

TECHNICAL SPECIFICATIONS

BID SET

for

HOLIDAY ROAD MASTER PUMP STATION SPLITTER BOX REPLACEMENT

JEA PROJECT NO. 8006211

By:



MITTAUER & ASSOCIATES ENGINEERING, INC. PROJECT NO. 0801-40-2

June 2020

ALL WORK SHALL ADHERE AND BE IN CONFORMANCE WITH THE JEA WATER & SEWER STANDARDS MANUAL DATED JANUARY 1, 2020. THE ENCLOSED SPECIFICATIONS ARE PROVIDED TO SUPPLEMENT THE JEA STANDARDS DUE TO THE SPECIALTY WORK. IN THE EVENT OF A CONFLICT BETWEEN THESE "JEA SUPPLEMENTAL SPECIFICATIONS" AND THE JEA STANDARDS, THE JEA SUPPLEMENTAL SPECIFICATIONS SHALL GOVERN.

DIVISION 0 – CONTRACT REQUIREMENTS

NOT APPLICABLE

DIVISION 1 - GENERAL REQUIREMENTS

- 01010 Summary of Work
- 01060 Regulatory Requirements
- 01300 Submittals
- 01301 Administrative Requirements
- 01370 Schedule of Values
- 01400 Quality Control
- 01500 Construction Facilities
- 01700 Project Closeout
- 01740 Warranties and Bonds

DIVISION 2 - SITE WORK

- 02210 Soil Borings
- 02220 Demolition
- 02230 Site Clearing, Stripping and Grubbing
- 02240 Dewatering
- 02300 Earthwork
- 02370 Erosion and Sedimentation Control

Technical Specifications Holiday Road Master Pump Station Splitter Box Replacement

- 02530 Pipe Work Gravity Sewers
- 02536 Precast Concrete Manholes
- 02590 Underground Facilities
- 02740 Asphaltic Concrete Paving
- 02745 Rework Existing Pavement
- 02750 Concrete Paving, Sidewalk and Curb
- 02820 Chain Link Fencing
- 02921 Grassing, Seeding and Sodding

DIVISION 3 - CONCRETE

- 03050 Concrete Bonding Agents and Toppings
- 03310 Cast-in-Place Concrete

DIVISION 4 - MASONRY

- 04100 Mortar and Grout
- 04900 Masonry Repointing and Reconstruction

DIVISION 5 - METALS

05515 Railings

DIVISION 6 - WOOD AND PLASTICS

06100 Rough Carpentry

Technical Specifications Holiday Road Master Pump Station Splitter Box Replacement

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

- 07200 Building Insulation
- 07510 Bituminous Built-up Roofing
- 07600 Flashing and Sheet Metal
- 07900 Expansion Joint System

DIVISION 8 - DOORS AND WINDOWS

NOT APPLICABLE

DIVISION 9 - FINISHES

- 09200 Stucco
- 09250 Gypsum Drywall
- 09910 Painting and Coatings

DIVISION 10 - SPECIALTIES

NOT APPLICABLE

DIVISION 11 - EQUIPMENT

- 11295 Slide Gates
- 11314 Pump Room Sump Pumping System
- 11500 Odor Control System

DIVISION 12 - FURNISHINGS

NOT APPLICABLE

Technical Specifications Holiday Road Master Pump Station Splitter Box Replacement

DIVISION 13 - SPECIAL CONSTRUCTION

NOT APPLICABLE

DIVISION 14 - CONVEYING SYSTEMS

NOT APPLICABLE

DIVISION 15 - MECHANICAL

15060 Pipe Work - Treatment Plant Sites

- 15101 Valves and Accessories
- 15200 Bypass Pumping Systems

DIVISION 16 - ELECTRICAL

- 16000 Electrical Work General
- 16600 Grounding and Surge Protection
- 16900 Instrumentation and Controls
- 16901 Existing Generator System SCADA System Integration and Fuel Delivery Relocation

SUMMARY OF WORK

PART 1 - GENERAL

- **1.00 PROJECT DURATION:** Project Duration is 420 days to Substantial Completion and 450 days to Final Completion from the notice-to-proceed (NTP) date.
- **1.01 LOCATION OF WORK:** The project site is located at the JEA Holiday Road Master Pump Station. The physical address is 7833 Holiday Road South, Jacksonville, Florida 32216.
- **1.02 DESCRIPTION OF WORK AND SEQUENCING REQUIREMENTS:** The work generally consists of furnishing all labor, materials, equipment, incidentals, and taxes as summarized herein.
 - A. The improvements include, but are not limited to, construction of:
 - 1. Site restoration and grading improvements;
 - 2. Bypass pumping system;
 - 3. One precast, 3-way splitter box with isolation gate valves;
 - 4. 30" gravity sewer bypass pipeline;
 - 5. Two 24" gravity delivery pipelines;
 - 6. Modifications to existing pump-out connection;
 - 7. Repair and rehabilitation to existing splitter box concrete walls;
 - 8. Wet pit improvements including but not limited to: wetwell debris and grit removal; slide gate removal and replacement; handrail removal and replacement; concrete repairs; existing piping removal within the wetwell; check valve removal and replacement in the pump room; sump pumping system removal and replacement; LED lighting enhancements; PLC upgrade; roofing replacement and other miscellaneous improvements to the master pump station.
 - 9. Miscellaneous site and yard piping improvements including existing utility protection during construction of the modifications.

- B. The improvements shall be sequenced with JEA to ensure bypass pumping is limited to the minimal time required to complete the staged construction sequencing and typical pump station operations are maintained to the fullest extent possible. The Contractor shall complete necessary shop drawing reviews, JEA scheduling coordination, and ensure all necessary materials are on-site so work can continue in a seamless manner. The anticipated construction sequencing is as follows:
 - 1. Collection System Modifications & Improvements Prior to Bypass Services include but are not limited to the following items:
 - a. Confirm all existing utility locations and process for protecting existing utilities during construction of the improvements.
 - b. Construct precast Splitter Box with 24" and 30" manual isolation valves. The Contractor may sequence portions of the Manhole No. 1 activities during this time, but connection to the existing collection system at MH 1 will not occur until Step 1 during Bypass Sequence B.
 - c. Construct 30" gravity bypass pipeline from Splitter Box to MH 2 and MH 3. MH 3 may be set following the 30" connection to the wetwell completed during Bypass Sequence A.
 - d. Demolish existing substation concrete foundation and construct relocated diesel fuel tank foundation in preparation of fuel tank relocation activities.
 - e. Upon isolation of the collection system flow from the pump station during either Bypass A or B, the Contractor may begin work on rehabilitating the existing splitter box area. Contractor shall coordinate with the Engineer to finalize the restoration requirements for Wall 1 as designated on the Drawings.
 - 2. Bypass Sequence A Wet Pit Modifications (*Bypass pumping to Existing 18" FM. See Sheet M-6*)
 - a. The Contractor shall prepare for bypass set-up and complete the pump-out connection modifications shown on the Drawings. Test the bypass pumping system to the existing 18" force main. Upon acceptance of bypass pumping system, the Contractor shall complete the following:
 - 1. Construct temporary bulkheads and pipe plug as identified in the Drawings to isolate the area where the 30" concrete wall coring will occur. These bulkheads will remain while the existing splitter box is repaired and normal flows diverted to the 30" gravity bypass following Bypass Sequence B.

