	In Situ	Quarterly				
Sulfate, Total	00945		Report	mg/L	Grab	Quarterly				

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENTS AND EXPLANATION (Reference all attachments here):

GROUNDWATER MONITORING REPORT - PART D

Facility Name: Nassau Regional WWTF
Permit Number: FL0116793-019-DW1P
County: Nassau

Monitoring Well ID: MWC-2
Well Type: Compliance
Description: Off west side of Percolation Pond No.3, along west property line.

Report Frequency: Quarterly
Program: Domestic

Office: Northeast District

Re-submitted DMR: ☐

Monitoring Period From: _____ To: _____

Date Sample Obtained: _____

Time Sample Obtained: _____

Was the well purged before sampling? ___Yes ___ No

Parameter	PARM Code	Sample Measurement	Permit Requirement	Units	Sample Type	Frequency of Analysis	Detection Limits	Analysis Method	Sampling Equipment Used	Samples Filtered (L/F/N)
Water Level Relative to NGVD	82545		Report	ft	In Situ	Quarterly				
Nitrite plus Nitrate, Total 1 det. (as N)	00630		10	mg/L	Grab	Quarterly				
Solids, Total Dissolved (TDS)	70295		650	mg/L	Grab	Quarterly				
Chloride (as Cl)	00940		250	mg/L	Grab	Quarterly				
Coliform, Fecal	74055		4	#/100mL	Grab	Quarterly				
pH	00400		5.5-8.5	s.u.	In Situ	Quarterly				
Sulfate, Total	00945		250	mg/L	Grab	Quarterly				

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENTS AND EXPLANATION (Reference all attachments here):

GROUNDWATER MONITORING REPORT - PART D

Facility Name: Nassau Regional WWTF
Permit Number: FL0116793-019-DW1P
County: Nassau
Office: Northeast District

Monitoring Well ID: MWC-3
Well Type: Compliance
Description: fka: MWI-3, south of Percolation Pond No.3.
Report Frequency: Quarterly
Program: Domestic
Re-submitted DMR: ☐

Monitoring Period From: _____ To: _____

Date Sample Obtained: _____

Time Sample Obtained: _____

Was the well purged before sampling? ___Yes ___ No

Parameter	PARM Code	Sample Measurement	Permit Requirement	Units	Sample Type	Frequency of Analysis	Detection Limits	Analysis Method	Sampling Equipment Used	Samples Filtered (L/F/N)
Water Level Relative to NGVD	82545		Report	ft	In Situ	Quarterly				
Nitrite plus Nitrate, Total 1 det. (as N)	00630		10	mg/L	Grab	Quarterly				
Solids, Total Dissolved (TDS)	70295		650	mg/L	Grab	Quarterly				
Chloride (as Cl)	00940		250	mg/L	Grab	Quarterly				
Coliform, Fecal	74055		4	#/100mL	Grab	Quarterly				
pH	00400		5.5-8.5	s.u.	In Situ	Quarterly				
Sulfate, Total	00945		250	mg/L	Grab	Quarterly				

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENTS AND EXPLANATION (Reference all attachments here):

GROUNDWATER MONITORING REPORT - PART D

Facility Name: Nassau Regional WWTF
Permit Number: FL0116793-019-DW1P
County: Nassau

Monitoring Well ID: MWC-4
Well Type: Compliance
Description: Off NE corner of Percolation Pond No. 4, along east property line.

Report Frequency: Quarterly
Program: Domestic

Office: Northeast District

Re-submitted DMR: ☐

Monitoring Period From: _____ To: _____

Date Sample Obtained: _____

Time Sample Obtained: _____

Was the well purged before sampling? ___Yes ___ No

Parameter	PARM Code	Sample Measurement	Permit Requirement	Units	Sample Type	Frequency of Analysis	Detection Limits	Analysis Method	Sampling Equipment Used	Samples Filtered (L/F/N)
Water Level Relative to NGVD	82545		Report	ft	In Situ	Quarterly				
Nitrite plus Nitrate, Total 1 det. (as N)	00630		10	mg/L	Grab	Quarterly				
Solids, Total Dissolved (TDS)	70295		650	mg/L	Grab	Quarterly				
Chloride (as Cl)	00940		250	mg/L	Grab	Quarterly				
Coliform, Fecal	74055		4	#/100mL	Grab	Quarterly				
pH	00400		5.5-8.5	s.u.	In Situ	Quarterly				
Sulfate, Total	00945		250	mg/L	Grab	Quarterly				

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (mm/dd/yyyy)

COMMENTS AND EXPLANATION (Reference all attachments here):

INSTRUCTIONS FOR COMPLETING THE WASTEWATER DISCHARGE MONITORING REPORT

Read these instructions before completing the DMR. Hard copies and/or electronic copies of the required parts of the DMR were provided with the permit. All required information shall be completed in full and typed or printed in ink. A signed, original DMR shall be mailed to the address printed on the DMR by the 28th of the month following the monitoring period. Facilities who submit their DMR(s) electronically through eDMR do not need to submit a hardcopy DMR. The DMR shall not be submitted before the end of the monitoring period.

The DMR consists of three parts--A, B, and D--all of which may or may not be applicable to every facility. Facilities may have one or more Part A's for reporting effluent or reclaimed water data. All domestic wastewater facilities will have a Part B for reporting daily sample results. Part D is used for reporting ground water monitoring well data.

When results are not available, the following codes should be used on parts A and D of the DMR and an explanation provided where appropriate. Note: Codes used on Part B for raw data are different.

CODE	DESCRIPTION/INSTRUCTIONS
ANC	Analysis not conducted.
DRY	Dry Well
FLD	Flood disaster.
IFS	Insufficient flow for sampling.
LS	Lost sample.
MNR	Monitoring not required this period.

CODE	DESCRIPTION/INSTRUCTIONS
NOD	No discharge from/to site.
OPS	Operations were shutdown so no sample could be taken.
OTH	Other. Please enter an explanation of why monitoring data were not available.
SEF	Sampling equipment failure.

When reporting analytical results that fall below a laboratory's reported method detection limits or practical quantification limits, the following instructions should be used, unless indicated otherwise in the permit or on the DMR:

1. Results greater than or equal to the PQL shall be reported as the measured quantity.
2. Results less than the PQL and greater than or equal to the MDL shall be reported as the laboratory's MDL value. These values shall be deemed equal to the MDL when necessary to calculate an average for that parameter and when determining compliance with permit limits.
3. Results less than the MDL shall be reported by entering a less than sign ("<") followed by the laboratory's MDL value, e.g. < 0.001. A value of one-half the MDL or one-half the effluent limit, whichever is lower, shall be used for that sample when necessary to calculate an average for that parameter. Values less than the MDL are considered to demonstrate compliance with an effluent limitation.

PART A -DISCHARGE MONITORING REPORT (DMR)

Part A of the DMR is comprised of one or more sections, each having its own header information. Facility information is preprinted in the header as well as the monitoring group number, whether the limits and monitoring requirements are interim or final, and the required submittal frequency (e.g. monthly, annually, quarterly, etc.). Submit Part A based on the required reporting frequency in the header and the instructions shown in the permit. The following should be completed by the permittee or authorized representative:

Resubmitted DMR: Check this box if this DMR is being re-submitted because there was information missing from or information that needed correction on a previously submitted DMR. The information that is being revised should be clearly noted on the re-submitted DMR (e.g. highlight, circle, etc.)
No Discharge From Site: Check this box if no discharge occurs and, as a result, there are no data or codes to be entered for all of the parameters on the DMR for the entire monitoring group number; however, if the monitoring group includes other monitoring locations (e.g., influent sampling), the "NOD" code should be used to individually denote those parameters for which there was no discharge.
Monitoring Period: Enter the month, day, and year for the first and last day of the monitoring period (i.e. the month, the quarter, the year, etc.) during which the data on this report were collected and analyzed.
Sample Measurement: Before filling in sample measurements in the table, check to see that the data collected correspond to the limit indicated on the DMR (i.e. interim or final) and that the data correspond to the monitoring group number in the header. Enter the data or calculated results for each parameter on this row in the non-shaded area above the limit. Be sure the result being entered corresponds to the appropriate statistical base code (e.g. annual average, monthly average, single sample maximum, etc.) and units. Data qualifier codes are not to be reported on Part A.
No. Ex.: Enter the number of sample measurements during the monitoring period that exceeded the permit limit for each parameter in the non-shaded area. If none, enter zero.
Frequency of Analysis: The shaded areas in this column contain the minimum number of times the measurement is required to be made according to the permit. Enter the actual number of times the measurement was made in the space above the shaded area.
Sample Type: The shaded areas in this column contain the type of sample (e.g. grab, composite, continuous) required by the permit. Enter the actual sample type that was taken in the space above the shaded area.
Signature: This report must be signed in accordance with Rule 62-620.305, F.A.C. Type or print the name and title of the signing official. Include the telephone number where the official may be reached in the event there are questions concerning this report. Enter the date when the report is signed.
Comment and Explanation of Any Violations: Use this area to explain any exceedances, any upset or by-pass events, or other items which require explanation. If more space is needed, reference all attachments in this area.

PART B - DAILY SAMPLE RESULTS

Monitoring Period: Enter the month, day, and year for the first and last day of the monitoring period (i.e. the month, the quarter, the year, etc.) during which the data on this report were collected and analyzed.
Daily Monitoring Results: Transfer all analytical data from your facility's laboratory or a contract laboratory's data sheets for all day(s) that samples were collected. Record the data in the units indicated. Table 1 in Chapter 62-160, F.A.C., contains a complete list of all the data qualifier codes that your laboratory may use when reporting analytical results. However, when transferring numerical results onto Part B of the DMR, only the following data qualifier codes should be used and an explanation provided where appropriate.

CODE	DESCRIPTION/INSTRUCTIONS
<	The compound was analyzed for but not detected.
A	Value reported is the mean (average) of two or more determinations.
J	Estimated value, value not accurate.
Q	Sample held beyond the actual holding time.
Y	Laboratory analysis was from an unpreserved or improperly preserved sample.

To calculate the monthly average, add each reported value to get a total. For flow, divide this total by the number of days in the month. For all other parameters, divide the total by the number of observations.
Plant Staffing: List the name, certificate number, and class of all state certified operators operating the facility during the monitoring period. Use additional sheets as necessary.

PART D - GROUND WATER MONITORING REPORT

Monitoring Period: Enter the month, day, and year for the first and last day of the monitoring period (i.e. the month, the quarter, the year, etc.) during which the data on this report were collected and analyzed.
Date Sample Obtained: Enter the date the sample was taken. Also, check whether or not the well was purged before sampling.
Time Sample Obtained: Enter the time the sample was taken.
Sample Measurement: Record the results of the analysis. If the result was below the minimum detection limit, indicate that. Data qualifier codes are not to be reported on Part D.
Detection Limits: Record the detection limits of the analytical methods used.
Analysis Method: Indicate the analytical method used. Record the method number from Chapter 62-160 or Chapter 62-601, F.A.C., or from other sources.
Sampling Equipment Used: Indicate the procedure used to collect the sample (e.g. airlift, bucket/bailer, centrifugal pump, etc.)
Samples Filtered: Indicate whether the sample obtained was filtered by laboratory (L), filtered in field (F), or unfiltered (N).
Signature: This report must be signed in accordance with Rule 62-620.305, F.A.C. Type or print the name and title of the signing official. Include the telephone number where the official may be reached in the event there are questions concerning this report. Enter the date when the report is signed.
Comments and Explanation: Use this space to make any comments on or explanations of results that are unexpected. If more space is needed, reference all attachments in this area.

SPECIAL INSTRUCTIONS FOR LIMITED WET WEATHER DISCHARGES

Flow (Limited Wet Weather Discharge): Enter the measured average flow rate during the period of discharge or divide gallons discharged by duration of discharge (converted into days). Record in million gallons per day (MGD).
Flow (Upstream): Enter the average flow rate in the receiving stream upstream from the point of discharge for the period of discharge. The average flow rate can be calculated based on two measurements; one made at the start and one made at the end of the discharge period. Measurements are to be made at the upstream gauging station described in the permit.
Actual Stream Dilution Ratio: To calculate the Actual Stream Dilution Ratio, divide the average upstream flow rate by the average discharge flow rate. Enter the Actual Stream Dilution Ratio accurate to the nearest 0.1.
No. of Days the SDF > Stream Dilution Ratio: For each day of discharge, compare the minimum Stream Dilution Factor (SDF) from the permit to the calculated Stream Dilution Ratio. On Part B of the DMR, enter an asterisk (*) if the SDF is greater than the Stream Dilution Ratio on any day of discharge. On Part A of the DMR, add up the days with an "*" and record the total number of days the Stream Dilution Factor was greater than the Stream Dilution Ratio.
$CBOD_5$: Enter the average $CBOD_5$ of the reclaimed water discharged during the period shown in duration of discharge.
TKN: Enter the average TKN of the reclaimed water discharged during the period shown in duration of discharge.
Actual Rainfall: Enter the actual rainfall for each day on Part B. Enter the actual cumulative rainfall to date for this calendar year and the actual total monthly rainfall on Part A. The cumulative rainfall to date for this calendar year is the total amount of rain, in inches, that has been recorded since January 1 of the current year through the month for which this DMR contains data.
Rainfall During Average Rainfall Year: On Part A, enter the total monthly rainfall during the average rainfall year and the cumulative rainfall for the average rainfall year. The cumulative rainfall for the average rainfall year is the amount of rain, in inches, which fell during the average rainfall year from January through the month for which this DMR contains data.
No. of Days LWWD Activated During Calendar Year: Enter the cumulative number of days that the limited wet weather discharge was activated since January 1 of the current year.
Reason for Discharge: Attach to the DMR a brief explanation of the factors contributing to the need to activate the limited wet weather discharge.

Appendix C2

Florida Department of Environmental Protection, Environmental Resource Permit

FLORIDA DEPARTMENT OF
Environmental Protection

Northeast District
8800 Baymeadows Way West, Suite 100
Jacksonville, Florida 32256

Permittee
JEA
Attn: Andrew Sears
Senior Environmental Scientist
21 W Church St, # T-8
Jacksonville, FL 32202
searar@jea.com

Engineering Consultant
Michael Klink, P.E.
Four Waters Engineering, Inc
324 6th Ave N
Jacksonville Beach, FL 32250
Mklink@4weng.com

Environmental Consultant
Matt Canepa
Onsite Environmental Consulting
2008 Riverside Ave, STE 100
Jacksonville, FL 32204
mcanepa@onsiteec.com

Radio Avenue RW Ground Storage Tanks & Booster Pump Station

Environmental Resource Permit
State-owned Submerged Lands Authorization – Not Applicable
U.S. Army Corps of Engineers Authorization – Not Included

Nassau County
Permit No.: 45-0393128-001-EI

Permit Issuance Date: November 20, 2020
Permit Construction Phase Expiration Date: November 20, 2025

Environmental Resource Permit

Permittee: JEA
Permit No: 45-0393128-001-EI

PROJECT LOCATION

The activities authorized by this permit are located south of SR200, north of Radio Avenue, west of Minor Road and east of US 17, Yulee, Florida 32097, Parcel ID 42-2N-27-0000-0001-0120 in Nassau County, Sections 42, Township 2N, Range 27, at latitude 30° 36' 22.78" N/ longitude 81° 35' 08.78" W.

PROJECT DESCRIPTION

The permittee is authorized to construct a stormwater management system to serve a new reclaimed water storage and booster facility, which consists of two reclaimed water ground storage tanks, a booster pump station, buildings, concrete pavement and pads, sidewalk, and a gravel access road from Art Wilson Lane to the facility. Two more tanks and other impervious areas may be added in Future Phase that will be required to have separate ERP authorizations.

The stormwater management system consists of a swale along the access road, site grading, pipes and inlets, and a wet detention pond. The pond has been designed to serve a total drainage area of 7.01-acre, of which 1.66-acre is accounted as impervious area covering both Phase I and Future Phase. Drawing C-14 Post Development Drainage Map shows the construction phases. The pond will provide runoff treatment and peak discharge attenuation for storm events up to 25year, 24hour storm. Excess runoff will be discharged via a control structure to a wetland east of the facility. Authorized activities are depicted on the attached exhibits.

AUTHORIZATIONS

Radio Avenue RW Ground Storage Tanks & Booster Pump Station

Environmental Resource Permit

The Department has determined that the activity qualifies for an Environmental Resource Permit. Therefore, the Environmental Resource Permit is hereby granted, pursuant to Part IV of Chapter 373, Florida Statutes (F.S.), and Chapter 62-330, Florida Administrative Code (F.A.C.).

Sovereignty Submerged Lands Authorization

As staff to the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees), the Department has determined the activity is not on submerged lands owned by the State of Florida. Therefore, your project is not subject to the requirements of Chapter 253, F.S., or Rule 18-21, F.A.C.

Federal Authorization

This permit does not include federal authorization or imply the presence or limits of Waters of the United States (WOTUS) on the subject property. Activities that may impact WOTUS shall require a separate permit from the Corps. It is recommended that you contact your local Corps office to determine whether your project site contains WOTUS and/or if a Department of the Army permit is

needed. A map of local Corps offices and the federal application form (ENG 4345) are available online at the Jacksonville District Regulatory Division website.

Coastal Zone Management
Issuance of this authorization also constitutes a finding of consistency with Florida's Coastal Zone Management Program, as required by Section 307 of the Coastal Zone Management Act.

Water Quality Certification
This permit also constitutes a water quality certification under Section 401 of the Clean Water Act, 33 U.S.C. 1341.

Other Authorizations
You are advised that authorizations or permits for this activity may be required by other federal, state, regional, or local entities including but not limited to local governments or municipalities. This permit does not relieve you from the requirements to obtain all other required permits or authorizations.

The activity described may be conducted only in accordance with the terms, conditions and attachments contained in this document. Issuance and granting of the permit and authorizations herein do not infer, nor guarantee, nor imply that future permits, authorizations, or modifications will be granted by the Department.

PERMIT CONDITIONS
The activities described must be conducted in accordance with:

- **The Specific Conditions**
- **The General Conditions**
- **The limits, conditions and locations of work shown in the attached drawings**
- **The term limits of this authorization**

You are advised to read and understand these conditions and drawings prior to beginning the authorized activities, and to ensure the work is conducted in conformance with all the terms, conditions, and drawings herein. If you are using a contractor, the contractor also should read and understand these conditions and drawings prior to beginning any activity. Failure to comply with these conditions, including any mitigation requirements, shall be grounds for the Department to revoke the permit and authorization and to take appropriate enforcement action. Operation of the facility is not authorized except when determined to be in conformance with all applicable rules and this permit, as described.

SPECIFIC CONDITIONS - PRIOR TO ANY CONSTRUCTION

1. The permittee must acquire legal ownership or legal control of the project area as delineated in the permitted construction drawings.

2. The permittee shall consult Division of Historical Resource (DHR) at CompliancePermits@DOS.MyFlorida.com if a professional cultural resources assessment survey shall be conducted. The permittee shall follow recommendations of the DHR.