- 2. Construct 30" gravity piping connection to basement and complete assembly of the 30" gravity bypass piping connection including Manholes No. 2 and No. 3.
- 3. Construct various wet pit improvements shown on the Drawings including but not limited to: pony pump suction piping; handrail removal and replacement; out of service piping removal; wet well debris and grit removal; slide gate removal and replacement; generator SCADA enhancements, and concrete repairs. The PLC and various SCADA improvements shall be coordinated with JEA and completed at this time.
- b. Relocate Diesel Fuel Tank during Bypass Sequence A. The concrete foundation shall be prepared prior to Sequence A so it is prep'd and ready for tank relocation. Following relocation, test the fuel pumping system for functionality and operational resiliency.
- c. Immediately following completion of the wet pit improvements and acceptance by JEA. Convert to Bypass Sequence B to make final connections to the existing collection system and begin operation of the 30" gravity bypass.
- 3. Bypass Sequence B Collection System Modifications (*Bypass pumping to 30" gravity bypass system via MH 2. See Sheet M-6*)
 - a. Once Manhole No. 1 is ready to accept the connection to the existing collection system and approved by JEA, coordinate with JEA to sequence movement of wastewater from the bypass system to the 30" collection system connection to the Splitter Box. The 24" gate valves shall remain closed during these operations and the 30" gate valve shall be opened. Once the 30" gravity bypass connection is operational and approved by JEA, Bypass Pumping Sequence B can be shut down and the 30" gravity sewer bypass system can be utilized to continue bypass of the existing splitter box area for rehabilitation and construction of the 24" gravity pipelines.
- C. The pavement restoration shall be sequenced by the Contractor based on their logistical needs. Final paving shall not occur until the yard piping and site modifications are completed.
- D. The roofing removal and replacement activities shall be sequenced by the Contractor based on their logistical needs. The modifications shall be completed prior to final paving activities.

E. The interior lighting and miscellaneous improvements (i.e., louver repairs, window removal, etc.) outside of the wetpit area may be sequenced by the Contractor based on their logistical needs.

The Contractor shall carefully review the Drawings and Technical Specifications for detailed requirements.

- **1.03 CONTRACTOR'S DUTIES:** Except as specifically noted, the Contractor shall provide and pay for the following:
 - A. All labor, materials, and equipment.
 - B. Tools, construction equipment, and machinery.
 - C. Utilities required for construction.
 - D. Other services and facilities necessary for the proper execution of work completion including incidental items not detailed or called for, but which are required for the proper completion of the project.
 - E. All legally required sales, consumer, and use taxes.
 - F. All applicable permits, government fees, and licenses.
 - G. Survey services for construction layout and record drawings.
 - H. Subsurface Utility Engineering (SUE) services to locate existing piping locations in advance of yard piping construction. See additional requirements in Specification Section 02590.

1.04 CONTRACTOR SHALL ALSO BE REQUIRED TO PERFORM THE FOLLOWING:

- A. Comply with all codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities which bear on the performance of work.
- B. Promptly submit written notice to the Engineer of observed variances of Contract Documents from legal requirements; it is not the Contractor's responsibility to make certain drawings and specifications comply with codes and regulations.
- C. Enforce strict discipline and good order among employees. Do not employ unfit persons or those not skilled in assigned tasks.
- D. Contractor shall coordinate their work with the Owner's field activities that may be occurring on a concurrent basis. Logistical coordination must continue on an ongoing basis. The Contractor will be responsible for any delay or related claims resulting from improper and/or insufficient communication/coordination.

1.05 WORK SEQUENCE:

- A. Coordinate with JEA.
- B. Contractor's construction schedule will be subject to approval by the Engineer and JEA and shall be updated on a monthly basis. The Contractor's schedule and work plan shall address the following minimum items:
 - 1. Mobilization and submittal coordination.
 - 2. Confirmation of sequencing requirements outlined in Section 1.02 with estimated durations for each step, including existing utility locates/protection approach.
 - 3. Material delivery scheduling to ensure construction sequencing can occur as intended.
 - 4. Scheduling of on-site field investigations for existing splitter box 'Wall 1', including Non-destructive Testing and Engineering review as defined in the Drawings.
 - 5. Sequencing of non-critical path items.
 - 6. Specifically note items requiring JEA operations coordination that are limited to:
 - a. Modifying pumping capacities to change wetwell operating levels. Any modifications to normal levels shall be limited to the shortest time possible.
- C. Notify Engineer and Owner 96 hours (minimum) in advance of removing any facility from service, permanently or temporarily.

1.06 CONTRACTOR'S USE OF PREMISES:

- A. Do not unreasonably encumber sites with materials or equipment.
- B. Assume full responsibility for protection and safekeeping of products stored on premises.
- C. Move any stored products interfering with operation of Owner.

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions apply to the work specified in this section.

1.02 SPECIFIED CODES:

- A. The design of the work is based on the requirements of the latest editions of the Florida Building Code, NFPA 70 National Electric Code, NFPA 101 Life Safety Code, and National Fire Protection Association Requirements, whichever is most stringent.
- B. The Contractor shall ensure the work complies to the aforementioned codes and regulations as they apply to the project whether or not specifically referenced elsewhere.

1.03 **REFERENCE STANDARDS**:

- A. Except as otherwise required by Paragraph 1.02, all products and workmanship shall conform to best quality materials and practices recognized by agencies, associations, councils, etc., specified in individual sections.
- B. In the absence of specified agencies, associations, councils, etc., the Contractor shall conform to the requirements of the most widely recognized standards for each particular portion of the work.

1.04 PERMITS:

- A. FDEP NPDES: Contractor shall apply for and obtain an NPDES permit for Stormwater Discharge from Large and Small Construction Activity. Application shall include Stormwater Pollution Prevention Plan. See Section 02370.
- B. If applicable, Contractor shall obtain a Florida Department of Environmental Protection and/or St. Johns River Water Management District Dewatering Permit. Materials, costs, and fees shall be the responsibility of the Contractor. Compliance with the permit requirements shall be the material and financial responsibility of the Contractor.
- C. Building Permit: As applicable, the Contractor shall apply for and obtain a City of Jacksonville Building Permit.

1.05 FEES: The Contractor shall be responsible for all fees associated with the permit for which he applies.

1.06 SUBMITTALS:

- A. Copy of Application.
- B. Copy of Approved Permit.

SUBMITTALS

PART 1 - GENERAL

1.01 TYPES OF SUBMITTALS:

- A. Construction Schedules: The Contractor shall prepare and submit to JEA and Engineer, within two weeks of the Notice to Proceed, a construction schedule showing the proposed dates for starting and completing each of the various branches of work. The schedule shall be in the form of a bar graph with a representation of the schedule of estimated pay requests by months.
- B. Manufacturer's data shall include all standard published information describing products, systems, methods and performance. Include manufacturer's name and address, and associations with which manufacturer of his products comply.
- C. Shop drawings and schedules shall include items, products, materials, methods, anchorages, details, or any other information required to fabricate items of the Work and complete the installation which is not specifically stated or described on manufacturer's data. Shop drawings shall specifically address the work of this project.
- D. Installation instruction shall include all information required from a manufacturer or fabricator to have his product installed. This may be included as a shop drawing, if such are required.
- E. Warranties and Guarantees required by the Contract Documents shall begin on the date of Substantial Completion of the project or any portion thereof, into which the warranted or guaranteed item was installed, constructed, or otherwise made operational. All warranties and guarantees shall be in effect for a minimum of one year unless specified for a longer period. Include all specific items covered, company names and addresses, and names of persons authorized to warrant or guarantee item(s), if not a blanket coverage.
- F. Certifications and test reports of products, materials, and performance for compliance with specified requirements shall specifically address the work and shall contain the name and signature and address of persons authorized to make such certifications.
- G. Evidence of compliance to instructions shall be copies of transmittal letters or letter of verification duly signed by authorized persons.

- H. Operation and Maintenance Manuals shall include all literature required to properly operate and maintain any equipment installed in the work and shall include names and addresses of manufacturers and authorized service and/or parts representatives, and dealers and shall be delivered on or before data of beneficial occupancy.
- I. Samples required shall be as specified and shall include identifications of the specific item and specification section to which the sample applies.
- J. In order to facilitate the creation of asset records and their corresponding preventive maintenance schedules and activities in the Computerized Maintenance Management System (CMMS), information on materials utilized within the project shall be prepared using the Excel template provided at the end of this Section. The template is intended to help convey how the information should be completed. The Engineer will provide the Contractor a copy of the Excel spreadsheet for use in distributing to vendors/manufacturers for completion. The spreadsheet will be prepopulated with the list of assets for which information is required and the specific attributes that need to be completed. The Contractor shall submit the database information updated with each pay request for materials provided within the previous month.
- K. Record drawing redlines shall be submitted with each month's pay request. See additional requirements in Specification Section 01700.

1.02 COPIES OF SUBMITTALS:

A. The minimum number of copies of submittals shall be submitted as follows and does <u>not</u> include numbers of copies required by the Contractor for his distribution purposes. <u>Electronic submittals are acceptable</u>, but the Contractor shall provide at least the denoted number of printed copies if directed by the JEA.

1.	Manufacturers Data:	4
2.	Shop Drawings and Schedules:	4
3.	Installation Instructions:	4
4.	Warranties and Guarantees:	4
5.	Certifications and Test Reports:	4
6.	Evidences:	4
5.	Certifications and Test Reports:	4
6.	Evidences:	4
7.	Operation and Maintenance Manuals:	4
8.	Samples:	3
9.	Progress Schedule:	4 Monthly

B. Any copies submitted in addition to those required will be processed and returned to the Contractor. Additional copies may be in the form of a reproducible copy.

- C. If electronic submittals are not legible or of poor quality, then they will be immediately returned to the Contractor not reviewed and without action.
- D. As soon as practicable after the date of execution of the JEA/Contractor Agreement and within 30 days, the Contractor will make all required submittals.

1.03 REVIEW OF SUBMITTALS:

- A. All submittals required by the Contract Documents shall be sent to the Engineer.
- B. Copies of submittals to be returned for the Contractor's use will be processed and submitted to the Contractor within 14 calendar days of receipt of each submittal by the Engineer. Resubmittal reviews resulting from initial review findings such as "Approved as Noted", "Revise and Resubmit", or "Not Approved" will be processed within 14 calendar days of receipt. Any submittal requiring more than two reviews will include an invoice for the Engineer's time to complete the review. Any non-payment will be addressed through the Contractor's retainage.
- C. Review of submittals is only for conformance with the design concept of the project or work and does not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents nor from responsibility for errors and omissions in the submittals.
- D. Submittals received without the Contractor's signed "Checked and Approved" stamp on each copy will be returned without action and noted as such or "RWA."
- E. Any submittals or portions thereof which are processed and returned to the Contractor will be marked "Approved," "Approved as Noted", "Revise and Resubmit", or "Not Approved" (i.e., "Rejected").
- F. Submittals which refer to information or data not included in the submittal (excluding the Contract Documents) will not be checked.

1.04 WRITTEN DOCUMENTS:

A. All written documents including letters, letters of transmittal and request, generated by the Contractor shall be on standard letter or legal size paper and include Contractor's name, the JEA's project number, Engineer's project number, date and be signed by authorized personnel.

- B. Letters of transmittal whether written or of standard form, shall also clearly identify each part of the submittal with specification section number and indicate the number of copies of each part. Letter requesting substitutions shall contain the same information.
- C. All submittals for approval shall be individually numbered by the Contractor in sequence of order of submission. Resubmittal of revised submittals shall bear the same numbers and be clearly marked "Resubmittal No. _____".
- D. All copies shall be neatly prepared, easily readable, bound and transmitted. Facsimile copies or reproductions of facsimile copies will not be accepted.

1.05 COLORS:

- A. The Engineer in noting and marking submittals will use the color green.
- B. The Contractor in noting and marking submittals shall use the color red.
- C. Marks or notations of any other color on submittals shall be disregarded.
- **1.06 ON-SITE RECORDS:** The Contractor shall have at least one set of complete, approved submittals and shop drawings on the job site at all times when such work is in progress.

1.07 SUBMITTAL SCHEDULE:

- A. Within 10 calendar days after the effective date of the Agreement, the Contractor shall submit a preliminary list of shop drawings with the project's preliminary schedule.
- B. Denote critical path shop drawings for review and discussion at the preconstruction meeting.
- C. Update shop drawing log with each month's pay request.

Asset Data - Sample

Asset Data		Attributes required for			l equipment						
Asset Description	Vendor	Serial Number	Model	Life Expectancy (Years)	Purchase Price	Warranty Start Date	Warranty Duration (Years)				
30" Gate Valve, MJ											
24" Gate Valve, MJ											
24" Gate Valve, MJ											
Manhole No. 1											
Manhole No. 2											
Manhole No. 3											
Splitter Box											
24" Gravity Sewer Piping											
30" Gravity Sewer Piping											
Asphalt Built-up Roof Replacement											
Asphalt Paving											

Vendor and Manufacturer Data - Sample

Vendor ID / Man. ID	Vendor/ Manufacturer Name	Address	City	State	ZIP	Phone	Fax	Contact Name	Contact Phone	Contact Fax	Contact email

Local Representative Data - Sample

Company Name	Address	City	State	ZIP	Contact Name	Contact Phone	Contact Fax	Contact email

Spare Part Data - Sample

Spare Part or Kit ID	Spare Part / Kit Description	Vendor/Manufacturer ID	Kit Contents	Asset ID(s)

Preventive Maintenance Data - Sample

PM ID	PM Description	Frequency - Calendar	Frequency - Runtime	Applicable Asset ID(s)

Preventive Maintenance Tasks

					Special Tools / Equipment
PM ID	Step	Step Description	Spare Part / Kit ID	Spare Part / Kit Quantity	Description

ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Construction progress schedule.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.01 **PRECONSTRUCTION MEETING:**

- A. JEA will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. JEA Management and Pump Station Operations Staff.
 - 2. Engineer.
 - 3. Contractor.

C. Agenda:

- 1. Execution of JEA Contractor Agreement, if not already completed.
- 2. Submission of executed bonds and insurance certificates, if not already completed.
- 3. Distribution of Contract Documents.
- 4. Submission of list of Subcontractors, Submittals (Shop Drawings), submittal scheduling, Schedule of Values, and progress schedule.
- 5. Designation of personnel representing the parties to Contract.
- 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
- 7. Scheduling.
- 8. Critical Path Review.

- 9. Construction Sequencing Plan and confirmation of JEA operations coordination.
- D. Contractor shall record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, JEA, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS:

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and Suppliers, JEA, Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meeting.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Review open request for information (RFI).
 - 5. Identification of problems that impede, or will impede, planned progress.
 - 6. Review of submittals schedule and status of submittals.
 - 7. Review of off-site fabrication and delivery schedules.
 - 8. Maintenance of progress schedule.
 - 9. Corrective measures to regain projected schedules.
 - 10. Provide status of open change orders.
 - 11. Planned progress during succeeding work period.
 - 12. Coordination of projected progress.
 - 13. Maintenance of quality and work standards.
 - 14. Effect of proposed changes on progress schedule and coordination.
 - 15. Other business relating to Work.
- E. Contractor shall record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, JEA, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE:

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Work Included: Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the work, as specified herein, and in other provisions of the Contract Documents. The Bid Form includes a breakdown of the Contract's lump sum portion for comparison purposes only.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE:

- A. Use required means to assure arithmetical accuracy of the sum described.
- B. When so required by the Engineer, provide copies of the subcontracts or other data acceptable to the Engineer substantiating the sums described.
- **1.03** EQUIPMENT AND MATERIALS IN STORAGE: Partial payment for materials and equipment in proper storage at the site of the work or other approved storage site will be made for those items for which the Contractor has submitted paid invoices to the Engineer.

1.04 SUBMITTALS:

- A. Prior to first application for payment, submit a proposed schedule of values to the Engineer.
 - 1. Meet with the Engineer and determine data, if any, required to be submitted.
 - 2. Secure the Engineer's approval of the values prior to submitting first application for payment.

QUALITY CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS: Definitions: Specified quality control requirements for the work are indicated throughout the Contract Documents and are not repeated herein. The requirements of this Section are primarily related to performance of the work beyond furnishing of manufactured products. The term "Quality Control" includes, but is not necessarily limited to, inspection and testing and associated requirements. This Section does not specify or modify Engineer's duties relating to quality control and Contract enforcement.