3. Prior to commencement of work authorized by this permit, the permittee shall provide written notification of the date of the commencement and proposed schedule of construction to the Department of Environmental Protection, Northeast District, 8800 Baymeadows Way West, Suite 100, Jacksonville, Florida 32256.

SPECIFIC CONDITIONS – CONSTRUCTION ACTIVITIES

4. This permit does not authorize any dredging, filling, stockpiling of tools, equipment and materials, or other construction activity, including the removal of any vegetation, tree stumps and/or vegetative root masses within any wetland.

5. If prehistoric or historic artifacts, such as pottery or ceramics, projectile points, stone tools, dugout canoes, metal implements, historic building materials, or any other physical remains that could be associated with Native American, early European, or American settlement are encountered at any time within the project site area, the permitted project shall cease all activities involving subsurface disturbance in the vicinity of the discovery. The permittee or other designee shall contact the Florida Department of State, Division of Historical Resources, Compliance Review Section (DHR), at (850)245-6333, as well as the appropriate permitting agency office. Project activities shall not resume without verbal or written authorization from the Division of Historical Resources. If unmarked human remains are encountered, all work shall stop immediately and the proper authorities notified in accordance with section 872.05, F.S. For project activities subject to prior consultation with the DHR and as an alternative to the above requirements, the permittee may follow procedures for unanticipated discoveries as set forth within a cultural resources assessment survey determined complete and sufficient by DHR and included as a specific permit condition herein.

SPECIFIC CONDITIONS - OTHER LISTED SPECIES

6. The liability to not adversely impact or cause "take" of listed species and other regulated species of fish and wildlife is the responsibility of the owner or applicant associated with this project. Please refer to Chapter 68A-27 of the Florida Administrative Code for definitions of "take" and a list of fish and wildlife species. If listed species are observed onsite, FWC staff are available to provide decision support information or assist in obtaining the appropriate FWC permits. Requests for further information or review can be sent to FWCConservationPlanningServices@MyFWC.com .

SPECIFIC CONDITIONS - CONSTRUCTION COMPLETION

7. Upon completion of construction, the permittee shall submit to the Department of Form 62-330.310(1) "As-Built Certification and Request for Conversion to Operation Phase". The form shall be certified by a registered professional and serve to notify the Department that the entire substation (authorized for construction under ERP No. 12-296190-001-SI, which is superseded by permit No. 12-296190-003-EI) is completed and ready for inspection by the Department. The person completing Form 62-330.310(1) shall inform the Department if there are substantial deviations from the plans approved as part of the permit and include as-built drawings with the form.

8. The plans must be clearly labeled as "as-built" or "record" drawings and shall consist of the permitted drawings that clearly highlight (such as through "red lines" or "clouds") any substantial deviations made during construction. The permittee shall be responsible for correcting the deviations [as verified by a new certification using Form 62-330.310(1)]. If such deviations require a modification of the permit under Rule 62-330.315, F.A.C., the permittee shall separately request a modification to the permit, which must be issued by the Department prior to the Department approving the request to convert.

9. When projects authorized by the permit are to be constructed in phases, each phase or independent portion of the permitted project must be completed and the permittee must have submitted Form 62-330.310(1) "As-Built Certification and Request for Conversion to Operation Phase," in accordance with subparagraph 62-330.350(1)(f)2., F.A.C., certifying as to such completion prior to the use of that phase or independent portion of the project. The request for conversion to the operating phase for any phase or independent portion of the permitted project shall occur before construction of any future work that may rely on that infrastructure for conveyance and water quality treatment and attenuation. Phased construction can include a partial certification.

SPECIFIC CONDITIONS – OPERATION AND MAINTENANCE ACTIVITIES

10. In accordance with Section 373.416(2), F.S., unless revoked or abandoned, all stormwater management systems, dams, impoundments, reservoirs, appurtenant works, or works permitted under Part IV of Chapter 373, F.S., must be operated and maintained in perpetuity. The operation and maintenance shall be in accordance with the designs, plans, calculations, and other specifications that are submitted with an application, approved by the Department, and incorporated as a condition into any permit issued.

11. A registered professional shall perform inspections every three (3) years after conversion of the permit to the operation and maintenance phase to identify if there are any deficiencies in structural integrity, degradation due to insufficient maintenance, or improper operation that may endanger public health, safety, or welfare, or the water resources, and to insure that systems are functioning as designed and permitted. Within 30 days of the inspection, a report shall be submitted electronically or in writing to the Department using Form 62-330.311(1), "Operation and Maintenance Inspection Certification".

12. The permittee shall conduct periodic inspections in addition to the professional inspections, especially after heavy rains. The permittee shall maintain a record of each inspection, including the date of inspection, the name and contact information of the inspector, whether the system was functioning as designed and permitted, and make such record available upon request of the Department. Within 30 days of any failure of any system or deviation from the permit, a report shall be submitted electronically or in writing to the Department using Form 62-330.311(1), "Operation and Maintenance Inspection Certification," describing the remedial actions taken to resolve the failure or deviation.

13. The following operational maintenance activities shall be performed on all permitted systems on a regular basis or as needed:
a. Inspection of culverts, pipes, inlets, manholes and structures for damage and blockage
b. Removal of trash and debris from the entire stormwater management systems

c. Removal of sediments when the storage volume or conveyance capacity of the surface water management system is below design levels
d. Mowing and removal of clippings
e. Stabilization and restoration of eroded areas and slopes
f. Maintenance of overland flow areas to prevent channelization

GENERAL CONDITIONS FOR INDIVIDUAL PERMITS
The following general conditions are binding on all individual permits issued under this chapter, except where the conditions are not applicable to the authorized activity, or where the conditions must be modified to accommodate project-specific conditions.

1. All activities shall be implemented following the plans, specifications and performance criteria approved by this permit. Any deviations must be authorized in a permit modification in accordance with rule 62-330.315, F.A.C. Any deviations that are not so authorized may subject the permittee to enforcement action and revocation of the permit under chapter 373, F.S.

2. A complete copy of this permit shall be kept at the work site of the permitted activity during the construction phase, and shall be available for review at the work site upon request by the Agency staff. The permittee shall require the contractor to review the complete permit prior to beginning construction.

3. Activities shall be conducted in a manner that does not cause or contribute to violations of state water quality standards. Performance-based erosion and sediment control best management practices shall be installed immediately prior to, and be maintained during and after construction as needed, to prevent adverse impacts to the water resources and adjacent lands. Such practices shall be in accordance with the State of Florida Erosion and Sediment Control Designer and Reviewer Manual (Florida Department of Environmental Protection and Florida Department of Transportation, June 2007), and the Florida Stormwater Erosion and Sedimentation Control Inspector's Manual (Florida Department of Environmental Protection, Nonpoint Source Management Section, Tallahassee, Florida, July 2008), which are both incorporated by reference in subparagraph 62-330.050(9)(b)5., F.A.C., unless a project-specific erosion and sediment control plan is approved or other water quality control measures are required as part of the permit.

4. At least 48 hours prior to beginning the authorized activities, the permittee shall submit to the Agency a fully executed Form 62-330.350(1), "Construction Commencement Notice," (October 1, 2013), (http://www.flrules.org/Gateway/reference.asp?No=Ref-02505), incorporated by reference herein, indicating the expected start and completion dates. A copy of this form may be obtained from the Agency, as described in subsection 62-330.010(5), F.A.C., and shall be submitted electronically or by mail to the Agency. However, for activities involving more than one acre of construction that also require a NPDES stormwater construction general permit, submittal of the Notice of Intent to Use Generic Permit for Stormwater Discharge from Large and Small Construction Activities, DEP Form 62-621.300(4)(b), shall also serve as notice of commencement of construction under this chapter and, in such a case, submittal of Form 62-330.350(1) is not required.

5. Unless the permit is transferred under rule 62-330.340, F.A.C., or transferred to an operating entity under rule 62-330.310, F.A.C., the permittee is liable to comply with the plans, terms, and conditions of the permit for the life of the project or activity.

6. Within 30 days after completing construction of the entire project, or any independent portion of the project, the permittee shall provide the following to the Agency, as applicable:
   a. For an individual, private single-family residential dwelling unit, duplex, triplex, or quadruplex – "Construction Completion and Inspection Certification for Activities Associated with a Private Single-Family Dwelling Unit" [Form 62-330.310(3)]; or
   b. For all other activities – "As-Built Certification and Request for Conversion to Operation Phase" [Form 62-330.310(1)].
   c. If available, an Agency website that fulfills this certification requirement may be used in lieu of the form.

7. If the final operation and maintenance entity is a third party:
   a. Prior to sales of any lot or unit served by the activity and within one year of permit issuance, or within 30 days of as-built certification, whichever comes first, the permittee shall submit, as applicable, a copy of the operation and maintenance documents (see sections 12.3 thru 12.3.4 of Volume I) as filed with the Florida Department of State, Division of Corporations, and a copy of any easement, plat, or deed restriction needed to operate or maintain the project, as recorded with the Clerk of the Court in the County in which the activity is located.
   b. Within 30 days of submittal of the as-built certification, the permittee shall submit "Request for Transfer of Environmental Resource Permit to the Perpetual Operation and Maintenance Entity" [Form 62-330.310(2)] to transfer the permit to the operation and maintenance entity, along with the documentation requested in the form. If available, an Agency website that fulfills this transfer requirement may be used in lieu of the form.

8. The permittee shall notify the Agency in writing of changes required by any other regulatory agency that require changes to the permitted activity, and any required modification of this permit must be obtained prior to implementing the changes.

9. This permit does not:
   a. Convey to the permittee any property rights or privileges, or any other rights or privileges other than those specified herein or in chapter 62-330, F.A.C.;
   b. Convey to the permittee or create in the permittee any interest in real property;
   c. Relieve the permittee from the need to obtain and comply with any other required federal, state, and local authorization, law, rule, or ordinance; or
   d. Authorize any entrance upon or work on property that is not owned, held in easement, or controlled by the permittee.

10. Prior to conducting any activities on state-owned submerged lands or other lands of the state, title to which is vested in the Board of Trustees of the Internal Improvement Trust Fund, the permittee must receive all necessary approvals and authorizations under chapters 253 and 258, F.S. Written authorization that requires formal execution by the Board of Trustees of the Internal Improvement Trust Fund shall not be considered received until it has been fully executed.

11. The permittee shall hold and save the Agency harmless from any and all damages, claims, or liabilities that may arise by reason of the construction, alteration, operation, maintenance, removal, abandonment or use of any project authorized by the permit.

12. The permittee shall notify the Agency in writing:

a. Immediately if any previously submitted information is discovered to be inaccurate; and
b. Within 30 days of any conveyance or division of ownership or control of the property or the system, other than conveyance via a long-term lease, and the new owner shall request transfer of the permit in accordance with rule 62-330.340, F.A.C. This does not apply to the sale of lots or units in residential or commercial subdivisions or condominiums where the stormwater management system has been completed and converted to the operation phase.

13. Upon reasonable notice to the permittee, Agency staff with proper identification shall have permission to enter, inspect, sample and test the project or activities to ensure conformity with the plans and specifications authorized in the permit.

14. If prehistoric or historic artifacts, such as pottery or ceramics, projectile points, stone tools, dugout canoes, metal implements, historic building materials, or any other physical remains that could be associated with Native American, early European, or American settlement are encountered at any time within the project site area, the permitted project shall cease all activities involving subsurface disturbance in the vicinity of the discovery. The permittee or other designee shall contact the Florida Department of State, Division of Historical Resources, Compliance Review Section (DHR), at (850)245-6333, as well as the appropriate permitting agency office. Project activities shall not resume without verbal or written authorization from the Division of Historical Resources. If unmarked human remains are encountered, all work shall stop immediately and the proper authorities notified in accordance with section 872.05, F.S. For project activities subject to prior consultation with the DHR and as an alternative to the above requirements, the permittee may follow procedures for unanticipated discoveries as set forth within a cultural resources assessment survey determined complete and sufficient by DHR and included as a specific permit condition herein.

15. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation, shall not be considered binding unless a specific condition of this permit or a formal determination under rule 62-330.201, F.A.C., provides otherwise.

16. The permittee shall provide routine maintenance of all components of the stormwater management system to remove trapped sediments and debris. Removed materials shall be disposed of in a landfill or other uplands in a manner that does not require a permit under chapter 62-330, F.A.C., or cause violations of state water quality standards.

17. This permit is issued based on the applicant's submitted information that reasonably demonstrates that adverse water resource-related impacts will not be caused by the completed permit activity. If any adverse impacts result, the Agency will require the permittee to eliminate the cause, obtain any necessary permit modification, and take any necessary corrective actions to resolve the adverse impacts.

18. A Recorded Notice of Environmental Resource Permit may be recorded in the county public records in accordance with subsection 62-330.090(7), F.A.C. Such notice is not an encumbrance upon the property.

19. In addition to those general conditions in subsection (1), above, the Agency shall impose any additional project-specific special conditions necessary to assure the permitted activities will not be

harmful to the water resources, as set forth in rules 62-330.301 and 62-330.302, F.A.C., Volumes I and II, as applicable, and the rules incorporated by reference in this chapter.

This action is final and effective on the date filed with the Clerk of the Department unless a petition for an administrative hearing is timely filed under Sections 120.569 and 120.57, F.S., before the deadline for filing a petition. On the filing of a timely and sufficient petition, this action will not be final and effective until further order of the Department. Because the administrative hearing process is designed to formulate final agency action, the hearing process may result in a modification of the agency action or even denial of the application.

Petition for Administrative Hearing

A person whose substantial interests are affected by the Department's action may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. Pursuant to Rules 28-106.201 and 28-106.301, F.A.C., a petition for an administrative hearing must contain the following information:
(a) The name and address of each agency affected and each agency's file or identification number, if known;
(b) The name, address, any e-mail address, any facsimile number, and telephone number of the petitioner, if the petitioner is not represented by an attorney or a qualified representative; the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination;
(c) A statement of when and how the petitioner received notice of the agency decision;
(d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate;
(e) A concise statement of the ultimate facts alleged, including the specific facts that the petitioner contends warrant reversal or modification of the agency's proposed action;
(f) A statement of the specific rules or statutes that the petitioner contends require reversal or modification of the agency's proposed action, including an explanation of how the alleged facts relate to the specific rules or statutes; and
(g) A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wishes the agency to take with respect to the agency's proposed action.
The petition must be filed (received by the Clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@dep.state.fl.us. Also, a copy of the petition shall be mailed to the applicant at the address indicated above at the time of filing.

Time Period for Filing a Petition

In accordance with Rule 62-110.106(3), F.A.C., petitions for an administrative hearing by the applicant and persons entitled to written notice under Section 120.60(3), F.S., must be filed within 21 days of receipt of this written notice. Petitions filed by any persons other than the applicant, and other than those entitled to written notice under Section 120.60(3), F.S., must be filed within 21 days of publication of the notice or within 21 days of receipt of the written notice, whichever occurs first. You cannot justifiably rely on the finality of this decision unless notice of this decision and the right of substantially affected persons to challenge this decision has been duly published or otherwise provided to all persons substantially affected by the decision. While you are not required to publish notice of this action, you may elect to do so pursuant Rule 62-110.106(10)(a).

The failure to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C. If you do not publish notice of this action, this waiver will not apply to persons who have not received written notice of this action.

Extension of Time

Under Rule 62-110.106(4), F.A.C., a person whose substantial interests are affected by the Department's action may also request an extension of time to file a petition for an administrative hearing. The Department may, for good cause shown, grant the request for an extension of time. Requests for extension of time must be filed with the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@dep.state.fl.us, before the deadline for filing a petition for an administrative hearing. A timely request for extension of time shall toll the running of the time period for filing a petition until the request is acted upon.

Mediation

Mediation is not available in this proceeding.

FLAWAC Review

The applicant, or any party within the meaning of Section 373.114(1)(a) or 373.4275, F.S., may also seek appellate review of this order before the Land and Water Adjudicatory Commission under Section 373.114(1) or 373.4275, F.S. Requests for review before the Land and Water Adjudicatory Commission must be filed with the Secretary of the Commission and served on the Department within 20 days from the date when this order is filed with the Clerk of the Department.

Judicial Review

Once this decision becomes final, any party to this action has the right to seek judicial review pursuant to Section 120.68, F.S., by filing a Notice of Appeal pursuant to Florida Rules of Appellate Procedure 9.110 and 9.190 with the Clerk of the Department in the Office of General Counsel (Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000) and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice must be filed within 30 days from the date this action is filed with the Clerk of the Department.

Executed in Jacksonville, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Thomas G. Kallemeyn
Permitting Program Administrator

TK:js:cc

Attachments:
Project Drawings and Design Specs., 16 pages
Construction Commencement Notice/Form 62-330.350(1)
As-built Certification and Request for Conversion to Operational Phase / Form 62-330.310(1)
Operation and Maintenance Inspection Certification / Form 62-330.311(1)

Copies furnished to:
Thomas Kallemeyn, FDEP NED
Michelle Neeley, FDEP NED
Junhong Shi, FDEP NED
Kim Pearce, FDEP NED
Kim Mann, FDEP NED

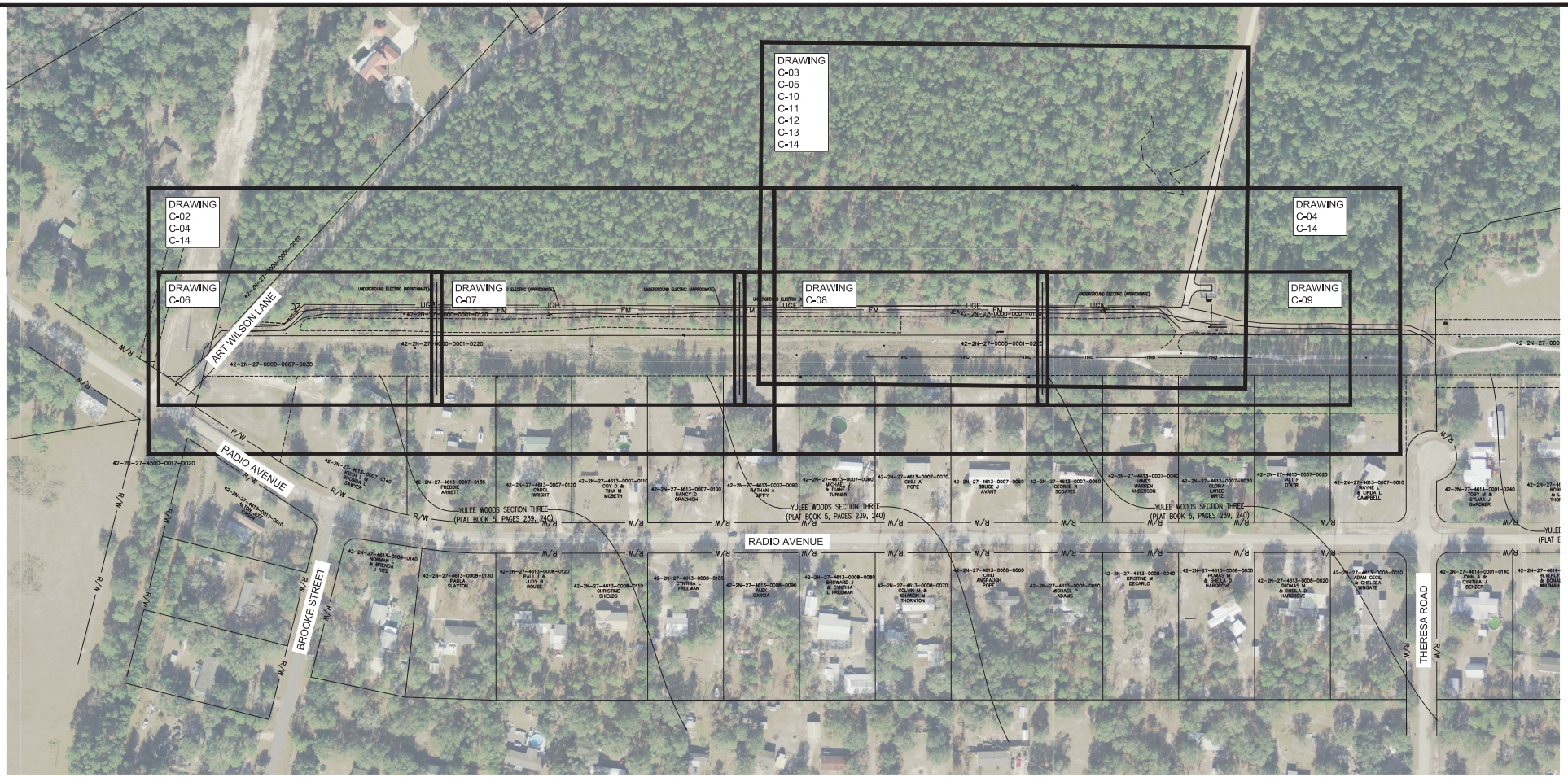
CERTIFICATE OF SERVICE

The undersigned hereby certifies that this permit, including all copies, were mailed before the close of business on November 20, 2020, to the above listed persons.