1.02 RESPONSIBILITY FOR INSPECTIONS AND TESTS:

- A. Unless otherwise noted all testing and inspections required by these specifications shall be performed by a properly certified entity. All cost associated with the testing and inspections shall be the Contractor's responsibility. The Contractor shall also be responsible for all tests or inspections required by any entity having jurisdictional control over the work.
- B. Costs for those required services by independent testing laboratories are recognized to be included in the Contract Sum.
- C. No failure of test agencies, whether engaged by Owner or Contractor, to perform adequate inspections or tests or to properly analyze or report results, shall relieve the Contractor of responsibility for fulfillment or requirements of Contract Documents. It is recognized that required inspection and testing programs are intended to assist the Contractor, Owner, Engineer and governing authorities in nominal determination of probable compliance with requirements for certain elements of work. The program is not intended to limit the Contractor's regular quality control program as needed for general assurance of compliance.

1.03 QUALITY ASSURANCE:

A. General Workmanship Standards: Except as more definitively specified, the Contractor shall comply with recognized workmanship quality standards within the industry as applicable to each unit of work, including ANSI Standards, where applicable. It is a requirement that each category of trades person or installer performing the work is prequalified, to the extent of being familiar with applicable and recognized quality standards for that category of work, and being capable of workmanship complying with those standards.

- B. Qualification of Quality-Control Agencies: Except where another qualification standard is indicated, and except where it is specifically indicated that use of prime product manufacturer's test facilities is acceptable, engage independent testing laboratories complying with "Recommended Requirements for Independent Laboratory Qualification" as published by American Council of Independent Laboratories, and specializing in type(s) of inspections and tests required.
- C. When requested by the Engineer, submit proof of qualification for agency(s) engaged or to be engaged to perform inspection and testing services. If, after review of the submitted information, the Engineer determines that the agency's qualifications are unsatisfactory, the Contractor shall engage an alternate agency at no additional cost to the Owner.
- **1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING:** Handle, store, and protect materials and products, including fabricated components, by methods and means which will prevent damage, deterioration, and losses including theft (and resulting delays), thereby ensuring highest quality results as the performance of the work progresses. Control delivery schedules so as to minimize unnecessary long-term storage at project site prior to installation. Contractor shall provide covered storage for all new equipment on the site which is not intended for outside installation. Electrical, hydraulic, and pneumatic connections on all equipment shall be protected from the elements.
- **1.05** WATER-TIGHTNESS: All tanks and other equipment containing liquids that are not subject to specific leakage testing, as may be specified elsewhere, shall be free of all leakage when filled to the maximum pressure of static head that could be applied during operation of the plant.

1.06 CODES AND STANDARDS:

- A. Work of this Project shall comply with all applicable Codes and Standards in effect at the time of performance of the Work of this Project (editions and updates as current). Codes include, but are not necessarily limited to, the following:
 - 1. Florida Building Code (6th Edition).
 - 2. Florida Fire Prevention Code, 6th Edition.
 - 3. Florida Administrative Code.
 - 4. Department of Community Affairs, Florida Building Commission.
 - 5. NFPA 70 National Electrical Code, 2017.
 - 6. ASCE/SEI 7-10.
 - 7. Underwriter's Laboratory Assembly Requirements.
 - 8. Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition.
 - 9. ACI 318, Latest Edition.
 - 10. AISC Steel Construction Manual, Latest Edition.
 - OSHA CFR 29, Parts 1926 and 1910.

11.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.01 PREPARATION FOR INSTALLATION:

- A. Pre-installation Conferences: Well in advance of installation of every major unit of work which requires coordination with other work, the Contractor shall meet at project site with installers and representatives of manufacturers and fabricators who are involved in, or affected by, the unit of work, and in its coordination or integration with other work which has preceded or will follow.
- B. The Contractor shall advise the Engineer of scheduled meeting dates. At each meeting the Contractor shall review the progress of other work and preparations for the particular work under consideration, including requirements of Contract Documents, product data, quality control samples, possible conflicts, compatibility problems, time schedules, weather limitations, structural limitation, governing regulations, safety, inspection and testing requirements, required performance results, recording requirements, and protection. Record significant discussion of each conference and agreements and disagreements, along with final plan of action. Distribute a record of the meeting promptly to everyone concerned, including the Engineer.
- C. The Contractor shall not proceed with the work if associated preinstallation conference cannot be concluded successfully. The Contractor shall complete actions to resolve impediments to performance of the work, and meet at earliest date feasible.
- D. Installer's Inspection of Conditions: The Contractor shall require the fabricator and installer of each major unit of work to inspect the field conditions under which the work will be performed, and to report (in writing, to the Contractor and the Engineer) any unsatisfactory conditions. If unsatisfactory conditions exist, do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the fabricator and installer.

3.02 INSTALLATION QUALITY CONTROL:

A. Manufacturer's Instructions: Where installation includes manufactured products, comply with manufacturer's applicable instructions and recommendations for installation to whatever extent these are more explicit or more stringent than applicable requirements indicated in the Contract Documents.

- B. The Contractor shall inspect each item of materials or equipment immediately prior to installation and reject damaged and defective items.
- C. Provide attachment and connection devices and methods for securing work properly as it is installed, true to line and level, and within recognized industry tolerances, if not otherwise indicated. Allow for expansions and building movements. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual effect choices to Engineer for final decision.
- D. The Contractor shall recheck measurements and dimensions of the work as an integral step of starting each installation.
- E. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure best possible results for each unit of work, in coordination with entire work. Isolate each unit of work for noncompatible work as required to prevent deterioration.
- F. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to avoid necessity of uncovering work for that purpose.
- G. Mounting Heights: Except as otherwise indicated, mount individual units of work at industry-recognized standard mounting heights for applications indicated. Refer questionable mounting height choices to Engineer for final decision.
- H. Adjust, clean, lubricate, restore marred finishes, and protect newly installed work to ensure that it will remain without damage or deterioration during the remainder of the construction period.

3.02 QUALITY ASSURANCE:

- A. Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to:
 - 1. Building Code Requirements.
 - 2. Health and Safety Regulations.
 - 3. Utility Company Regulations.
 - 4. Police, Fire Department and Rescue Squad Rules.
 - 5. Environmental Protection Regulations.

CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION: The following criteria shall govern the furnishing of and paying for temporary construction and service items. Such items shall be instituted at the beginning and maintained for the life of the work or until removal or termination is approved by the Engineer.

1.02 TEMPORARY FACILITIES:

- A. Drinking Water: The Contractor shall provide cool water with dispensing utilities.
- B. Construction Water: The Contractor shall purchase/rent/obtain a temporary water meter from JEA and pay for all construction water utilized during the project construction. JEA will reimburse the Contractor for the water use. The Owner shall make available temporary water for construction through existing outlets at the project site provided the Contractor is not careless or wasteful with his water usage. The Contractor shall provide proper backflow devices in order to comply with regulations concerning backflow & cross connection.
- C. The Owner will make available construction power through existing outlets at the project site. It shall be the Contractor's responsibility to provide additional temporary electrical power for construction should the Owner's existing outlets and distribution devices not be suitable for construction purposes.
- D. Toilet Facilities: The Contractor shall furnish a portable, job-site toilet enclosure facility through a local company specializing and licensed in this business. The toilet enclosure shall be located on the plant site at a point approved by the Owner. It shall be maintained daily by the supplying company and removed from the project site upon completion of the project.
- E. A complete first aid kit, supplied in accordance with applicable OSHA standards and suitable for a project of this size, shall be kept in this facility and fully maintained for the duration of this project.

1.03 SECURITY:

A. General: The Contractor shall provide security, as necessary or required, to protect work and property at all times.

- B. Rodents and Other Pests: The Contractor, through debris removal, etc., shall control the creation of rodent or pest problems. Should such develop, the Contractor shall secure services of exterminator to control.
- C. Debris Control: Keep premises clean and free from accumulation of debris and rubbish. Provide trash and debris receptacles and require use. Remove from site at least weekly.
- D. Cleaning: As work is completed by trades, areas of work shall be cleaned in preparation for next trade, inspections or general safety of property and person.
- E. Project Safety: The Contractor shall comply with all applicable governmental and insuring company requirements relative to construction and project safety. Either the superintendent or another company representative on the site during all working hours shall be trained in project safety and designated as Contractor's Safety Director. Contractor shall comply with JEA safety requirements.

PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Summary of Work: The Contractor shall remove all stains, spots, marks and dirt from all finished surfaces caused by this work. All items shall be cleansed in accordance with the manufacturers' written instructions.
- B. Inspection Certificates, Bonds and Guarantees: Upon completion of project, and prior to submission of certificate for final payment, the Contractor shall have the electrical, plumbing and other work, as applicable, inspected by proper authorities as required by the specifications and all applicable codes, laws and ordinances. Before final payment will be made, the Contractor shall submit copies of all bonds and guarantees as required.
- C. Operating Manuals Data:
 - 1. The Contractor shall furnish to the Engineer required copies of all maintenance manuals, instruction books, parts lists, and installation drawings bound in ringed binders for all items furnished under this Contract. It shall be the Contractor's responsibility to satisfy the Owner's requirements regarding such data. Operating and Maintenance Data for all equipment associated with this project shall be prepared and submitted in accordance with the similar requirements as listed in *JEA Water & Sewer Standards Section 445 Pump Station operation and Maintenance Data Submittal Requirements.* Manuals, parts list, etc. shall be presented to the Owner at time of final inspection unless specifically requested earlier. All submittals shall be in a binder and neatly indexed and tabbed.
 - 2. Binder: The manuals shall be in a 9-inch by 12-inch, three-ring binder of a size to facilitate easy turning of the pages. The binders shall have a full-size, transparent, built-in, plastic pocket on the front to accommodate a label showing the name and location of the project, date of completion, Engineer/Contractors' names, addresses and phone numbers. On the binding edge the binders shall have a clip-on metal frame or built-in plastic pocket to accommodate a label showing the name and location of the project and the date of completion.
 - 3. Index: The Contractor shall furnish a neatly typed index in alphanumerical order. Each major division shall list the equipment in alphanumerical order. Listed under each of these major divisions shall be

all items specified on the drawings as furnished with major items listed. These secondary items shall also be listed in alpha-numerical order. To the right of each of these equipment designations shall be the tab number where the information can be found.

4. Tabs: Behind the index, provide numbered tabs beginning with one through the number required for each type of equipment. Behind the tab, insert all shop drawings, shop-cuts, parts' manuals, installation manuals and operation manuals associated with each item furnished. Only one tab will be required for each different material provided. The index designation shall refer to the tab number behind which the information on the equipment can be found.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS:

- A. The record drawings shall correctly and accurately show all changes from the Contract Documents made during construction and shall reflect surveyed information which shall be performed by a professional engineer or land surveyor registered in the State of Florida. The drawings shall be neat and legible. Show all elevations and horizontal control of all utilities (piping, conduit, cables, etc.).
- B. At a minimum, the record 'as-built' documents shall be prepared in accordance with and shall include all information requested by JEA Water and Sewer Standards Section 501 As-Built Drawings and any additional requirements listed therein.
- C. Record Drawing redlines shall be submitted with each month's pay request.

PART 3 - EXECUTION

- **3.01 RECORDS:** Daily records of changes in location of piping, fixtures, and other items shall be kept and recorded on the record drawings. The Contractor shall review the completed record drawings and ascertain that all data furnished is accurate and truly represents the work actually installed. No Record Drawing information will be accepted from subcontractors.
- **3.02 SUBMITTAL:** The Project shall not be considered to be in substantial completion until record drawings have been submitted and accepted by the Engineer. Prior to final payment, the record drawings shall be revised by the Contractor to reflect any changes which have occurred since the substantial completion submittal.

3.03 FINAL INSPECTION:

- A. Final inspection will be held upon completion of the project. The Contractor shall notify the Owner, upon completion, to arrange an inspection tour of the completed project.
- B. The Contractor and the Owner's Representative shall be present for the inspection.
- **3.04 RELEASE OF LIEN STATEMENT:** The Contractor shall submit with his request for final payment sworn statements on the Owner's forms (01700A, 01700B, and 01700C following this Section) from himself and each subcontractor; material or labor suppliers who have filed a "Notice to Owner", that all work has been completed and that all bills for labor, materials, and subcontractors' work on the project have been paid in full.
- **3.05 CONSENT OF SURETY:** The Contractor shall submit with his request for final payment a consent of Contractor's surety to final payment.

CONSENT OF SURETY COMPANY TO FINAL PAYMENT

Project Name: Holiday Road Master Pump Station Splitter Box Replacement

Location: 7833 Holiday Road South, Jacksonville,	FL 32216
A/E#: <u>0801-40-2</u>	
TO (Owner): JEA	
Address: 21 W. Church Street	
City/ State/ Zip: Jacksonville, Florida 32202	
Contractor:	Contract Date:
In accordance with the provisions of the Contract betwee (here insert name and address of Surety Company)	en the Owner and the Contractor as indicated above, the
	, Surety Company,
on bond of (here insert name and address of Contractor)	, Contractor,
hereby approves of the final payment to the Contractor, relieve the Surety Company of any of its obligations to t as set forth in the said Surety Company's bond.	and agrees that final payment to the Contractor shall not he, Owner,
IN WITNESS WHEREOF, the Surety Company has hereunto set its hand this	day of ,
	Surety Company
	Signature of Authorized Representative
Attest: (Seal)	Title

FINAL WAIVER AND RELEASE OF LIEN AND OF RIGHT TO CLAIM AGAINST THE PAYMENT BOND (Subcontractor) (FINAL PAYMENT)

STATE OF FLORIDA COUNTY OF _____

The undersigned, in consideration of the final payment in the amount of \$______, the receipt of which is hereby acknowledged does hereby waive and release any and all lien, right of lien and its right to claim against the payment bond for labor, services, or materials furnished under contract with or by order from _______, the general contractor, on the job of the for improvements to the following described project:

HOLIDAY ROAD MASTER PUMP STATION SPLITTER BOX REPLACEMENT JEA

JACKSONVILLE, FLORIDA MITTAUER & ASSOCIATES, INC. PROJECT NO. 0801-40-2

SIGNED, SEALED and DELIVERED this _____ day of _____, 20____.

(Lienor)

Ву:_____

Title:_____

STATE OF FLORIDA
COUNTY OF _____

The foregoing instrument was acknowledged before me this ____ day of _____, 20____, by _____ as <u>President</u> of ______ who

did/did not take an oath and who:

_____ Is/are personally known to me.

_____ produced current Florida driver's license as identification.

______produced ______as identification.

Notary Public My Commission Expires:_____
FINAL AFFIDAVIT AND WAIVER AND RELEASE OF LIEN (Prime Contractor)

STATE OF FLORIDA	
COUNTY OF	

BEFORE ME, the undersigned authority, personally appeared _______ who, after being by me first duly sworn, deposes and says of his personal knowledge that:

(1) He is President of _______which does business in the State of Florida (hereinafter called the "Contractor").

(2) Contractor, pursuant to the Contract dated ______ (hereinafter referred to as the "Contract") with ______, (hereinafter referred to as the "Owner"), has heretofore furnished or caused to be furnished labor, materials and services for the construction as more particularly set forth in the Contract for the project/job described as:

HOLIDAY ROAD MASTER PUMP STATION SPLITTER BOX REPLACEMENT JEA JACKSONVILLE, FLORIDA MITTAUER & ASSOCIATES, INC. PROJECT NO. 0801-40-2

(3) Contractor represents that all work to be performed under the aforesaid Contract has been fully completed and that all lienors under the direct contract have been paid in full, except the following which are being paid by Owner with checks issued jointly to the Contractor and the lienors named below:

NAME OF LIENOR

AMOUNT DUE

(4) In consideration of final payment to the Contractor in the amount of \$______ and final payment in the amount of \$______ to be issued in joint checks made payable to contractor and the subcontractors/suppliers as listed under section 3 of this affidavit in the amounts shown, and all other previous payments paid by the Owner to the Contractor, the undersigned does hereby for and in behalf of the Contractor, waive, release and relinquish the Contractor's right to any claim or demand or right to impose a lien or liens for work done or materials or services furnished or any other class of lien whatsoever, on any of the property owned by Owner on which improvements have been completed in connection with the aforementioned Contract.