FILING AND ACKNOWLEDGMENT

FILED, on this date, under 120.52(7) of the
Florida Statutes, with the designated Department Clerk,
receipt of which is hereby acknowledged.

Cathy E Clay — November 20, 2020
Clerk — Date



Michael R. Klink, State of Florida Professional Engineer, License No. 71840.
This item (C-01 to C-09) has been digitally signed and sealed by Michael R. Klink, PE, on the date indicated here.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Digitally signed by Michael R Klink
Date: 2020.10.20 18:19:11 -04'00'

SCALE: 1" = 100'

100' 50' 0 100'

FOUR WATERS ENGINEERING
324 6th AVE N. JACKSONVILLE BEACH, FLORIDA 32250
904-414-2400 C.O.A.# 31101 WWW.4WENG.COM

REV	ISSUED FOR	DATE	BY
1	PERMIT SUBMITTAL	10/20	AD

PROJECT ENGINEER:	A. DIEFFENTHALLER
DESIGNED BY:	M. KLINK
DRAWN BY:	S. DUCHARME
CHECKED BY:	G. BROWN

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE 0 1/2" 1"

PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

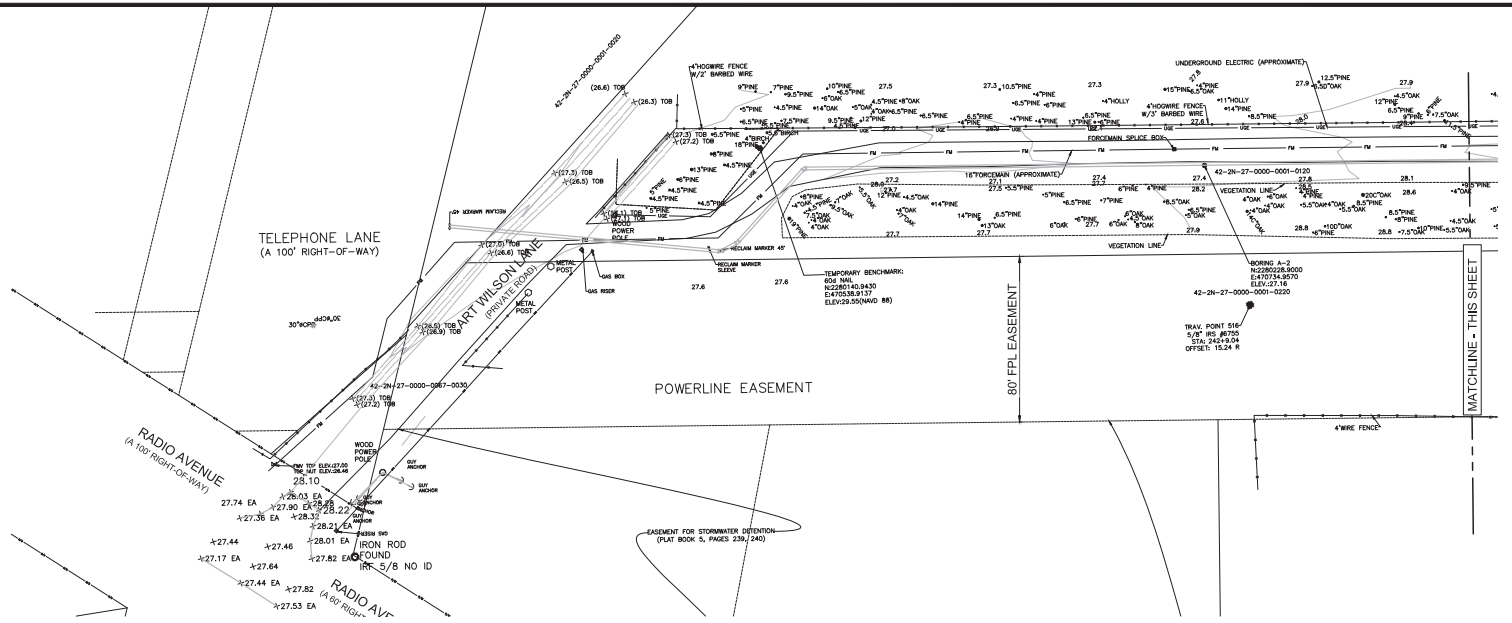
Hazen
HAZEN AND SAWYER
6675 CORPORATE CENTER PARKWAY
JACKSONVILLE, FLORIDA 32216

RADIO AVENUE R.W. GROUND STORAGE TANKS & BOOSTER PUMP STATION

JEA Building Community

VICINITY PLAN AND KEY MAP

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-01



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REV	ISSUED FOR	DATE	BY
1	PERMIT SUBMITTAL	10/20	AD

PROJECT ENGINEER:	A. DIEFFENTHALLER
DESIGNED BY:	M. KLINK
DRAWN BY:	S. DUCHARME
CHECKED BY:	G. BROWN

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PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

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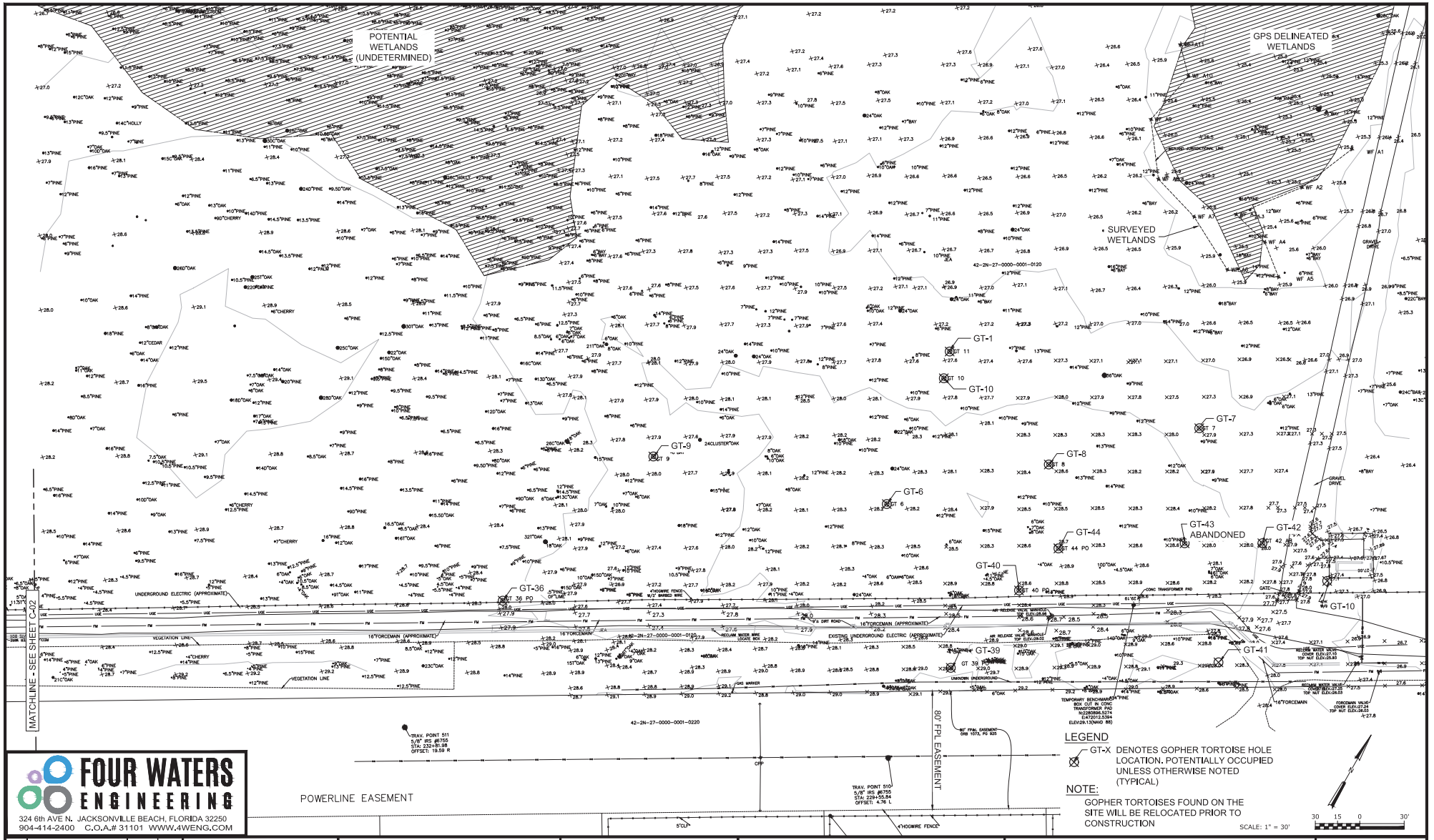
JACKSONVILLE, FLORIDA 32216

RADIO AVENUE R.W. GROUND STORAGE TANKS & BOOSTER PUMP STATION

JEA Building Community

EXISTING SITE PLAN I

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-02



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REV	ISSUED FOR	DATE	BY
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PROJECT ENGINEER:	A. DIEFFENTHALLER
DESIGNED BY:	M. KLINK
DRAWN BY:	S. DUCHARME
CHECKED BY:	G. BROWN

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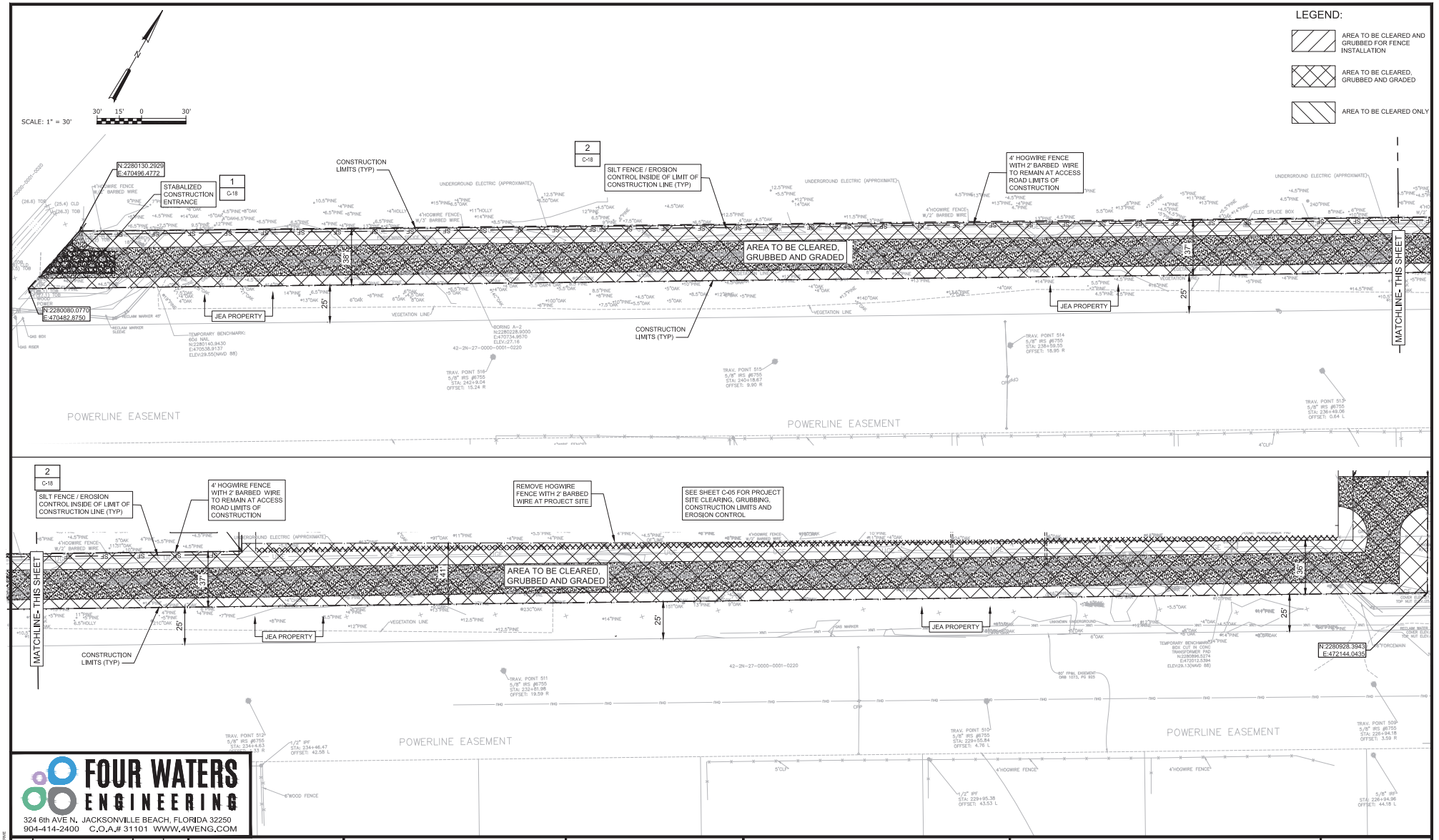
EXISTING SITE PLAN II

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-03



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REV	ISSUED FOR	DATE	BY
1	PERMIT SUBMITTAL	10/20	AD

PROJECT ENGINEER:	A. DIEFFENTHALLER
DESIGNED BY:	J. WILHOIT
DRAWN BY:	C. SCOTT
CHECKED BY:	G. BROWN

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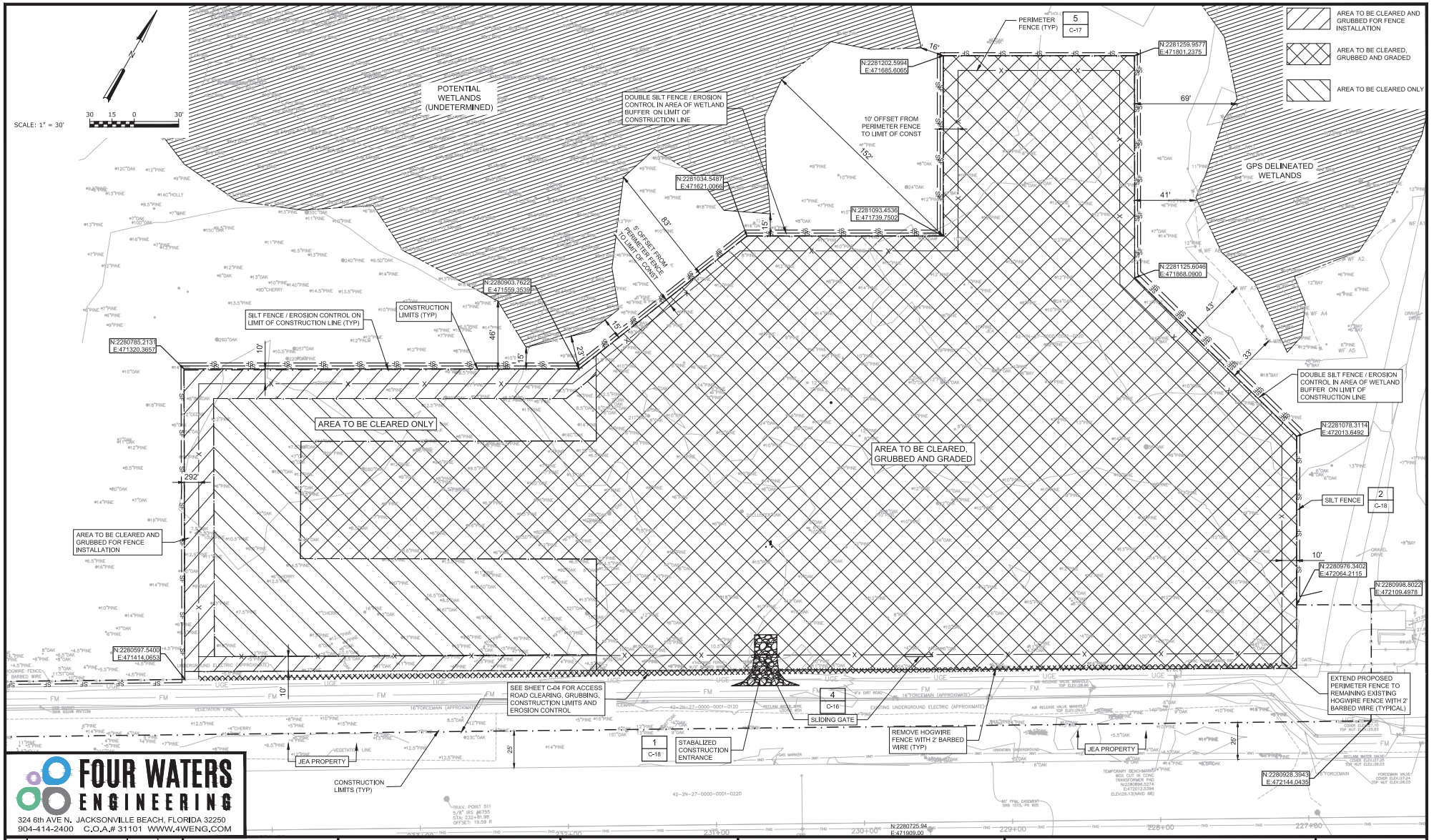
CLEARING, GRUBBING, CONSTRUCTION LIMITS AND EROSION CONTROL I