(5) The affiant represents that he has authority to execute a full and Final Affidavit and Waiver and Release of Lien, for and in behalf of the Contractor.

(6) The affiant makes this Final Affidavit and Waiver and Release of Lien pursuant to Chapter 713, Florida Statutes, for the express purpose of inducing the Owner to make final disbursement and payment to the Contractor in the total amount of \$_____, and final payment in the amount of \$_____ to be issued in joint checks made payable to Contractor and the subcontractors/suppliers as listed under section 3 of this affidavit.

Signed, Sealed and Delivered this	day of	20
Signed, Sealed and Delivered this	uay ui	, 20

(CONTRACTOR)

By: _______, President

STATE OF FLORIDA COUNTY OF ______

The foregoing instrument was acknowledged before me this ____ day of _____, 20____, by _____ as <u>President</u> of _____ who

did/did not take an oath and who:

_____ who is personally known to me; or

_____ who has produced current Florida driver's license as identification, and who did/did not take an oath.

Notary Public
My Commission Expires:_____

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS:

- A. General provisions of Contract, including General and Supplementary Conditions.
- B. Warranties and certificates for specific products Respective Specification Sections.
- C. Project Closeout Section 01700.
- **1.02 SECTION INCLUDES:** Administrative and procedural requirements for warranties, bonds, and certifications required by the Contract Documents, including Owner's Standard Maintenance Warranty Bond, manufacturers' standard warranties on products, and special warranties.

1.03 WARRANTY REQUIREMENTS:

- A. Contractor shall warrant all work covered under this Agreement to be free from defects for a period of two (2) years after the date of Substantial Completion.
- B. When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work or abandon in-place, if acceptable to Owner, in a manner that is acceptable to Owner.
- C. When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- D. Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work, regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

- E. Written warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- F. The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- G. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.04 SUBMITTALS:

- A. Submit written warranties to the Owner before requesting inspection for Substantial Completion. If the Owner's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner.
- B. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner within fifteen days of completion of that designated portion of the Work.
- C. When a special warranty is required to be executed by the Contractor or the Contractor and a subcontractor, supplier, or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for approval prior to final execution.
- D. Provide written certifications of compliance and other commitments and agreements for continuing services in a form which includes all pertinent information including:
 - 1. Quantities and dates of shipments.
 - 2. Attestment that materials incorporated into the Work comply with specified requirements. Certification shall not be construed as relieving the Contractor from furnishing satisfactory materials, if the material is later found to not meet specified requirements.
 - 3. Signature of officer of company.

- 4. Laboratory test reports submitted with certificates of compliance shall show dates of testing, specification requirements under which testing was performed, and results of tests.
- E. Refer to individual Sections of Divisions 2 through 16 for specific content requirements and particular requirements for submittal of special warranties.
- F. Form of Submittal:
 - 1. Compile three (3) copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer.
 - 2. Organize the warranty documents into an orderly sequence based on the table of contents of the Technical Specifications.
 - 3. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 in. by 11 in. paper.
 - 4. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
 - 5. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the Project title or name, and the name of the Contractor.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION

SECTION 02210

SOIL BORINGS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. The soil boring logs contained in the Geotechnical Report are provided for the Contractor's information only. The logs are only intended to provide a general indication of the soils at the site and may vary away from the boring location. The Contractor shall satisfy himself as to the character and amount of different soil materials, groundwater and subsurface conditions to be encountered in the work to be performed. Subsurface information included in these specifications is the result of borings made at the exact locations shown only. While the borings show the subsurface conditions at their respective exact locations, local variations in soils and groundwater conditions will be encountered.
- B. It is to be expressly understood that the Owner or Engineer will not be responsible for any interpretation or conclusion drawn therefrom.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.01 Although the borings do not reveal every subsurface condition, the geotechnical engineer has made general recommendations from the information provided by the boring logs. The Contractor shall consider all recommendations made in this report to be the minimum requirements for placement of soil and soil preparation on this project.

END OF SECTION

Jason Shepler

From:	Jamie Oehmann <joehmann@meskelengineering.com></joehmann@meskelengineering.com>	RECEIVED
Sent:	Thursday, April 16, 2020 3:51 PM	
То:	Jason Shepler	APR 16 2020
Cc:	Rodney Mank; Josh Mele	
Subject:	Holiday Road MPS Splitter Box Improvements	Mittauer & Assoc Inc
Attachments:	MAE_Report-JEA_Holiday_Rd_MPS_Splitter_Box_Improv-p	orm.pdf

Importance:

High

Good afternoon, Attached is our signed and sealed report for this project. If you have any questions or need anything else, please let us know. Thank you,

Jamie Oehmann | Office Manager Meskel & Associates Engineering

Office: 904.519.6990 x213 | Cell: 904.673.1557



3728 Philips Highway, Suite 208, Jacksonville, FL 32207

www.MeskelEngineering.com | Facebook | Twitter | YouTube | LinkedIn

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Report of Geotechnical Exploration For

APR 1 6 2020

Mittauer & Assoc., Inc.

Holiday Road Master Pump Station Splitter Box Improvements

MAE Project No. 0146-0006 April 16, 2020

Prepared for:



Mittauer & Associates, Inc. 580-1 Wells Road Orange Park, Florida 32073



Prepared by:

Meskel & Associates Engineering Geotechnical r Environmental r Inspection r Testing

> 3728 Philips Highway, Suite 208 Jacksonville, Florida 32207 Phone (904) 519-6990 Fax (904) 519-6992

April 16, 2020



Mr. Jason Shepler, P.E Mittauer & Associates, Inc. 580-1 Wells Road Orange Park, Florida 32073

Subject : Report of Geotechnical Exploration Holiday Road Master Pump Station Splitter Box Improvements Jacksonville, Florida MAE Project No. 0146-0006

Dear Mr. Shepler:

Meskel & Associates Engineering, PLLC (MAE) has completed a geotechnical exploration for the subject project. Our work was performed in general accordance with our revised proposal dated October 24, 2019. The geotechnical exploration was performed to evaluate the general subsurface conditions encountered within the areas of the proposed manhole and splitter box structures and associated pipelines, and to provide recommendations for foundation support and design and site preparation.

In general, the borings encountered very loose to dense fine sands to silty fine sands (A-3, A-2-4) to the boring termination depths; however, we note that significant subsurface debris (rocks, concrete, and brick fragments) was encountered at boring locations B-1 and B-1A beginning at a depth of 4 feet and forced the borings to terminate at a depth of 8 feet due to refusal. Boring B-2 encountered very loose sands between depths of 4 and 8 feet, underlain by sands containing debris to a depth of about 19 feet below existing grade. Drilling fluid circulation losses, possibly due to voids within the debris, were observed beginning at a depth of 10 feet. Highly organic soils were encountered at boring location B-3 between depths of 8 up to 13.5 feet below existing grade. We recommend that all debris and organic soils within the area of the proposed structures be removed. Groundwater was encountered between approximately 3 to 3.5 feet below existing grade. Therefore, dewatering will be required to facilitate removal of debris and placement and compaction of backfill.

We appreciate this opportunity to be of 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

W. Josh Mele, E.I. Staff Engineer

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 04/16/2020 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.

> Philip R Mank Digitally signed by Philip R Mank Date: 2020.04.16 15.46(18-04'00'

P. Rodney Mank, P.E. Principal Engineer Licensed, Florida No. 41986

Distribution: Mr. Jason Shepler, P.E – Mittauer & Associates, Inc.

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TABLE OF CONTENTS

Subject

3

4

Page No.