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-04



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REV	ISSUED FOR	DATE	BY
1	PERMIT SUBMITTAL	10/20	AD

PROJECT ENGINEER:	A. DIEFFENTHALLER
DESIGNED BY:	M. KLINK
DRAWN BY:	S. DUCHARME
CHECKED BY:	G. BROWN

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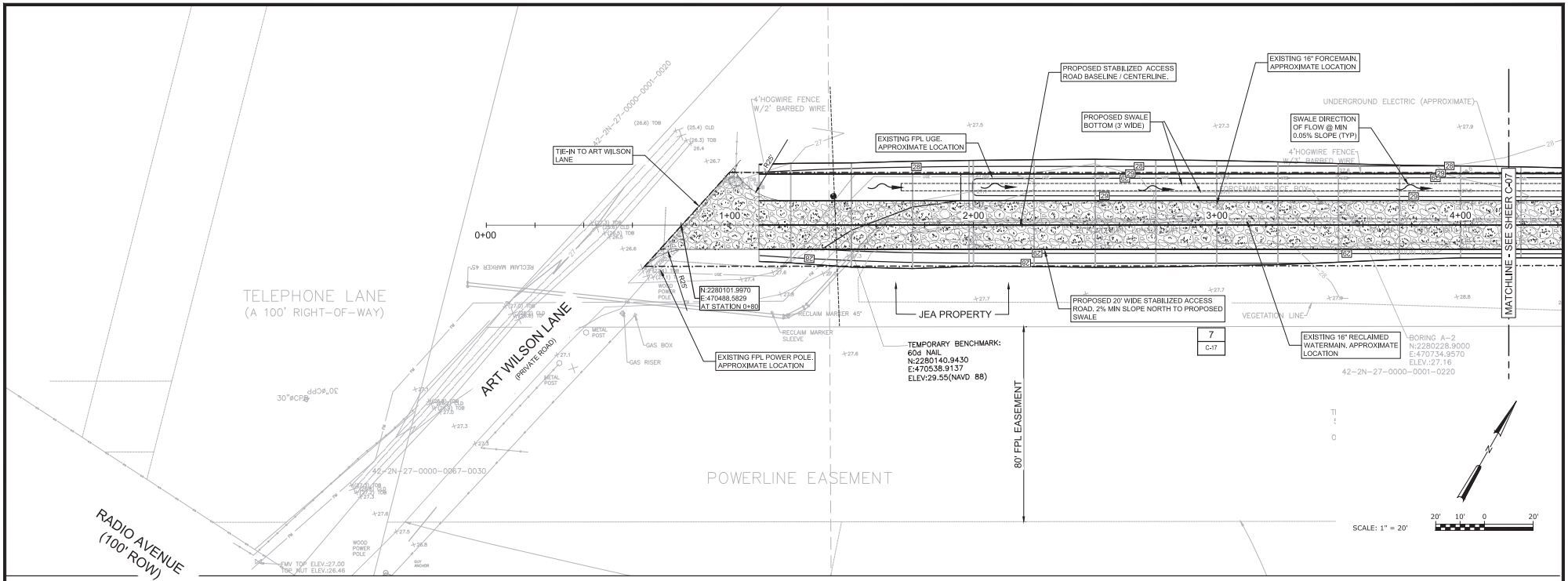
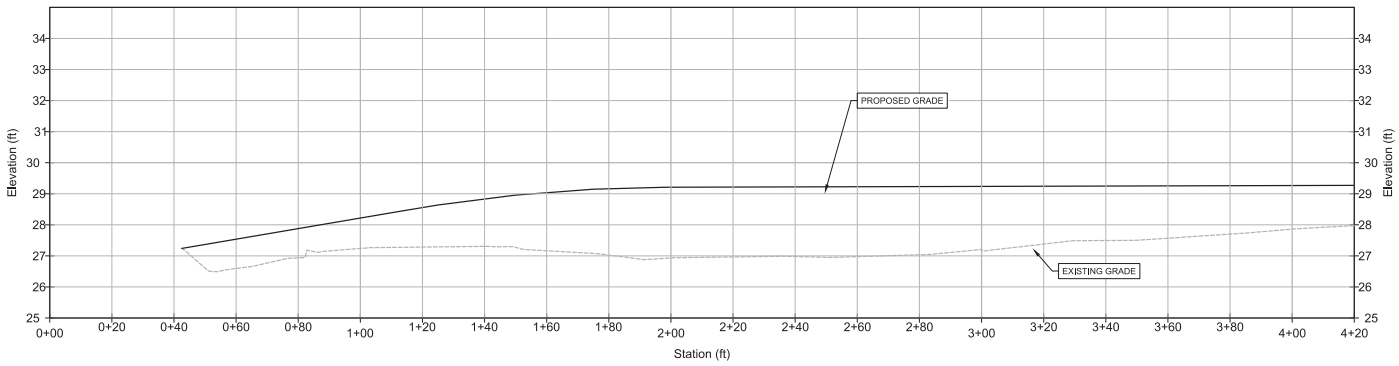
CLEARING, GRUBBING, CONSTRUCTION LIMITS AND EROSION CONTROL II

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-05



PROPOSED STABILIZED ACCESS ROAD PROFILE



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1	PERMIT SUBMITTAL	10/20	AD

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DESIGNED BY:	M. KLINK
DRAWN BY:	S. DUCHARME
CHECKED BY:	G. BROWN

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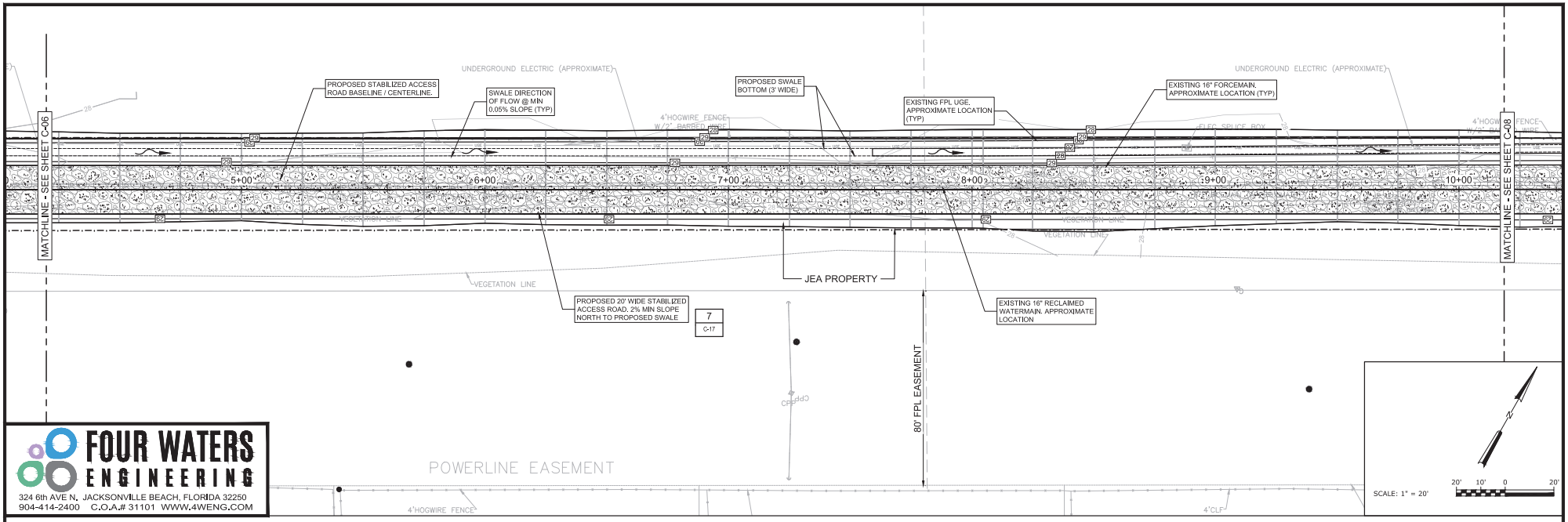
PROPOSED ACCESS ROAD PLAN AND PROFILE I

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-06



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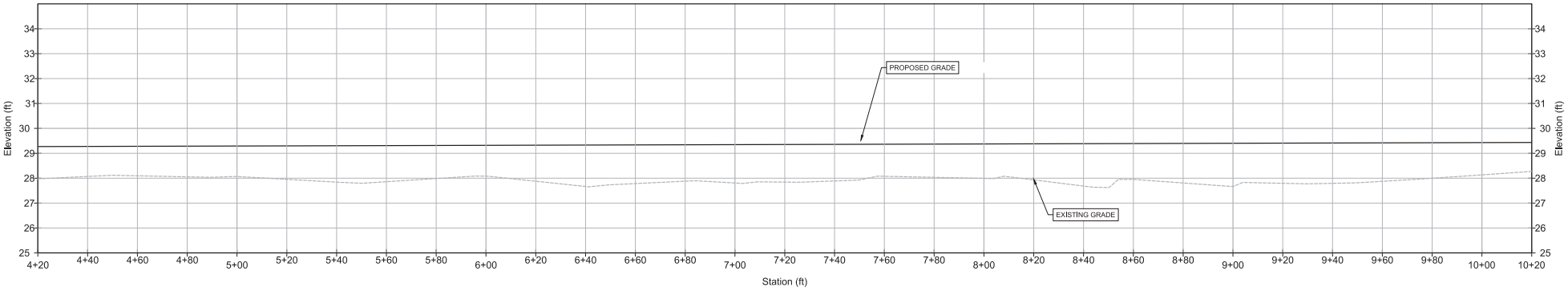
PROPOSED STABILIZED ACCESS ROAD PROFILE



REV	ISSUED FOR	DATE	BY
1	PERMIT SUBMITTAL	10/20	AD

PROJECT ENGINEER:	A. DIEFFENTHALLER
DESIGNED BY:	M. KLINK
DRAWN BY:	S. DUCHARME
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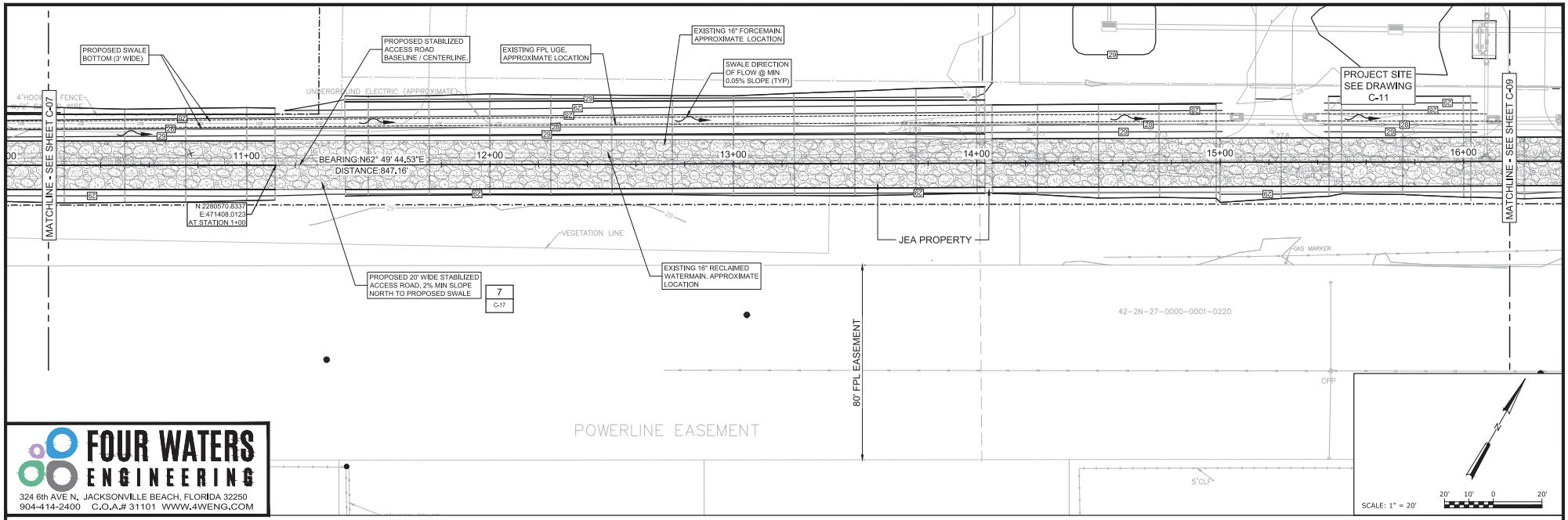
PROPOSED ACCESS ROAD PLAN AND PROFILE II

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-07



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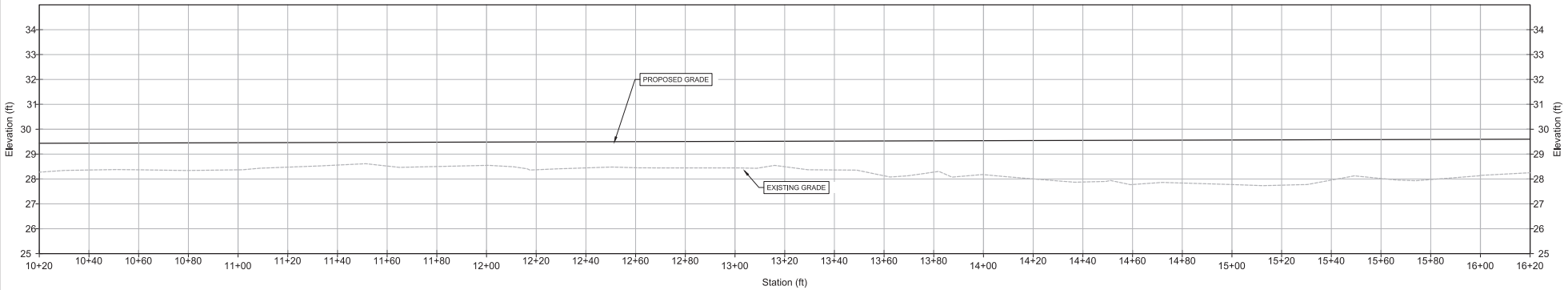
PROPOSED STABILIZED ACCESS ROAD PROFILE



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DESIGNED BY:	M. KLINK
DRAWN BY:	S. DUCHARME
CHECKED BY:	G. BROWN

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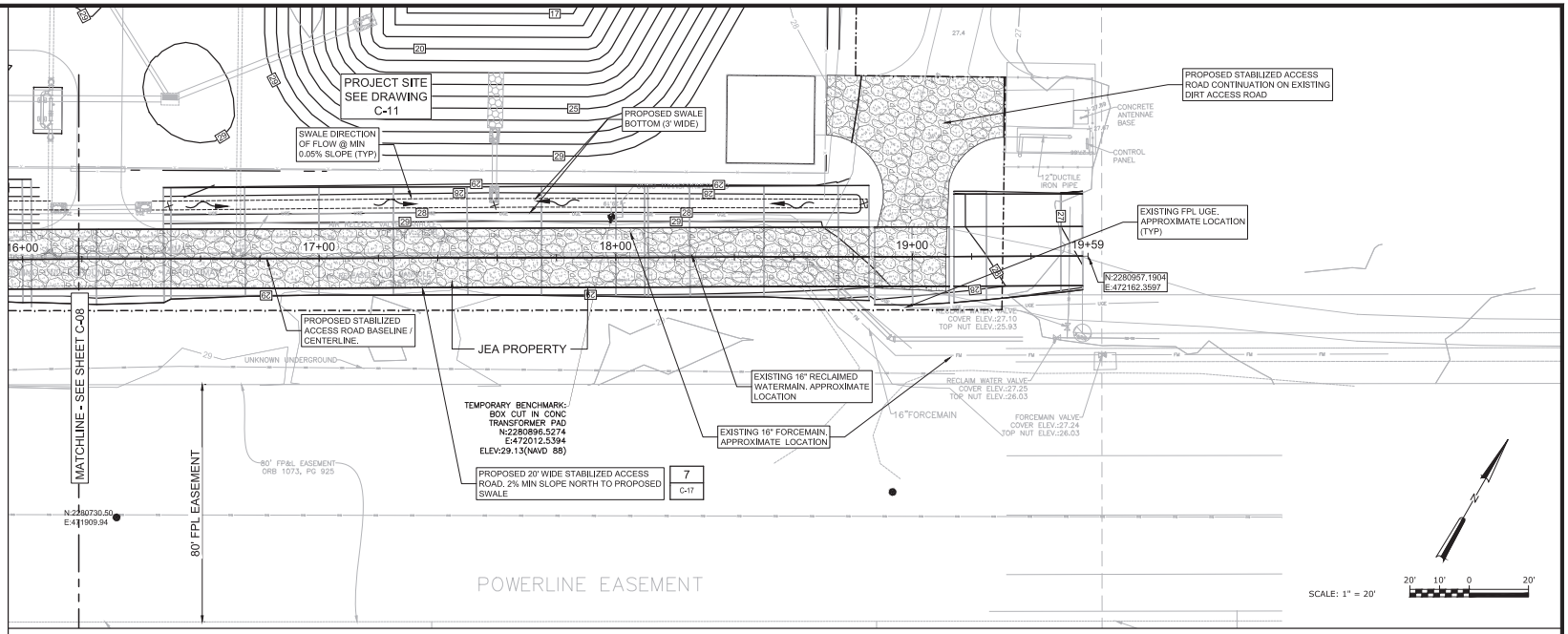
PROPOSED ACCESS ROAD PLAN AND PROFILE III

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-08



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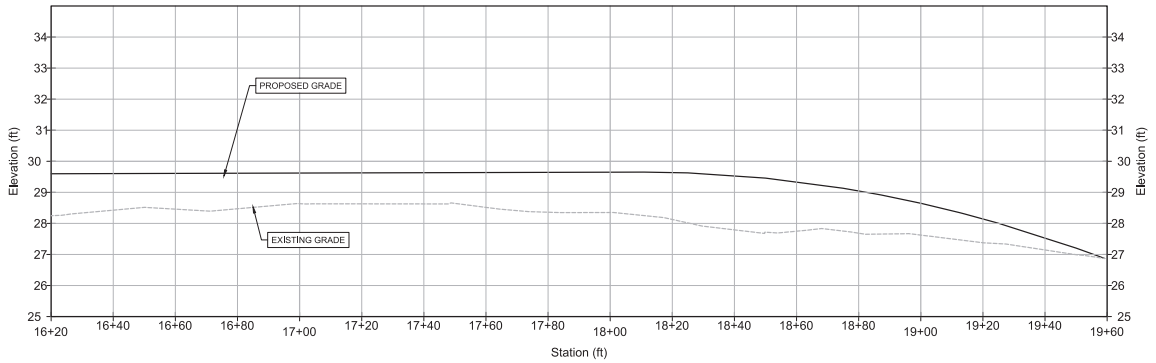