1.0	PROJECT INFORMATION1
1.1	General1
1.2	Project Description1
2.0	FIELD EXPLORATION1
2.1	Standard Penetration Test Borings1
3.0	LABORATORY TESTING
4.0	GENERAL SUBSURFACE CONDITIONS
4.1	General Soil Profile2
4.2	Groundwater Level
4.3	Review of the USDA Web Soil Survey Map3
4.4	Seasonal High Groundwater Level3
5.0	DESIGN RECOMMENDATIONS
5.1	General
5.2	Foundation Design Recommendations4
5.3	Borrow Suitability6
6.0	SITE PREPARATION AND EARTHWORK RECOMMENDATIONS6
6.1	Clearing and Stripping6
6.2	Removal /Replacement and Dewatering Program6
6.3	Surface Compaction7
6.4	Compaction of Excavation Bottom and Backfilling7
6.5	Structural Backfill/Fill Soils
6.6	Foundation Areas8
6.7	Excavation Protection8
7.0	QUALITY CONTROL TESTING
8.0	REPORT LIMITATIONS9

FIGURES

Figure 1.	Site Location Map
Figure 2.	Boring Location Plan
Figure 3.	Generalized Soil Profiles

APPENDICES

Appendix A.	Soil Boring Logs
	Field Exploration Procedures
	Key to Boring Logs
	Key to Soil Classification
Appendix B.	Summary of Laboratory Test Results
	Laboratory Test Procedures

Meskel & Associates Engineering

1.0 PROJECT INFORMATION

1.1 General

Project information was provided to us by Mr. Jason Shepler, P.E. with Mittauer & Associates, Inc. For our review and reference, we were provided with a Site Plan which showed the proposed boring locations and depths, prepared by Mittauer & Associates, Inc., dated January 2020.

1.2 Project Description

The site for the subject project is located at 7834 Holiday Road South, just south of the intersection of Holiday Road South and Catalina Road West, in Jacksonville, Florida. The general site location is shown on Figure 1.

Based on the provided information and our discussions with Mr. Shepler, it is our understanding the proposed project includes the construction of two manhole structures and a splitter box. One manhole will have an inside diameter (ID) of 6 feet, while the second manhole will be a 6-foot by 7-foot rectangular structure. The bottom of both manhole structures will be about 13 feet below the existing ground surface. The splitter box will have an ID of 10 feet and will also have a bottom about 13 feet below existing grade.

If the actual project details vary from those described 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 reevaluation of our recommendations can be assessed prior to final design.

2.0 FIELD EXPLORATION

A field exploration was performed during the period of March 10 through 19, 2020. A copy of the plan provided to us, which shows the approximate boring locations, is included as the *Boring Location Plan*, Figure 2. GPS coordinates for the requested boring locations were obtained by overlaying the provided plan in Google Earth, and then each boring location was identified in the field using a Garmin GPSMAP 78 hand-held receiver. Each location was then marked for reference. Prior to starting our field exploration, a utility locate request was submitted to the Sunshine State One-Call Center, and the JEA site representative was contacted to assist with locating on-site utilities. Once the site utilities were located and marked, our field crew mobilized to the site. The boring locations as shown on Figure 2 should be considered accurate only to the degree implied by the method of layout used.

2.1 Standard Penetration Test Borings

To explore the subsurface conditions within the area of the proposed subsurface structures, we located and performed 4 Standard Penetration Test (SPT) borings. It was originally planned to only perform three soil borings; however, due to the encountered debris at boring location B-1, another boring (B-1A) was located approximately 3 feet to the northeast of the B-1 location, in an attempt to bypass or advance through the debris. Both borings B-1 and B-1A were forced to terminate at 8 feet due to the debris and due to possible utility conflicts, so no additional exploration at this location was done. Borings B-2 and B-3 were advanced to depths of approximately 25 feet below the existing ground surface. All SPT borings were drilled 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 further evaluation. A summary of the field procedures is included in Appendix A.

3.0 LABORATORY TESTING

Representative soil samples obtained during our field exploration were visually classified by a geotechnical engineer using the AASHTO Classification System in general accordance with ASTM D 3282. 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 organic, natural moisture, and percent passing a U.S. No. 200 sieve (percent fines) contents of 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* sheet, Figure 3, and on the *Log of Boring* records at the respective depths from which the tested samples were recovered. A summary of the laboratory test procedures is included in Appendix B.

4.0 GENERAL SUBSURFACE CONDITIONS

4.1 General Soil Profile

Graphical presentation of the generalized subsurface conditions is presented on the *Generalized Soil Profiles* sheet, Figure 3. 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.

In general, borings B-1 and B-1A encountered loose to medium dense fine sands to fine sands with silt (A-3) from the existing ground surface to an approximate depth of 4 feet below the existing grade. Both borings then encountered soils with significant amounts of debris consisting of rock, concrete, and brick fragments. Neither boring could be advanced below a depth of 8 feet due to the amount of debris present and the concern that unmarked buried utilities may also be present.

Boring location B-2 encountered fine sands with silt (A-3) to a depth of about 8 feet below existing grade. These sands were loose to medium dense in relative density to a depth of about 4 feet, becoming very loose to a depth of about 8 feet below existing grade. Below the very loose sands, the boring encountered loose to medium dense fine sands with silt (A-3) to the boring termination depth of 25 feet below the existing grade. The samples obtained at depths of 10 and 15 feet contained debris, but the debris was not observed in the samples at depths of 20 and 25 feet. The drill crew also observed a total loss of drilling fluid circulation beginning at a depth of 10 feet, likely due to void space within the debris. The boring continued to the termination depth of 25 feet without regaining circulation.

Boring location B-3 encountered loose to medium dense fine sands with silt (A-3) from the ground surface to a depth of about 8 feet below existing grade, followed by loose highly organic silty fine sands (A-8) to a depth of 13.5 feet. The organic soils were then followed by dense fine sands and medium dense silty fine sands (A-3 and A-2-4, respectively) to the boring termination depth of 25 feet below the existing ground surface.

4.2 Groundwater Level

The groundwater level was encountered at each of the boring locations and recorded at the time of drilling at depths varying from 3 feet 2 inches to 3 feet 5 inches below the existing ground surface. However, it should be anticipated that the groundwater levels will fluctuate seasonally and with changes in climate. As such, we recommend that the water table be remeasured prior to construction. Measured

groundwater levels are shown on the Generalized Soil Profiles sheet, Figure 3, 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 Duval County are shown in the table below. There are two predominant soil map units at the project site: Hurricane/Ridgewood soils and Maurepas muck. 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)
24	Hurricane and Ridgewood soils, 0 to 5 percent slopes	Somewhat Poorly Drained	А	24 to 42
40	Maurepas muck, 0 to 1 percent slopes, frequently flooded	Very Poorly Drained	A/D	0 to 6

⁽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 the 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, effects of development, 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 level at the site to be generally 1 to 2 feet above the water levels measured at the time of our field work.

It is possible that higher groundwater levels may exceed the estimated seasonal high groundwater level as a result of significant or prolonged rains. 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 DESIGN RECOMMENDATIONS

5.1 General

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 details are incorrect or change after this report, or if the 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 be allowed to review the foundation plans and

earthwork specifications to verify that the recommendations in this report have been properly interpreted and implemented.

Both borings at the proposed splitter box location (B-1 and B-1A) encountered soils containing a significant amount of debris (rock, concrete and brick fragments) beginning at a depth of about 4 feet below existing grade. The concentration of the debris caused both borings to terminate due to refusal at a depth of 8 feet below existing grade, or 2 feet above the planned embedment depth of the Splitter Box. We recommend that this debris be completely removed from within the area of the Splitter Box, plus a lateral margin of 5 feet, to the planned embedment depth of the structure. If debris is still present at the planned structure embedment depth, then the excavation should continue until all debris has been removed. Backfill consisting of suitable structural fill soil should be placed in compacted lifts as discussed in Section 6.0 below until the design embedment depth is reached.