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PROJECT ENGINEER: A. DIEFFENTHALLER
DESIGNED BY: M. KLINK
DRAWN BY: S. DUCHARME
CHECKED BY: G. BROWN
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PROPOSED ACCESS ROAD PLAN AND PROFILE IV

DATE: OCTOBER 2020
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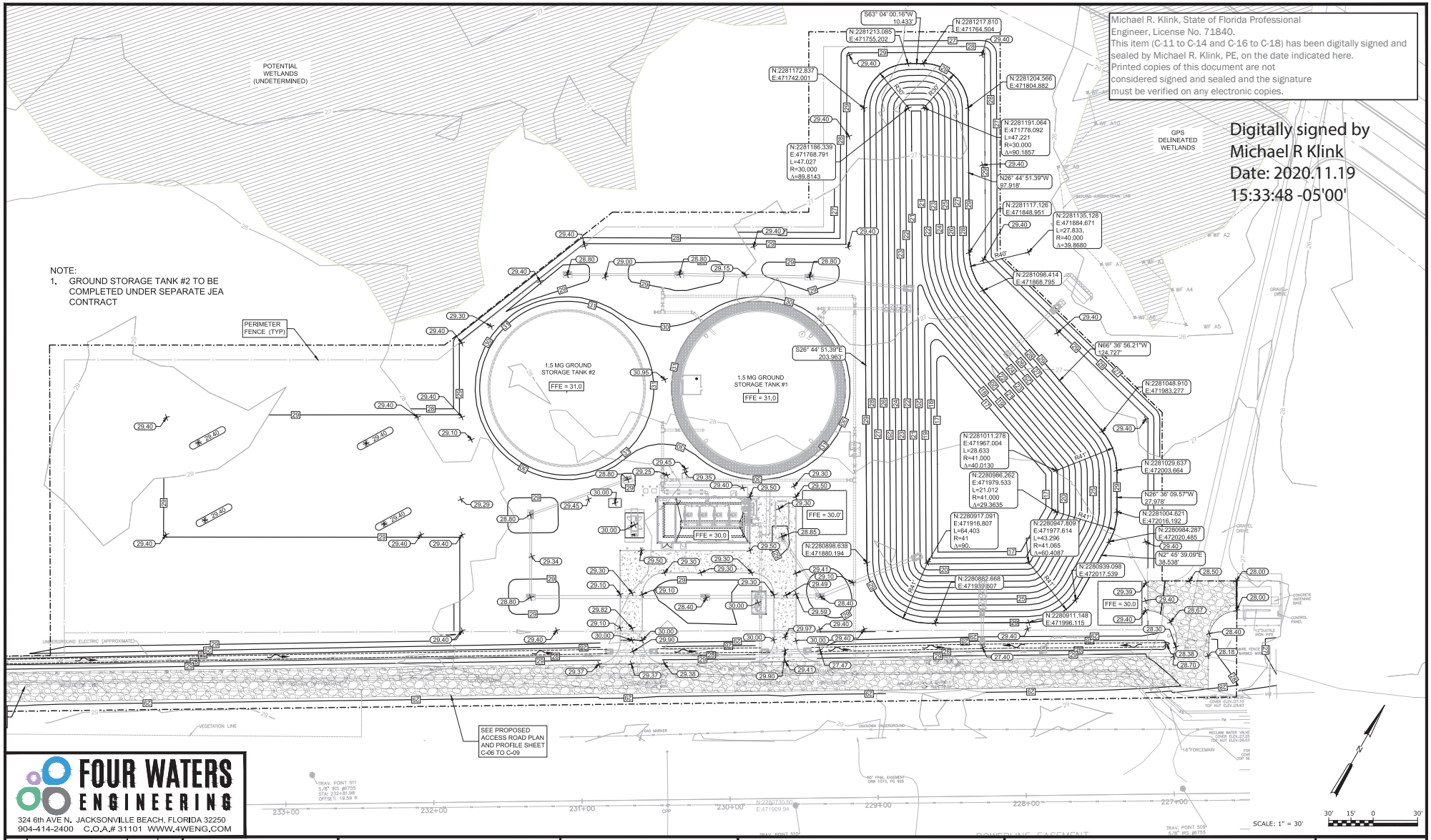
CONTRACT NO.: 8004751
DRAWING NUMBER: C-09



Michael R. Klink, State of Florida Professional Engineer, License No. 71840.
This item (C-11 to C-14 and C-16 to C-18) has been digitally signed and sealed by Michael R. Klink, PE, on the date indicated here.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Digitally signed by Michael R Klink
Date: 2020.11.19 15:33:48 -05'00'

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1	PERMIT SUBMITTAL	10/20	AD

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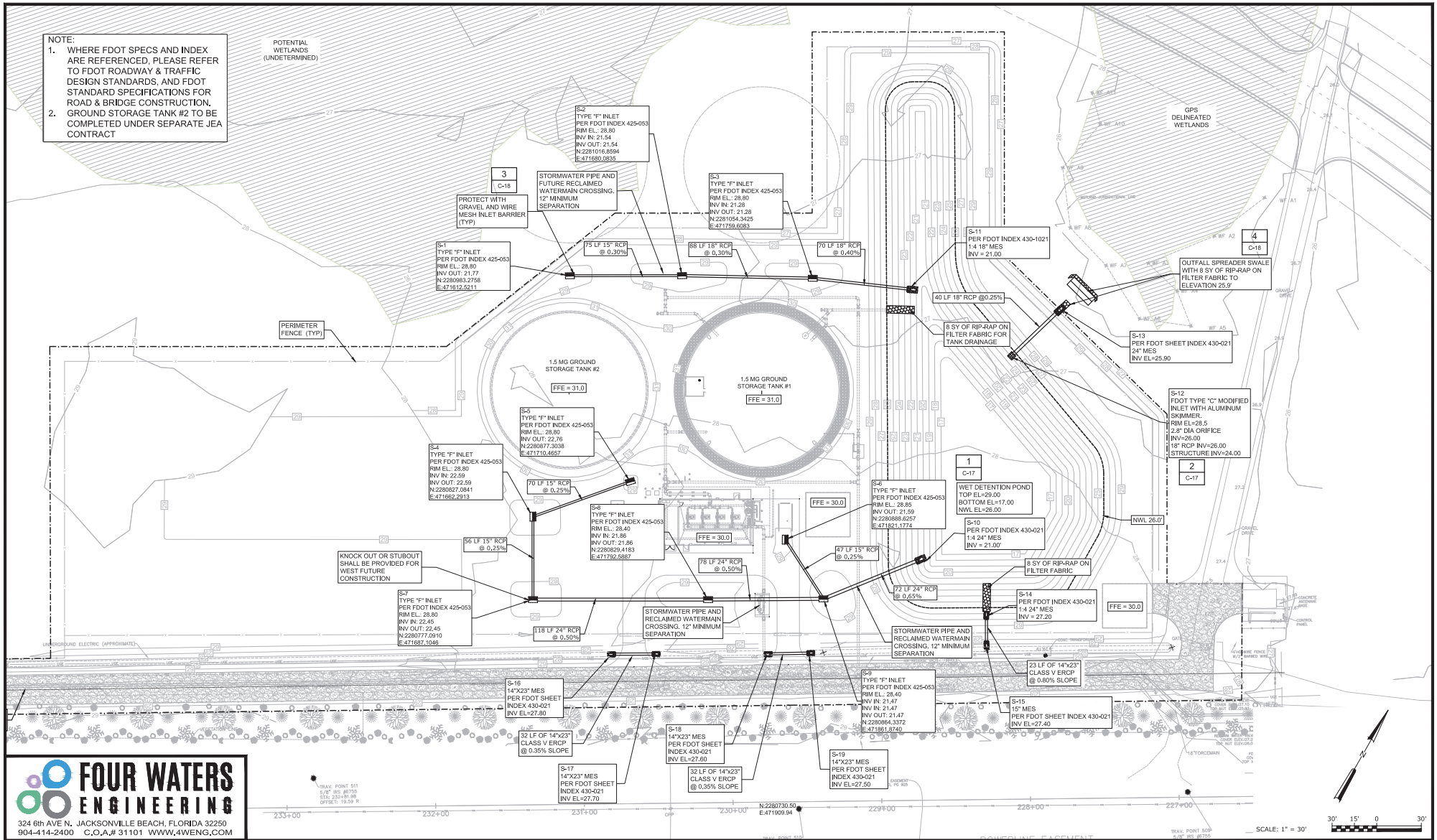
SITE GRADING

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-11



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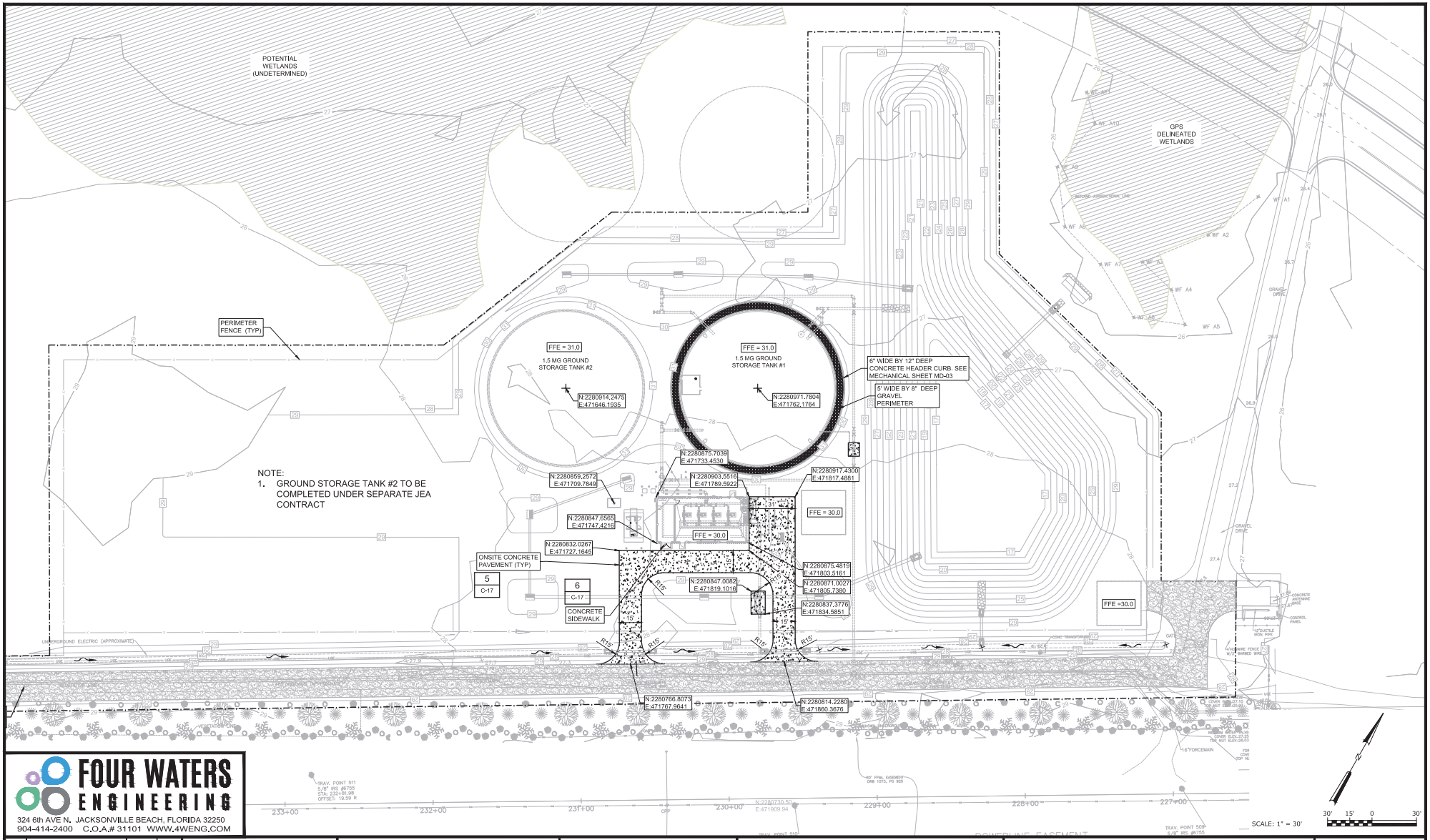
SITE DRAINAGE

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-12



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REV	ISSUED FOR	DATE	BY
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SITE PAVING

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-13

SITE TABULATIONS*:
GROSS SITE ACREAGE GROSS SITE ACREAGE (PHASE 1 AND FUTURE PHASE - OUTER DASHED LINE): 305,356 SF

TOTAL BUILDING AREAS (INCLUDES FUTURE):
BUILDING 2,000 (2,000; 900: 900) = 5,800 SF
TANKS PHASE 1 = 20,774 SF
(FUTURE TANKS = 20,774 SF)
TOTAL TANKS = 41,548 SF
PIPE PADS, GENERATOR PAD, SIDEWALK 1,000 (1,000) = 2,000 SF
CONCRETE PAVEMENT 5,005 (18,000) = 23,005 SF
TOTAL IMPERVIOUS = 72,353 SF
STABALIZED ACCESS ROAD = 40,075 SF

TOTAL PARKING AREA AND PARKING RATIO = 162 SF AND 1.0 (100%)

TOTAL SURFACE AREA OF STORMWATER RETENTION FACILITIES AT TOP OF BANK (29' CONTOUR) = 42,010 SF

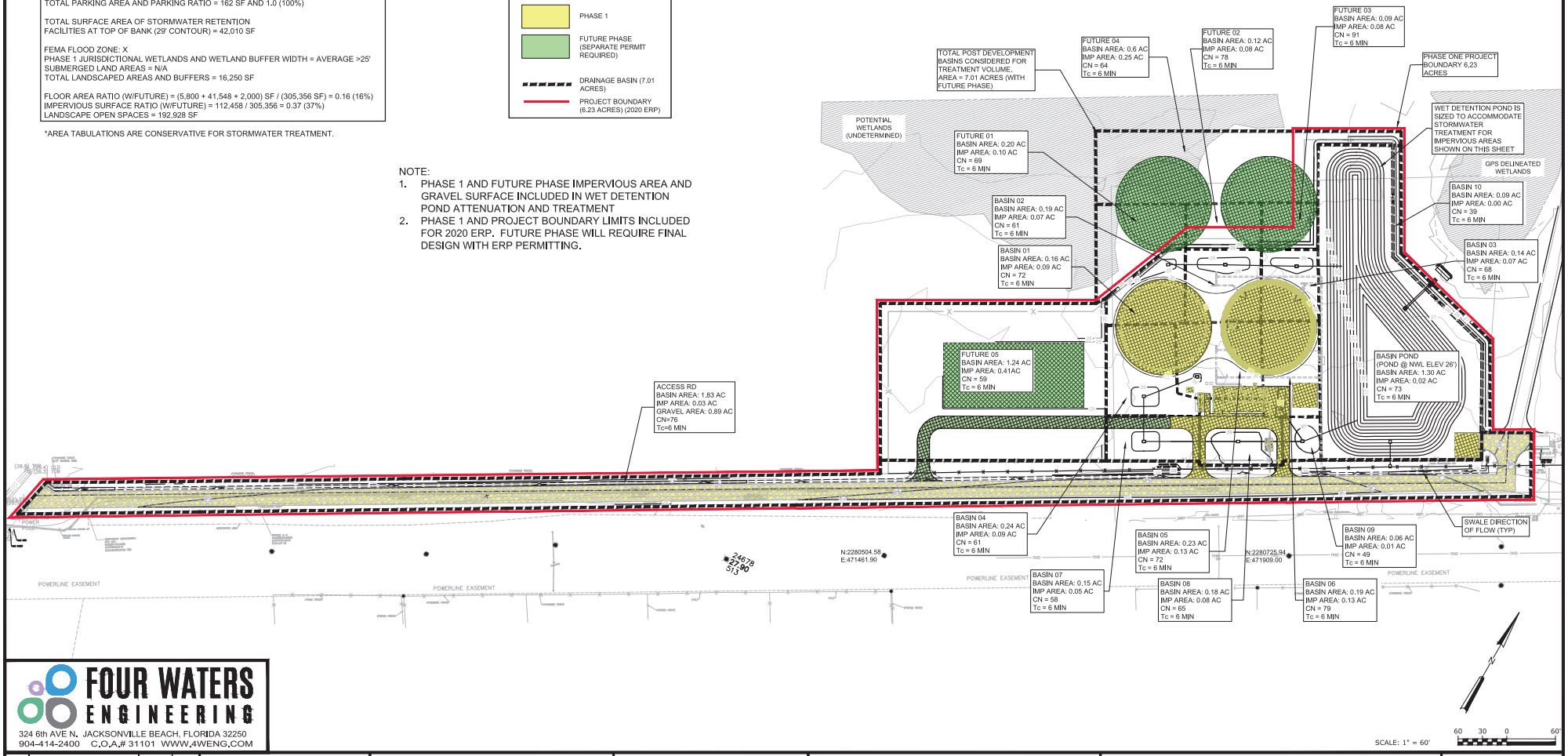
FEMA FLOOD ZONE: X
PHASE 1 JURISDICTIONAL WETLANDS AND WETLAND BUFFER WIDTH = AVERAGE >25'
SUBMERGED LAND AREAS = N/A
TOTAL LANDSCAPED AREAS AND BUFFERS = 16,250 SF

FLOOR AREA RATIO (W/FUTURE) = (5,800 + 41,548 + 2,000) SF / (305,356 SF) = 0.16 (16%)
IMPERVIOUS SURFACE RATIO (W/FUTURE) = 112,458 / 305,356 = 0.37 (37%)
LANDSCAPE OPEN SPACES = 192,928 SF

*AREA TABULATIONS ARE CONSERVATIVE FOR STORMWATER TREATMENT.

LEGEND:
- IMPERVIOUS AREA
- GRAVEL AREA
- PHASE 1
- FUTURE PHASE (SEPARATE PERMIT REQUIRED)
- DRAINAGE BASIN (7.01 ACRES)
- PROJECT BOUNDARY (6.23 ACRES) (2020 ERP)

NOTE:
1. PHASE 1 AND FUTURE PHASE IMPERVIOUS AREA AND GRAVEL SURFACE INCLUDED IN WET DETENTION POND ATTENUATION AND TREATMENT
2. PHASE 1 AND PROJECT BOUNDARY LIMITS INCLUDED FOR 2020 ERP. FUTURE PHASE WILL REQUIRE FINAL DESIGN WITH ERP PERMITTING.



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CHECKED BY:	G. BROWN

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POST DEVELOPMENT DRAINAGE MAP

DATE:	OCTOBER 2020
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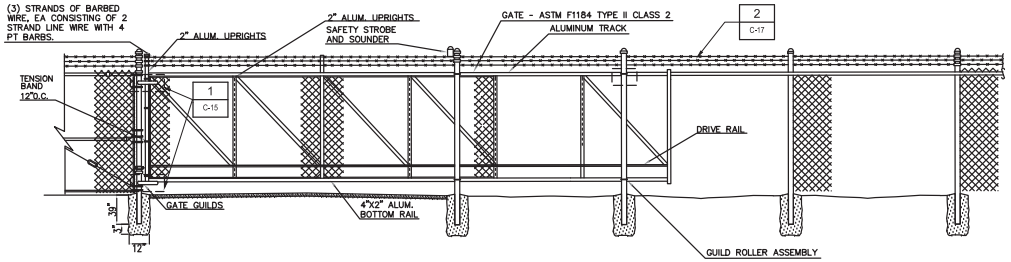
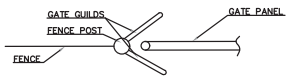
DRAWING NUMBER:	C-14



GATE - TROLLEY
NOT TO SCALE

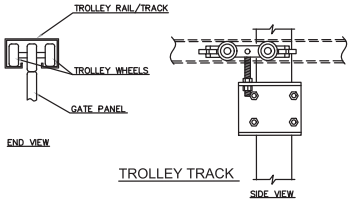
DETAIL 4 | NTS | C-10



PLAN VIEW

GATE GUILD
NOT TO SCALE

DETAIL 1 | NTS | C-17

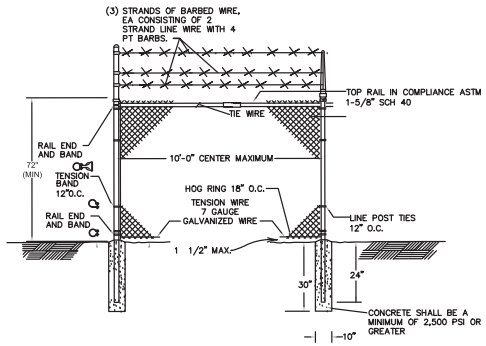


TROLLEY TRACK

DETAIL 2 | NTS | C-XX

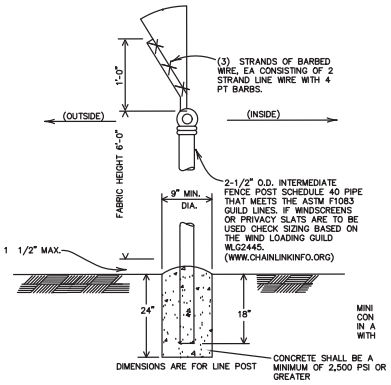
NOTES:

1. VEHICLE GATES SHALL BE OF SIMILAR CONSTRUCTION AS FENCES, BUT REQUIRE ADDITIONAL STRENGTH DUE TO THE WEIGHT OF THE GATE ASSEMBLY, AND TO PREVENT VEHICLE INCURSION, IF DICTATED.
2. UNLESS OTHERWISE NOTED, ALL MATERIALS AND INSTALLATION PROCESS SHALL CONFORM TO THE CHAIN LINK MANUFACTURE INSTITUTE PRODUCT MANUAL (CLFMI-PM-2445)
3. FENCE FABRIC SHALL BE GALVANIZED CHAIN LINK (ASTM A392) 9 GAUGE WITH 2" MESH UNLESS OTHERWISE NOTED. STANDARD FABRIC SELVAGE FOR 2 IN (50 MM) MESH 72 IN. (1,8 M) HIGH AND OVER IS KNUCKLE FINISH AT ONE END AT ONE END, TWIST AT THE OTHER, K&T. FABRIC LESS THAN 72 IN (1,8 M), KNUCKLE FINISH TOP AND BOTTOM, K&K.
4. CONCRETE SHALL BE A MINIMUM OF 2,500 PSI OR GREATER MINIMUM DEPTH OF CONCRETE FOOTINGS IN ACCORDANCE WITH ASTM F567.

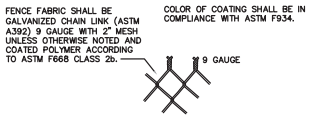


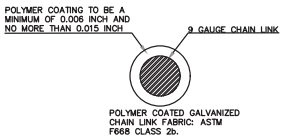
FENCE - POLYMER COATED

DETAIL 5 | NTS | C-04-05



SIDE VIEW





NOTES:

1. CHAIN LINK FENCING MUST BE A MINIMUM OF 6 FEET PLUS 1 FOOT OF 3 STRAND OF BARBED WIRE AT THE TOP FOR A TOTAL HEIGHT OF 7 FEET.
2. ALL FENCE COMPONENTS IN A HARSH AND CORROSIVE ENVIRONMENT MUT BE PROVIDED A 6 GAUGE VINYL COATING, THE PREFERRED COLOR FOR THE COATING IS BLACK.
3. PRIVACY SLATS WILL BE INSTALLED WHERE REQUIREMENTS DICTATE SCREENING IS REQUIRED, THESE SLATS WILL BE TOP-LOCKING AND SPAN THE ENTIRE LENGTH THE FENCE FABRIC, THE PREFERRED COLOR FOR THESE SLATS IS BLACK.
4. UNLESS OTHERWISE NOTED, ALL MATERIALS AND INSTALLATION PROCESS SHALL CONFORM TO THE CHAIN LINK MANUFACTURE INSTITUTE PRODUCT MANUAL (CLFMI-PM-2445)
5. IF THE POLYMER COATING IS DAMAGED DURING INSTALLATION, CONTRACTOR SHALL REPLACE OR REPAIR THE MATERIAL AT OWN EXPENSE.
6. CONTRACTOR SHALL WARRANTY THE POLYMER-COATED GALVANIZED CHAIN LINK FENCE (CLASS 2B) FOR 15 YEARS AGAINST FAILURE DUE TO RUST OR CORROSION.
7. ALL POSTS, BARBWIRE AND ALL FITTINGS SHALL BE VINYL COATED THE SAME AS ON THE FENCING FABRIC.
8. MINIMUM DEPTH OF CONCRETE FOOTINGS IN ACCORDANCE WITH ASTM F567
9. FENCE FABRIC SHALL BE GALVANIZED CHAIN LINK (ASTM A392) 9 GAUGE WITH 2" MESH UNLESS OTHERWISE NOTED. STANDARD FABRIC SELVAGE FOR 2 IN (50 MM) MESH 72 IN. (1,8 M) HIGH AND OVER IS KNUCKLE FINISH AT ONE END AT ONE END, TWIST AT THE OTHER, K&T. FABRIC LESS THAN 72 IN (1,8 M), KNUCKLE FINISH TOP AND BOTTOM, K&K.
10. BARBED WIRE MUST BE MOUNTED AT A 45 DEGREE ANGLE TOWARDS THE UNSECURE SIDE OF FENCE.
11. FOR LATEST SECURITY FENCING AND GATES UPDATES, CONTACT SECURITYSERVICE@JEA.COM.

REV	ISSUED FOR	DATE	BY
1	PERMIT SUBMITTAL	10/20	AD

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE (0, 1/2", 1")

PROJECT ENGINEER:	A. DIEFFENTHALLER
DESIGNED BY:	J. WILHOIT
DRAWN BY:	C. SCOTT
CHECKED BY:	G. BROWN

PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

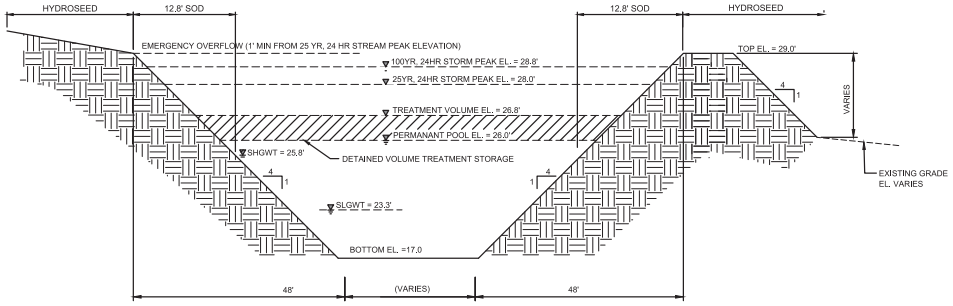
Hazen
HAZEN AND SAWYER
6675 CORPORATE CENTER PARKWAY
JACKSONVILLE, FLORIDA 32216

RADIO AVENUE R.W. GROUND STORAGE TANKS & BOOSTER PUMP STATION

JEA Building Community

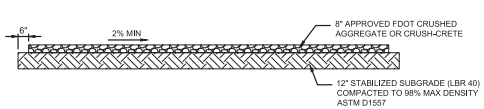
FENCING ENLARGED PLANS AND SECTIONS

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-16



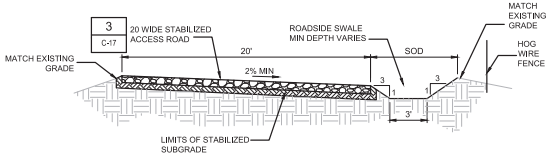
STORMWATER POND SECTION

DETAIL 1 / NTS / C-12



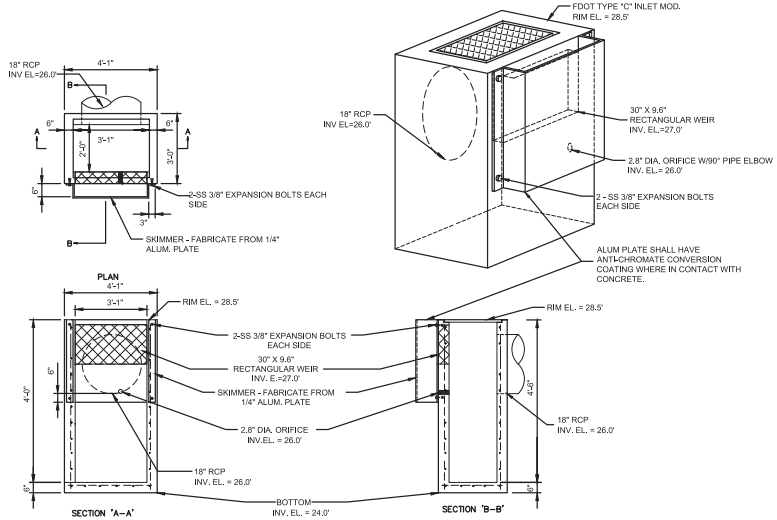
20' WIDE STABILIZED ACCESS ROAD DETAIL

DETAIL 3 / NTS / C-17



TYPICAL STABILIZED ACCESS ROAD DETAIL SECTION

DETAIL 7 / NTS / C-06-09

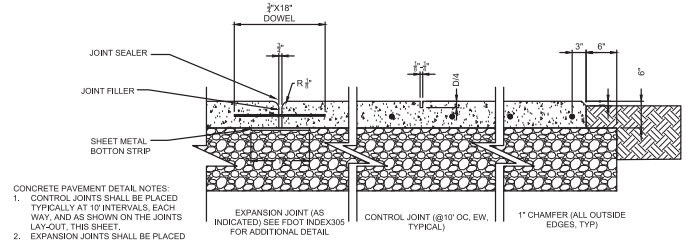


STORMWATER POND OUTFALL STRUCTURE AND SKIMMER DETAIL

DETAIL 2 / NTS / C-12

NOTE:

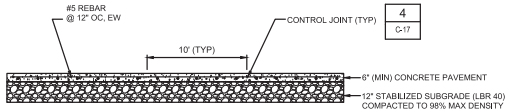
WHERE FDOT SPECS AND INDEX ARE REFERENCED, PLEASE REFER TO FDOT ROADWAY & TRAFFIC DESIGN STANDARDS, AND FDOT STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION.



CONCRETE PAVEMENT DETAIL NOTES:
1. CONTROL JOINTS SHALL BE PLACED TYPICALLY AT 10' INTERVALS, EACH WAY, AND AS SHOWN ON THE JOINTS LAY-OUT, THIS SHEET.
2. EXPANSION JOINTS SHALL BE PLACED AS SHOWN ON THE JOINTS LAY-OUT, THIS SHEET
3. ELEVATIONS AND SLOPES AS SHOWN ON DESIGN DRAWINGS

ON-SITE CONCRETE PAVEMENT TYPICAL DETAILS

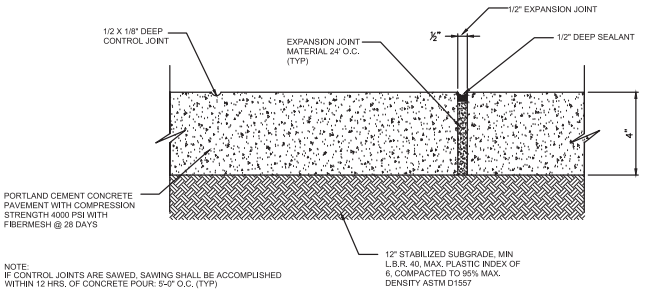
DETAIL 4 / NTS / C-17



CONCRETE PAVEMENT NOTES
1. CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS. 4,000 PSI CONCRETE MIX SHALL BE PER FDOT CLASS I (PAVEMENT) MIX PROPORTIONS REQUIREMENTS.
2. (IMPORTED) SOIL USED FOR SUB-BASE SHALL BE FREE OF HEAVY CLAY, SILTS, STONES, PLANT ROOTS OR OTHER FOREIGN MATERIAL GREATER THAN 1-1/2" IN DIAMETER IN ORDER TO ACHIEVE ADEQUATE AND UNIFORM COMPACTION.
3. CONTROL JOINTS SHALL BE FORMED OR SAWED IMMEDIATELY AFTER THE FINAL FINISH USING AN EARLY ENTRY SYSTEM SUCH AS THE SOFF-CUT SYSTEM
4. ALL JOINTS MUST BE COMPLETED WITHIN 12 HOURS FROM TIME OF CONCRETE PLACEMENT.
5. CURE CONCRETE IMMEDIATELY AFTER FINISHING OPERATION IS COMPLETED BY USING ONE OF THE FOLLOWING METHODS: WATER, PIGMENTED WATER BASED CURING COMPOUND OR VISQUEEN AND BURLAP

ON-SITE CONCRETE PAVEMENT TYPICAL SECTION

DETAIL 5 / NTS / C-13



NOTE:
IF CONTROL JOINTS ARE SAWED, SAWING SHALL BE ACCOMPLISHED WITHIN 12 HRS. OF CONCRETE POUR: 5'-0" O.C. (TYP)

CONCRETE SIDEWALK SECTION DETAIL

DETAIL 6 / NTS / C-13

FOUR WATERS ENGINEERING
324 6th AVE N. JACKSONVILLE BEACH, FLORIDA 32250
904-414-2400 C.O.A.# 31101 WWW.4WENG.COM

REV	ISSUED FOR	DATE	BY
1	PERMIT SUBMITTAL	10/20	AD

PROJECT ENGINEER: A. DIEFFENTHALLER
DESIGNED BY: M. KLINK
DRAWN BY: S. DUCHARME
CHECKED BY: G. BROWN

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE (0 1/2" 1")

PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

Hazen
HAZEN AND SAWYER
6675 CORPORATE CENTER PARKWAY
JACKSONVILLE, FLORIDA 32216

RADIO AVENUE R.W. GROUND STORAGE TANKS & BOOSTER PUMP STATION

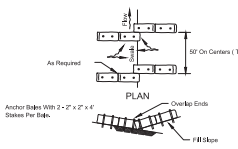
JEA Building Community

CIVIL DETAILS

DATE: OCTOBER 2020
HAZEN NO.: 42011-014
CONTRACT NO.: 8004751
DRAWING NUMBER: C-17

EROSION AND SEDIMENT CONTROL NOTES

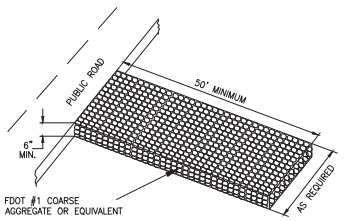
1. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING SILT FROM SITE IF NOT REUSABLE ON-SITE AND ASSURING PLAN ALIGNMENT AND GRADE IN ALL DITCHES AND SWALES AT COMPLETION OF CONSTRUCTION.
2. THE SITE CONTRACTOR IS RESPONSIBLE FOR REMOVING THE TEMPORARY EROSION AND SEDIMENT CONTROL DEVICES AFTER COMPLETION OF CONSTRUCTION AND ONLY WHEN AREAS HAVE BEEN STABILIZED.
3. ADDITIONAL PROTECTION - ON-SITE PROTECTION IN ADDITION TO THE ABOVE MUST BE PROVIDED THAT WILL NOT PERMIT SILT TO LEAVE THE PROJECT CONFINES DUE TO UNSEEN CONDITIONS OR ACCIDENTS.
4. CONTRACTOR SHALL INSURE THAT ALL DRAINAGE STRUCTURES, PIPES, ETC. ARE CLEANED OUT AND WORKING PROPERLY AT TIME OF ACCEPTANCE.
5. WIRE MESH SHALL BE LAID OVER THE DROP INLET SO THAT THE WIRE EXTENDS A MINIMUM OF 1 FOOT BEYOND EACH SIDE OF THE INLET STRUCTURE. HARDWARE CLOTH OR COMPARABLE WIRE MESH WITH 1/2-INCH OPENINGS SHALL BE USED. IF MORE THAN ONE STRIP OF MESH IS NECESSARY, THE STRIPS SHALL BE OVERLAPPED.
6. FDOT NO. 1 COARSE AGGREGATE SHALL BE PLACED OVER THE WIRE MESH AS INDICATED IN D-903. THE DEPTH OF STONE SHALL BE AT LEAST 12 INCHES OVER THE ENTIRE INLET OPENING. THE STONE SHALL EXTEND BEYOND THE INLET OPENING AT LEAST 18 INCHES ON ALL SIDES.
7. IF THE STONE FILTER BECOMES CLOGGED WITH SEDIMENT SO THAT IT NO LONGER ADEQUATELY PERFORMS ITS FUNCTION, THE STONES MUST BE PULLED AWAY FROM THE INLET, CLEANED AND REPLACED.
8. BALES SHALL BE EITHER WIRE-BOUND OR STRING-TIED WITH THE BINDINGS ORIENTED AROUND THE SIDES RATHER THAN OVER AND UNDER THE BALES.
9. BALES SHALL BE PLACED LENGTHWISE IN A SINGLE ROW SURROUNDING THE INLET, WITH THE ENDS OF ADJACENT BALES PRESSED TOGETHER.
10. THE FILTER BARRIER SHALL BE ENTRENCHED AND BACKFILLED. A TRENCH SHALL BE EXCAVATED TO A MINIMUM DEPTH OF 8 INCHES. AFTER THE BALES ARE STAKED, THE EXCAVATED SOIL SHALL BE BACKFILLED AND COMPACTED AGAINST THE FILTER BARRIER.
11. EACH BALE SHALL BE SECURELY ANCHORED AND HELD IN PLACE BY AT LEAST TWO STAKES OR REBARS DRIVEN THROUGH THE BALE.
12. LOOSE STRAW SHOULD BE WEDGED BETWEEN BALES TO PREVENT WATER FROM ENTERING BETWEEN BALES.
13. STRAW BALE BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL.
14. CLOSE ATTENTION SHALL BE PAID TO THE REPAIR OF DAMAGED BALES, END RUNS AND UNDERCUTTING BENEATH BALES.
15. NECESSARY REPAIRS TO BARRIERS OR REPLACEMENT OF BALES SHALL BE ACCOMPLISHED PROMPTLY.
16. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE STRAW BALE BARRIER IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM TO THE EXISTING GRADE, PREPARED AND SEEDED.
17. SILT FENCES AND FILTER BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
18. SHOULD THE FABRIC ON A SILT FENCE OR FILTER BARRIER DECOMPOSE OR BECOME INEFFECTIVE PRIOR TO THE END OF THE EXPECTED USABLE LIFE AND THE BARRIER STILL BE NECESSARY, THE FABRIC SHALL BE REPLACED PROMPTLY.
19. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE-THIRD THE HEIGHT OF THE BARRIER.
20. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SILT FENCE OR FILTER BARRIER IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE, PREPARED AND SEEDED.
21. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
22. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/3 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
23. THE CONTRACTOR IS RESPONSIBLE FOR FOLLOWING THE BEST EROSION AND SEDIMENT CONTROL PRACTICES AS OUTLINED IN THE PLANS, SPECIFICATIONS AND ST. JOHNS RIVER WATER MANAGEMENT DISTRICT SPECIFICATIONS AND CRITERIA.
24. FOR ADDITIONAL INFORMATION ON SEDIMENT AND EROSION CONTROL REFER TO "THE FLORIDA DEVELOPMENT MANUAL - A GUIDE TO SOUND LAND AND WATER MANAGEMENT" FROM THE STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION (F.D.E.R.) CHAPTER 6.
25. EROSION AND SEDIMENT CONTROL BARRIERS SHALL BE PLACED ADJACENT TO ALL WETLAND AREAS WHERE THERE IS POTENTIAL FOR DOWNSTREAM WATER QUALITY DEGRADATION. SEE DETAIL SHEET FOR TYPICAL CONSTRUCTION.
26. ALL DISTURBED AREAS SHALL BE GRASSED, FERTILIZED, MULCHED AND MAINTAINED UNTIL A PERMANENT VEGETATIVE COVER IS ESTABLISHED.
27. SOD SHALL BE PLACED IN AREAS WHICH MAY REQUIRE IMMEDIATE EROSION PROTECTION TO ENSURE WATER QUALITY STANDARDS ARE MAINTAINED.
28. ANY DISCHARGE FROM DEWATERING ACTIVITY SHALL BE FILTERED AND CONVEYED TO THE OUTFALL IN A MANNER WHICH PREVENTS EROSION AND TRANSPORTATION OF SUSPENDED SOLIDS TO THE RECEIVING OUTFALL.
29. DEWATERING PUMPS SHALL NOT EXCEED THE CAPACITY OF THAT WHICH REQUIRES A CONSUMPTIVE USE PERMIT FROM THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT.
30. ALL DISTURBED AREAS TO BE STABILIZED THROUGH COMPACTION, SILT SCREENS, HAY BALES, AND GRASSING. ALL FILL SLOPES 3:1 OR STEEPER TO RECEIVE STAKED SOLID SOD.
31. ALL DEWATERING, EROSION, AND SEDIMENT CONTROL TO REMAIN IN PLACE AFTER COMPLETION OF CONSTRUCTION AND REMOVED ONLY WHEN AREAS HAVE STABILIZED.
32. THIS PLAN INDICATES THE MINIMUM EROSION AND SEDIMENT MEASURES REQUIRED FOR THIS PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR MEETING ALL APPLICABLE RULES, REGULATIONS AND WATER QUALITY GUIDELINES AND MAY NEED TO INSTALL ADDITIONAL CONTROLS.
33. THE CONTRACTOR SHALL BE REQUIRED TO RESPOND TO ALL FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP) INQUIRIES, RELATIVE TO COMPLIANCE OF FDEP FOR EROSION AND SEDIMENTATION CONTROL. THE COST OF THIS COMPLIANCE SHALL BE PART OF THE CONTRACT.



BARRIERS FOR FILL SLOPES

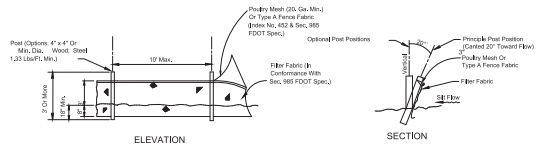
HAY BALE LOCATION

(D-901)
N.T.S.



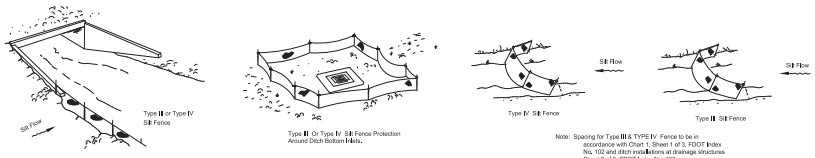
STABILIZED CONSTRUCTION ENTRANCE

DETAIL 1 / NTS C-05



Note: Silt Fence to be paid for under the contract lump sum price for Erosion and Sediment Control.

TYPE IV SILT FENCE



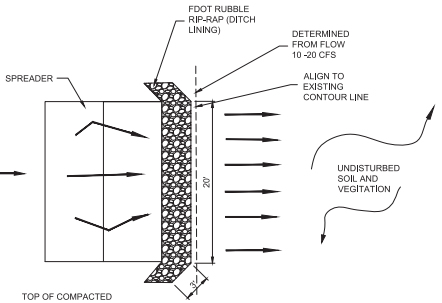
Note: Spacing for Type III & TYPE IV Fence to be in accordance with Chart 1, Sheet 1 of 3, FDOT Index No. 102 and ditch installations at drainage structures Sheet 2 of 3, FDOT Index No. 102.

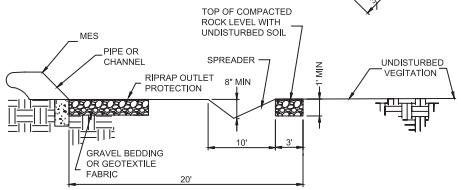
Do not deploy in a manner that silt fences will act as a dam across permanent flowing watercourses. Silt fences are to be used at upland locations and turbidity barriers used at permanent bodies of water.

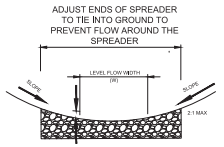
SILT FENCE APPLICATIONS

SILT FENCE TYPE III & IV

DETAIL 2 / NTS C-05

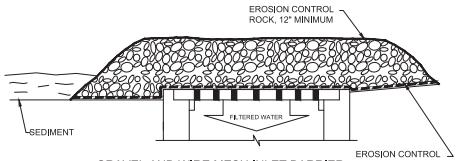






RIGID LIP SPREADER SWALE

DETAIL 4 / NTS C-12



GRAVEL AND WIRE MESH INLET BARRIER

DETAIL 3 / NTS C-12

NOTE:
WHERE FDOT SPECS AND INDEX ARE REFERENCED, PLEASE REFER TO FDOT ROADWAY & TRAFFIC DESIGN STANDARDS, AND FDOT STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION.

FOUR WATERS ENGINEERING
324 6th AVE N. JACKSONVILLE BEACH, FLORIDA 32250
904-414-2400 C.O.A.# 31101 WWW.4WENG.COM

REV	ISSUED FOR	DATE	BY
1	PERMIT SUBMITTAL	10/20	AD

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE (0 1/2" 1")

PROJECT ENGINEER:	A. DIEFFENTHALLER
DESIGNED BY:	M. KLINK
DRAWN BY:	S. DUCHARME
CHECKED BY:	G. BROWN

PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

Hazen
HAZEN AND SAWYER
6675 CORPORATE CENTER PARKWAY
JACKSONVILLE, FLORIDA 32216

RADIO AVENUE R.W. GROUND STORAGE TANKS & BOOSTER PUMP STATION

JEA Building Community

EROSION CONTROL DETAILS

DATE:	OCTOBER 2020
HAZEN NO.:	42011-014
CONTRACT NO.:	8004751
DRAWING NUMBER:	C-18

CONSTRUCTION COMMENCEMENT NOTICE

Instructions: In accordance with Chapter 62-330.350(1)(d), F.A.C., complete and submit this form at least 48 hours prior to commencement of activity authorized by permit.

Permit No. _____ Application No. _____

Project Name _____ Phase _____

Construction of the system authorized by the above referenced Environmental Resource Permit and Application, is expected to commence on _____ , 20 _____ and will have an estimated completion date of _____ , 20 _____

PLEASE NOTE: If the actual construction commencement date is not known within 30 days of issuance of the permit, District staff should be so notified in writing. As soon as a construction commencement date is known, the permittee shall submit a completed construction commencement notice form.

Permittee's or Authorized Agent's Signature _____ Company _____

Print Name _____ Title _____ Date _____

E-mail _____ Phone Number _____

As-Built Certification
And Request for Conversion to Operation Phase

Instructions: Complete and submit this page within 30 days of completion of the entire project, or any independent portion of the project, as required by the permit conditions. The operation phase of the permit is effective when the construction certification for the entire permit/application is approved by the Agency. If the final operation and maintenance entity is not the permittee, the permittee shall operate the project, system, works, or other activities temporarily until such time as the transfer to the operation entity is finalized (use Form 62-330.310(2)).

Permit No: Application No: Permittee:

Project Name: Phase or Independent Portion (if applicable):

I HEREBY CERTIFY THAT (please check only one box):

☐ To the best of my knowledge, information, and belief, construction of the project has been completed in substantial conformance with the plans specifications and conditions permitted by the Agency. Any minor deviations will not prevent the project from functioning in compliance with the requirements of Chapter 62-330, F.A.C. Attached are documents to demonstrate satisfaction of the outstanding permit conditions, other than long term monitoring and inspection requirements.

☐ Construction of the project was NOT completed in substantial conformance with the plans and specifications permitted by the Agency. Any deviations or independent phasing will not prevent the project from functioning in compliance with the requirements of Chapter 62-330, F.A.C. (Contact the permitting agency to determine whether a modification of the permit will be required in accordance with Rule 62-330.315, F.A.C.) Attached is a description of substantial deviations, a set of as-built drawings, and documents to demonstrate satisfaction of the outstanding permit conditions, other than long term monitoring and inspection requirements.

☐ Construction of the project was NOT completed in substantial conformance with the plans and specifications permitted by the Agency. There are substantial deviations that prevent the project from functioning in compliance with the requirements of Chapter 62-330, F.A.C. I acknowledge that corrections to the project and/or a modification of the permit will likely be required, and that conversion to the operation phase cannot be approved at this time. As-built or record drawings reflecting the substantial deviations are attached.

For activities that require certification by a registered professional*:*

By: _____ (Print Name) (Fla. Lic. or Reg. No.)
Signature

(Company Name) (Company Address)

(Telephone Number) (Email Address)

AFFIX SEAL

(Date)

For activities that do not require certification by a registered professional:

By: _____ (Print Name)
Signature

(Company Name) (Company Address)

(Telephone Number) (Email Address) (Date)

Drawings and Information Checklist

Following is a list of information that is to be verified and/or submitted by the Registered Professional or Permittee:

1. All surveyed dimensions and elevations shall be certified by a registered Surveyor or Mapper under Chapter 472, F.S.

2. The registered professional's certification shall be based upon on-site observation of construction (scheduled and conducted by the registered professional of record or by a project representative under direct supervision) and review of as-built drawings, with field measurements and verification as needed, for the purpose of determining if the work was completed in accordance with original permitted construction plans, specifications, and conditions.

3. If submitted, the as-built drawings are to be based on the permitted construction drawings revised to reflect any substantial deviations made during construction. Both the original design and constructed condition must be clearly shown. The plans need to be clearly labeled as "as-built" or "record" drawings that clearly highlight (such as through "red lines" or "clouds") any substantial deviations made during construction. As required by law, all surveyed dimensions and elevations required shall be verified and signed, dated, and sealed by an appropriate registered professional. The following information, at a minimum, shall be verified on the as-built drawings, and supplemental documents if needed:

    a. Discharge structures - Locations, dimensions and elevations of all, including weirs, orifices, gates, pumps, pipes, and oil and grease skimmers;
    b. Detention/Retention Area(s) – Identification number, size in acres, side slopes (h:v), dimensions, elevations, contours, or cross-sections of all, sufficient to determine stage-storage relationships of the storage area and the permanent pool depth and volume below the control elevation for normally wet systems,
    c. Side bank and underdrain filters, or exfiltration trenches - locations, dimensions, and elevations of all, including clean-outs, pipes, connections to control structures, and points of discharge to receiving waters;
    d. System grading - dimensions, elevations, contours, final grades, or cross-sections to determine contributing drainage areas, flow directions, and conveyance of runoff to the system discharge point(s);
    e. Conveyance - dimensions, elevations, contours, final grades, or cross-sections of systems utilized to divert off-site runoff around or through the new system;
    f. Benchmark(s) - location and description (minimum of one per major water control structure);
    g. Datum- All elevations should be referenced to a vertical datum clearly identified on the plans, preferably the same datum used in the permit plans.

4. Wetland mitigation or restoration areas - Show the plan view of all areas, depicting a spatial distribution of plantings conducted by zone (if plantings are required by permit), with a list showing all species planted in each zone, numbers of each species, sizes, date(s) planted, and identification of source of material; also provide the dimensions, elevations, contours, and representative cross-sections depicting the construction.

5. A map depicting the phase or independent portion of the project being certified, if all components of the project authorized in the permit are not being certified at this time.

6. Any additional information or outstanding submittals required by permit conditions or to document permit compliance, other than long-term monitoring or inspection requirements.

OPERATION AND MAINTENANCE INSPECTION CERTIFICATION

Instructions: Submit this form to the Agency within 30 days of completion of the inspection after any failure of a stormwater management system or deviation from the permit. This form may also be used to document inspections required under Section 12.4 of Applicant's Handbook Volume I, however submittal to the Agency is not required unless requested by the Agency.

Permit No.: _____ Application No.: _____ Date Issued: _____

Identification or Name of Stormwater Management System: _____

Phase of Stormwater Management System (if applicable): _____

Inspection Date: _____

Inspection results: (check all that apply)

☐ The undersigned hereby certifies that the works or activities are functioning in substantial conformance with the permit. This certification is based upon on-site observation of the system conducted by me or my designee under my direct supervision and my review of as-built plans.

☐ The following maintenance was conducted since the last inspection (attach additional pages if needed):

_____

☐ The undersigned hereby certifies that I or my designee under my direct supervision has inspected this surface water management system and the system does not appear to be functioning in substantial conformance with the permit. I am aware that maintenance or alteration is required to bring the system into substantial compliance with the terms and conditions of the permit. As appropriate, I have informed the owner of the following:

(a) The system does not appear to be functioning properly;
(b) That maintenance or repair is required to bring the system into compliance; and
(c) If maintenance or repair measures are not adequate to bring the system into compliance, the system may have to be replaced or an alternative design constructed subsequent to approval by the agency below.

The following components of the system do not appear to be functioning properly (attach additional pages if needed):

_____

Any components of the constructed system that are not in substantial conformance with the permitted system shall require a written request to modify the permit in accordance with the provisions of Rule 62-330.315, F.A.C. If such modification request is not approved by the agency below, the components of the system that are not in conformance with the permit are subject to enforcement action under Sections 373.119, .129, .136, and .430, F.S.

Name of Inspector: _____ Florida Registration Number: _____

Company Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Phone: _____ Fax: _____ Email: _____

_____ _____

Signature of Inspector Date

Report Reviewed by Permittee:

Name of Permittee: _____

_____ _____

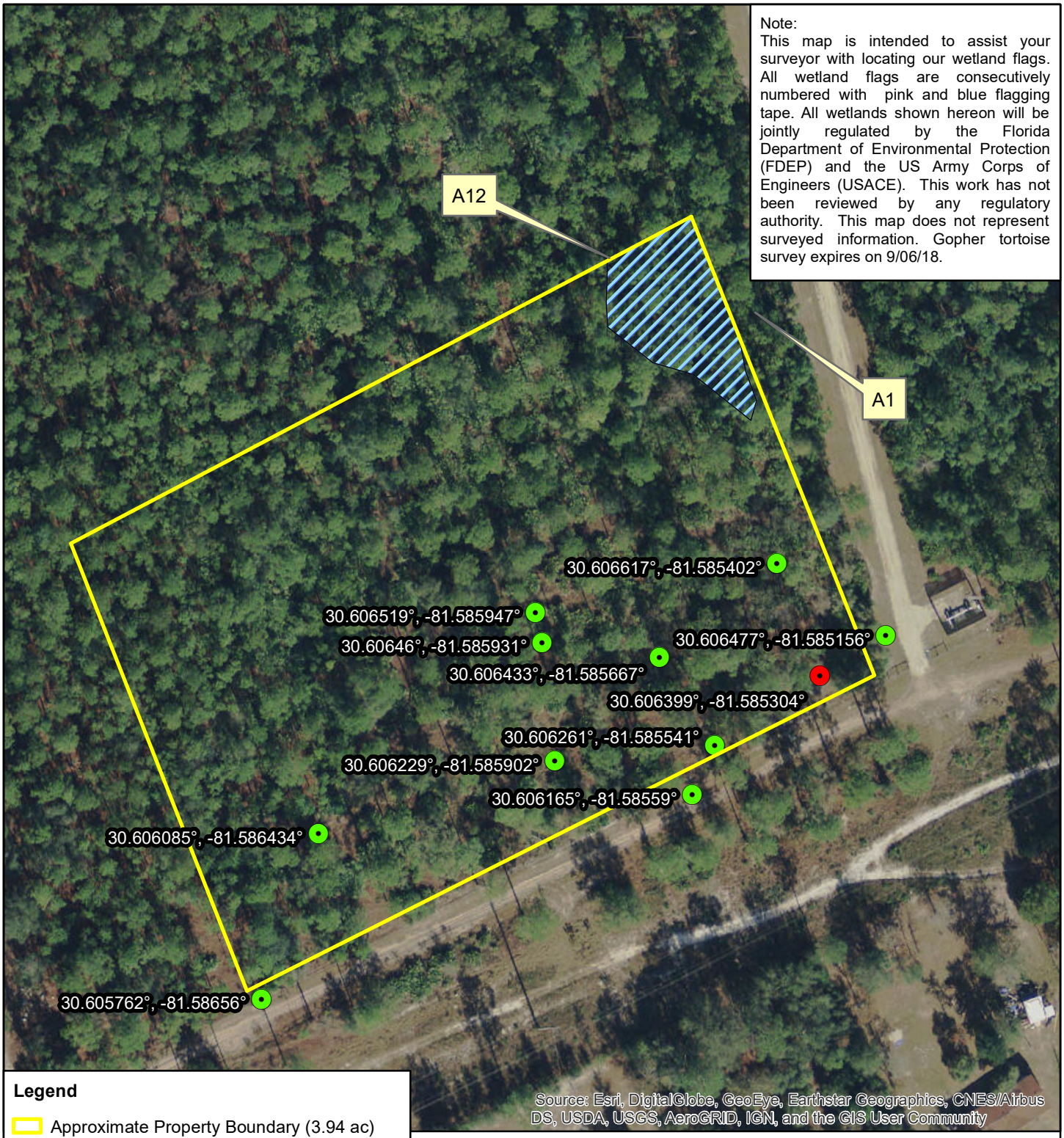
Signature of Permittee Date

_____

Title (if any)

Appendix D

Gopher Tortoise Burrow Locations, June 2018



Note:
This map is intended to assist your surveyor with locating our wetland flags. All wetland flags are consecutively numbered with pink and blue flagging tape. All wetlands shown hereon will be jointly regulated by the Florida Department of Environmental Protection (FDEP) and the US Army Corps of Engineers (USACE). This work has not been reviewed by any regulatory authority. This map does not represent surveyed information. Gopher tortoise survey expires on 9/06/18.

Legend

- Approximate Property Boundary (3.94 ac)
- Upland (3.75 ac)
- FDEP / USACE Regulated Wetland (0.19 ac)
- Abandoned (1)
- Potentially Occupied (10)

100 50 0 100 Feet

1 inch = 100 feet

1:1,200

N

OEC www.onsiteec.com
Onsite Environmental Consulting, LLC
"Our Expertise Wherever You Are."
PH: 904.384.7020 FAX: 904.384.7021

Wetland and Gopher Tortoise Map
HS Nassau WRF Improvements
RE: 42-2N-27-0000-0001-0120

Yullee, Nassau County, Florida

Project: J17227 HS Nassau WRF
Date: June 2018
Basemap provided by ESRI. Property boundaires based on 2017 FDOR data. Habitats from a WD and gopher tortoise survey performed on 5/31/18 and 6/08/18 located using a handheld GPS unit.

Appendix E

Neptune - Fire Alarm Permit Drawings

JEA RADIO AVENUE
FIRE ALARM
PERMIT DRAWINGS

YULEE, FLORIDA 32097

DRAWING INDEX			
SHEET #	DESCRIPTION	REV	DATE
FA-1	COVER SHEET	0	6/26/2020
FA-2	FIRE ALARM DETAILS AND DESIGN CRITERIA	0	6/26/2020
FA-3	FIRE ALARM PLAN	0	6/26/2020

ALL WORK MUST BE PERFORMED IN COMPLIANCE WITH THE FOLLOWING APPLICABLE LOCAL, STATE & NFPA STANDARDS, AS WELL AS THE NASSAU COUNTY LOCAL ORDINANCES

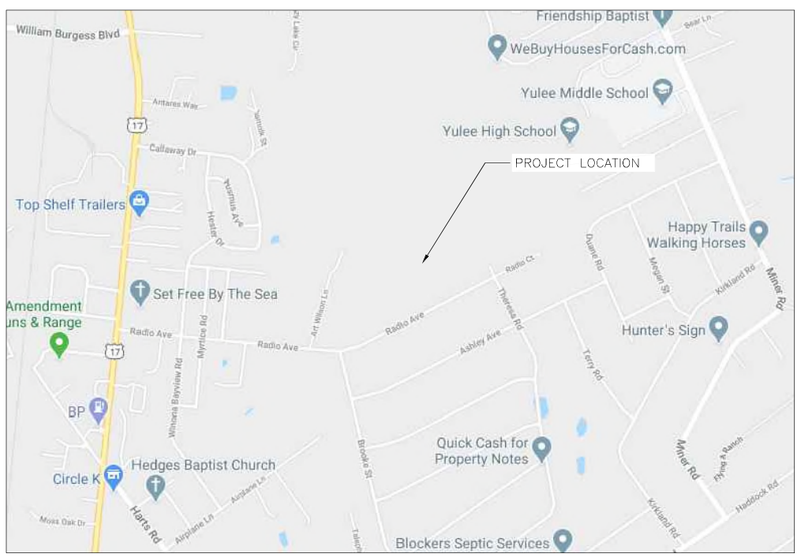
FBC	FLORIDA BUILDING CODE, 6TH EDITION
FFPC	FLORIDA FIRE PREVENTION CODE, 6TH EDITION
NFPA 70	NATIONAL ELECTRIC CODE, 2017 EDITION
NFPA 72	NATIONAL FIRE ALARM AND SIGNALING CODE, 2016 EDITION

Brandon Huffman

Digitally signed by Brandon Huffman
Date: 2020.06.26 16:19:15 -04'00'

This item has been digitally sealed and signed by Brandon A. Huffman, P.E. on the date adjacent to this seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.



NEPTUNE
FIRE PROTECTION ENGINEERING LLC
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Florida Firm License # 28520
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904-622-4200

ENGINEER'S SEAL

BRANDON A. HUFFMAN LICENSED PROFESSIONAL ENGINEER No 88374 STATE OF FLORIDA

Brandon A. Huffman #88374

Revisions			
Number	Descriptions	Date	Approved
0	ISSUED FOR PERMIT	06/26/2020	BAH

JEA Radio Avenue
Yulee, Florida 32097

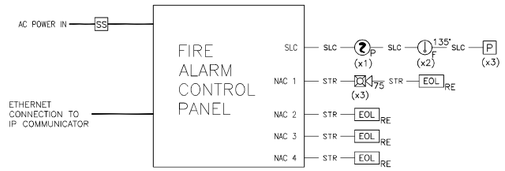
COVER SHEET

Drawn By:	OPB
AHJ:	NCFR
Date:	06/26/2020
Paper Size:	24 x 36
Job Number:	20064

FA-1

FIRE ALARM LEGEND

FACP	FIRE ALARM CONTROL PANEL
FADC	FIRE ALARM DOCUMENT CABINET
RF	RF COMMUNICATOR
SMOKE DETECTOR (PHOTOELECTRIC)	
HEAT DETECTOR FIXED TEMP.	
P	MANUAL PULL STATION
75	HORN WITH STROBE (NUMBER INDICATES CANDELA)
EOL RE	END OF LINE RESISTOR



SCHEMATIC RISER DIAGRAM

NOT TO SCALE

Output Signals

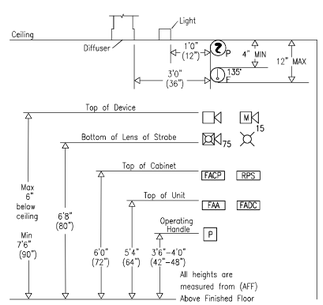
Input Signals		A Actuate fire alarm visual signal on fire alarm control panel	B Actuate fire alarm audible signal at fire alarm control panel	C Actuate trouble visual signal on fire alarm control panel	D Actuate trouble audible signal at fire alarm control panel	E Activate speaker strobes with pre-recorded evacuation message	F Activate fire alarm visual and audible notification appliances	G Silence both audible and visual notification appliances per NFPA 72 - 10.10.2	H Transmit fire alarm signal to monitoring station	I Transmit trouble signal to monitoring station	
	General Fire Detection Initiating Devices										
1	Manual pull station	●	●			●	●		●		1
2	Smoke detector	●	●			●	●		●		2
3	Spot heat detector	●	●			●	●		●		3
	Trouble Conditions										
4	Ground fault			●	●					●	4
5	Notification appliance short circuit			●	●					●	5
6	Open circuit			●	●					●	6
7	Low battery			●	●					●	7
8	AC power failure with 1 hour delay			●	●					●	8
9	Telephone line fault			●	●					●	9
10	Remote power supply trouble condition			●	●					●	10
	Notification Functions										
11	Silence feature on fire alarm panel							●			11
		A	B	C	D	E	F	G	H	I	

SEQUENCE OF OPERATIONS

NOT TO SCALE

	LINE TYPE	DESCRIPTION	CLASS	TYPE
A	SLC — SLC	SIGNALING LINE CIRCUITS	B	2 #16 AWG FPLP
B	STR — STR	NOTIFICATION APPLIANCE CIRCUITS	B	2 #14 AWG FPLP
C	IDC — IDC	INITIATING DEVICE CIRCUITS	B	2 #18 AWG FPL

WIRE CHART



TYPICAL DEVICE MOUNTING HEIGHTS

NOT TO SCALE

FIRE ALARM DESIGN CRITERIA

OVERALL DESCRIPTION:
THE FIRE ALARM INSTALLATION WILL CONSIST OF PROTECTING A NEW 2,000 SQUARE FOOT BOOSTER PUMP STATION. THE OVERALL BUILDING TYPE WILL BE TYPE II-B UNPROTECTED NON-COMBUSTIBLE CONSTRUCTION. THE BUILDING IS CLASSIFIED AS A GROUP U UTILITY AND MISCELLANEOUS OCCUPANCY.

PROJECT SCOPE:
A NEW FIRE ALARM SYSTEM WILL BE INSTALLED WITH SUPPLEMENTAL MANUAL AND AUTOMATIC DETECTION. NOTIFICATION WILL BE PROVIDED THROUGHOUT. INITIATION WILL BE ACCOMPLISHED USING MANUAL PULL STATIONS AT ALL EXITS. SMOKE DETECTION WILL BE PROVIDED IN THE ELECTRICAL ROOM AND HEAT DETECTION WILL BE PROVIDED IN THE PUMP ROOM.

SYSTEM DESCRIPTION:
THE SYSTEM SHALL BE A FULLY ADDRESSABLE, NON DEALER-LIMITED FIRE ALARM SYSTEM. APPROVED EQUIPMENT INCLUDES THE POTTER AFC-50 FACP. SIGNALING LINE CIRCUITS SHALL BE CLASS B WIRING, NOTIFICATION APPLIANCE CIRCUITS SHALL BE CLASS B WIRING, AND INITIATING DEVICE CIRCUITS SHALL BE CLASS B WIRING.

GOVERNING STANDARDS:
SYSTEM DESIGN AND INSTALLATION SHALL COMPLY WITH THE 2016 EDITION OF NFPA 72, AS WELL AS THE FLORIDA BUILDING CODE, 6TH EDITION AND THE FLORIDA FIRE PREVENTION CODE, 6TH EDITION.

FIRE SPRINKLER:
THE BUILDING IS NOT PROTECTED BY AN AUTOMATIC SPRINKLER OR OTHER TYPE OF SUPPRESSION SYSTEM.

MANUAL FIRE DETECTION:
DOUBLE ACTION MANUAL PULL STATIONS WILL BE INSTALLED AT ALL EXTERIOR EGRESS DOORS.

AUTOMATIC FIRE DETECTION:
SMOKE DETECTION WILL BE INSTALLED IN THE ELECTRICAL ROOM, WHICH WILL ALSO PROTECT ABOVE THE FIRE ALARM CONTROL PANEL. AUTOMATIC HEAT DETECTION WILL BE PROVIDED IN THE PUMP ROOM.

DUCT SMOKE DETECTORS:
DUCT SMOKE DETECTORS ARE NOT REQUIRED AS BOTH AIR HANDLING UNITS ARE LESS THAN 2,000 CFM.

AUDIBLE NOTIFICATION:
AUDIBLE NOTIFICATION WILL BE PROVIDED BY HORNS. AUDIBILITY WILL BE PROVIDED THROUGHOUT THE BUILDING IN ACCORDANCE WITH NFPA 72 SECTION 18.4.3.1.

VISUAL NOTIFICATION:
STROBES ACTIVATED BY FIRE ALARM CONTROL PANEL WILL BE INSTALLED TO PROVIDE VISUAL NOTIFICATION THROUGHOUT THE BUILDING. THE APPLIANCES WILL BE SPACED IN ACCORDANCE WITH NFPA 72 TABLE 18.5.5.4.1(a) AND (b).

TRANSIENT VOLTAGE SURGE SUPPRESSION:
TRANSIENT VOLTAGE SURGE SUPPRESSION IS NOT EXPECTED TO BE REQUIRED ON THE LOW VOLTAGE FIRE ALARM WIRING BECAUSE THE WIRING WILL BE INSTALLED IN DRY INTERIOR LOCATIONS; HOWEVER, SURGE SUPPRESSION IS TO BE PROVIDED ON THE 120 VAC SUPPLY. TRANSIENT VOLTAGE SURGE SUPPRESSION IS TO BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

CEILING DESCRIPTION:
THE CEILING IS SMOOTH PRECAST CONCRETE INSTALLED AT A MAXIMUM OF 14 FEET ABOVE FINISHED FLOOR (AFF) OR LESS, UNLESS NOTED OTHERWISE.

PATHWAY SURVIVABILITY:
PATHWAY SURVIVABILITY IS NOT REQUIRED AS THE SYSTEM IS NOT AN EMERGENCY VOICE/ALARM COMMUNICATION SYSTEM AND DOES NOT UTILIZE ZONED EVACUATION AS SPECIFIED BY NFPA 72 SECTION 24.3.13.

MONITORING:
MONITORING OF THE FIRE ALARM SYSTEM IS TO BE BY INTERNET PROTOCOL (IP) COMMUNICATOR. THE COMMUNICATOR IS TO SEND SIGNALS UTILIZING CONTACT ID TO PROVIDE DETAILED DESCRIPTIONS OF EACH SIGNAL TO THE MONITORING STATION.

FIRE ALARM SYSTEM DOCUMENTATION:
UPON COMPLETION OF SYSTEM INSTALLATION, A DOCUMENT BOX SHALL BE PROVIDED (AS SHOWN ON THE PLANS) CONTAINING AS-BUILT DRAWINGS, ALL OPERATIONS AND MAINTENANCE PROCEDURES, MANUALS FOR THE PANEL, SYSTEM DOCUMENTATION, RECORD OF COMPLETION, AND THE PANEL PROGRAM ON A DISK OR JUMP DRIVE.

FINAL ACCEPTANCE TESTING:
UPON COMPLETION OF THIS PROJECT, THE INSTALLING CONTRACTOR SHALL PRE-TEST 100% OF THE FIRE ALARM SYSTEM. FINAL ACCEPTANCE TESTING SHALL BE PROVIDED BY THE CONTRACTOR AND WITNESSED BY NEPTUNE FIRE PROTECTION ENGINEERING AND THE LOCAL FIRE INSPECTOR. THE ACCEPTANCE TESTING WILL INCLUDE FUNCTIONALITY TESTING OF ALL FIRE ALARM DEVICES.

REQUIRED MAINTENANCE:
THE FOLLOWING MAINTENANCE RELATED ITEMS ARE REQUIRED BY CODE:
1. ANNUAL INSPECTION, TESTING, AND MAINTENANCE IS REQUIRED FOR THE NEW FIRE ALARM SYSTEM AND MUST BE SCHEDULED BY THE OWNER TO BE PERFORMED ON AN ANNUAL BASIS BY A LICENSED FIRE ALARM CONTRACTOR, IN ACCORDANCE WITH NFPA 72.
2. TESTING SHALL BE COORDINATED BY THE CONTRACTOR TO MINIMIZE INTERRUPTION TO BUILDING OPERATIONS.
3. RECORDS OF INSPECTION, TESTING, AND MAINTENANCE MUST BE MAINTAINED ON-SITE.

OTHER:
CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, CALCULATIONS, AND PRODUCT SUBMITTALS TO NEPTUNE FIRE PROTECTION ENGINEERING FOR REVIEW BEFORE ANY CONSTRUCTION ACTIVITIES BEGIN.

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Yulee, Florida 32097

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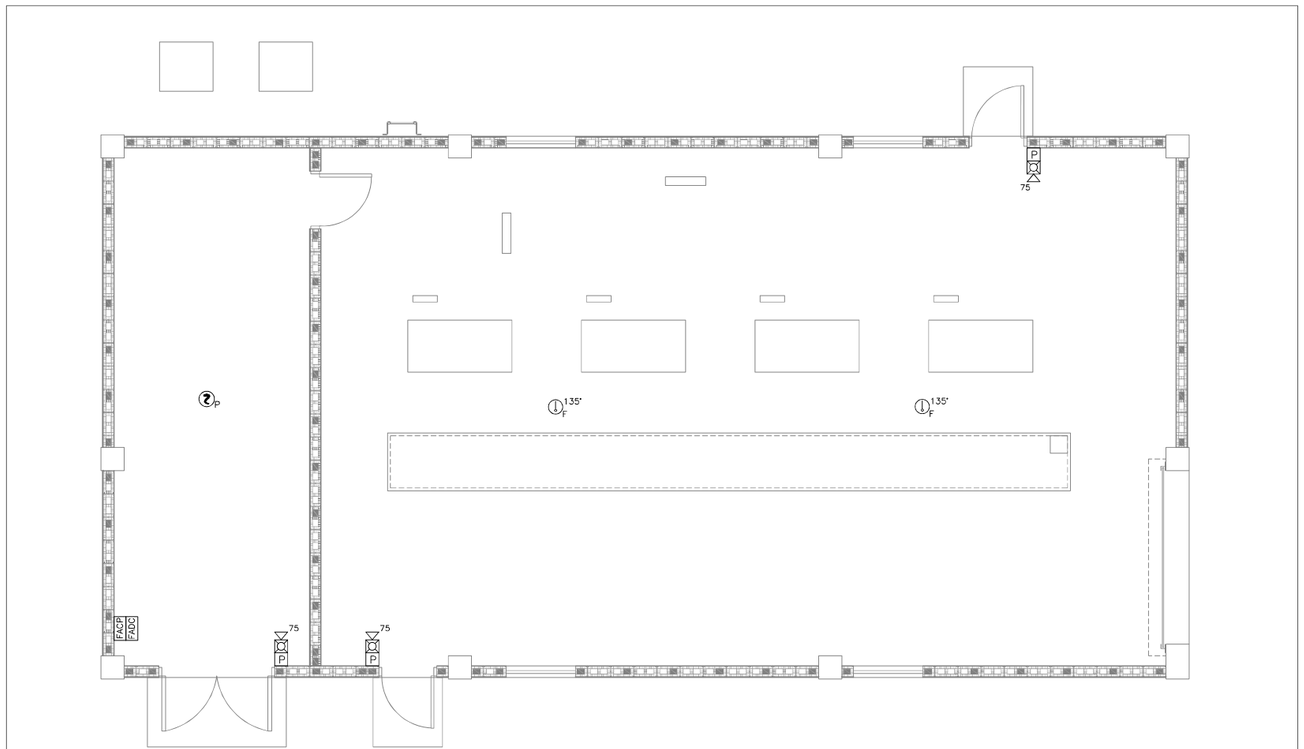
Drawn By:	OPB
AHJ:	NCFR
Date:	06/26/2020
Paper Size:	24 x 36
Job Number:	20064

FA-2

FIRE ALARM LEGEND

FACP	FIRE ALARM CONTROL PANEL
FADC	FIRE ALARM DOCUMENT CABINET
RF	RF COMMUNICATOR
P	SMOKE DETECTOR (PHOTOELECTRIC)
F 135°	HEAT DETECTOR FIXED TEMP.
P	MANUAL PULL STATION
75	HORN WITH STROBE (NUMBER INDICATES CANDELA)
EOL RE	END OF LINE RESISTOR



FIRE ALARM PLAN

0 4' 8'

SCALE: 1/4"=1'-0"

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Brandon A. Huffman #88374

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FA-3