Borings B-2 and B-3, located at the proposed manhole structure locations, encountered A-3 soils to a depth of approximately 8 feet below existing grade. Below 8 feet, boring B-2 encountered sands with debris to a depth of about 19 feet below existing grade. Boring B-3 encountered heavily organic soils (A-8) below a depth of 8 feet to a depth of about 14 feet below existing grade. We recommend that the debris laden soils as encountered at boring B-2 be removed within the area of the manhole structure plus a lateral margin of 5 feet, to a depth of at least 2 feet below the structure bottom elevation. Structural backfill should be placed in 6 to 12-inch lifts and compacted per Section 6.0 to the structure bottom elevation plus a lateral margin of at least 5 feet, to the entire depth of the organic soil. Any backfill needed to reach the proposed structure embedment depth should consist of structural fill placed and compacted per Section 6.0 below.

5.2 Foundation Design Recommendations

We understand the proposed manhole and splitter box structures will bear approximately 13 feet below the existing ground surface. Debris or very organic soils were encountered above the proposed structure embedment depths and may extend below the structure embedment depths. Below the debris and organic soils, borings B-2 and B-3 encountered sands (A-3) and silty sands (A-2-4) to the boring termination depth of 25 feet below existing grade. We have assumed that similar soils exist below the debris at boring B-1 and B-1A locations. Provided that all debris or very organic soils are completely removed below the proposed structures and backfilled with suitable compacted structural fill as outlined in Section 6.0 of this report, we believe that the subsurface conditions are adaptable for support of the planned structures.

Based on the results of our exploration, we consider the subsurface conditions at the site adaptable for support of the proposed structures 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

The maximum allowable net soil bearing pressure for the manhole and splitter box base slabs should not exceed 1,500 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 base slab foundations should be designed based on the maximum load that could be imposed by all loading conditions.

5.2.2 Bearing Material

The subgrade soils below the manhole and splitter box base slabs should consist of suitable on-site or

import structural fill soils. The fine sands and fine sands with silt (A-3) as encountered in the borings are considered suitable onsite soils. These soils should be compacted to at least 95 percent of the soil's modified Proctor maximum dry density (ASTM D-1557) to a depth of at least one foot below the slab bearing levels. Control of the soil's moisture content, particularly for the subgrade soils below the structures bearing slabs, will be necessary to achieve the required level of compaction.

5.2.3 Lateral Pressure Design Parameters

In general, walls that have adjacent compacted fill will be subjected to lateral earth pressures. Walls that are restrained at the top and bottom will be subjected to at-rest soil pressures, while walls that are not restrained at the top, and where sufficient movement is anticipated, will be subjected to active earth pressures. Surcharge effects for sloped backfill, point or area loads behind the walls, and adequate drainage provisions should be incorporated in the wall design. Passive resistance, resulting from footing embedment at the wall toe, could be neglected for safer design. The following soil parameters can be used where suitable backfill soils, as described in Section 6.5, are placed adjacent to the underground structures:

- Backfill Soil Unit Weight, Saturated (γ_{sat}) = 115 pcf
- Backfill Soil Unit Weight, Moist (γ_m) = 110 pcf
- Backfill Soil Angle of Internal Friction (φ) = 30 degrees
- Coefficient of Active Earth Pressure, k_a = 0.33
- Coefficient of At-Rest Earth Pressure, k₀ = 0.5
- Coefficient of Passive Earth Pressure, k_p = 3.0
- Foundation Soil Unit Weight, Saturated (γ_{sat}) = 120 pcf
- Foundation Soil Angle of Internal Friction (φ) = 30 degrees

The above parameters are based on sand backfill (A-3) placed and compacted behind the walls as discussed in Section 6.5, and on compacted wall foundation soils as discussed in Section 6.4. A coefficient of friction for poured in-place concrete of 0.45 may be used in the wall design. The manhole and splitter box structures should be designed to include all temporary construction and permanent traffic and surcharge loads acting on the walls.

5.2.4 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 seasonal high groundwater table. Hydrostatic uplift forces can be resisted in several ways including:

- Addition of dead weight to the structures.
- Mobilizing the dead weight of the soil surrounding the structures through extension of the bottom slabs outside the perimeter of each structure.

A moist compacted soil unit weight of 110 lb/ft³ may be used in designing the manholes and splitter box structures to resist buoyancy. It should be assumed that the groundwater table will be at the ground surface for design purposes.

5.3 Borrow Suitability

Based on the boring results and classification of the soil samples, the fine sands and fine sands with silt, (A-3) as encountered at the boring locations, are considered suitable for use as fill and backfill soil. The silty fine sands (A-2-4), i.e. soils containing more than 10 percent fines content as encountered at boring location B-3 between depths of 18.5 to 25 feet, are not considered suitable by JEA standards for use as bearing or backfill soil. Furthermore, the highly organic soils (A-8) encountered at boring location B-3 between depths of 8 and up to 13.5 feet are not considered suitable for reuse as fill and/or backfill material; however, the organic soils could be used in landscape berms. Finally, soil containing debris is not considered suitable for structural fill. Any debris laden soils should be stockpiled a safe distance from the construction area, so to not be confused with any soils intended for reuse and be removed from the site.

6.0 SITE PREPARATION AND EARTHWORK RECOMMENDATIONS

Site preparation as outlined in this section should be performed to provide more uniform foundation and slab bearing conditions and reduce the potential for post-construction settlements of the planned structures.

6.1 Clearing and Stripping

Prior to construction, the location of existing underground utility lines within the construction areas 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 subsurface 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.

Although not recorded on our field logs, it should be anticipated that at least 6 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 topsoils removed from the construction areas can be stockpiled and used in areas to be grassed.

6.2 Removal / Replacement and Dewatering Program

All debris as encountered at borings B-1 and B-1A and very organic soils as encountered at boring B-3 should be completely removed from within the construction area as defined above to the full depth of these materials. The debris laden soils as encountered at boring B-2 should be removed to a depth of at least 2 feet below the planned embedment depth of the manhole structure. Temporary groundwater control measures will be required to facilitate removal of the debris/organic soils and the placement and compaction of all backfill soils. The dewatering methods should be determined by the contractor and should remain in place until backfilling has reached a height of 2 feet above the groundwater level at the time of construction. The site should be graded to direct surface water runoff from the construction area.

Note that discharge of produced groundwater to surface waters of the state from dewatering operations or other site activities is regulated and requires a permit from the State of Florida Department of Environmental Protection (FDEP). This permit is termed a *Generic Permit for the Discharge of Produced*

Groundwater From Any Non-Contaminated Site Activity. If discharge of produced groundwater is anticipated, we recommend sampling and testing of the groundwater early in the site design phase to prevent project delays during construction. MAE can provide the sampling, testing, and professional consulting required to evaluate compliance with the regulations.

6.3 Surface Compaction

Any exposed surface areas outside of the excavation but within the proposed construction area should be compacted with a vibratory drum roller having a minimum static, at-drum weight, on the order of 3 tons. Typically, the soils to be compacted 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 95 percent of the Modified Proctor maximum dry density (ASTM D 1557) have been achieved within the upper 2 feet of the compacted natural soils at the site. Prior to compaction, proof-rolling of these areas with a loaded dump truck is recommended to locate any unforeseen soft areas or unsuitable surface or near-surface soils.

Should the surface 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, 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 50 feet from existing structures. Within this zone, use of a track-mounted bulldozer or a vibratory roller, operating in the static mode, is recommended.

6.4 Compaction of Excavation Bottom and Backfilling

Once the clearing and stripping has been completed, and the debris and organic soils have been removed as discussed in Section 6.2 above, backfill placement can commence. The temporary dewatering method should remain in-place to facilitate compaction of the bottom soils for structures base slab, and to facilitate the backfilling operation. The bottom soils for the base slabs of the splitter box and manhole structure at boring B-3 location, if observed to be suitable bearing soils as discussed in Section 6.5 below, should be compacted to 95 percent of their Modified Proctor maximum dry density for a depth of 12 inches below subgrade elevation.

Backfill soil placed to raise the excavation to the manhole structure subgrade elevation located at the boring B-2 location, and if necessary for the other structures, and placed against the sides of all of the structures should consist of sand soils as defined in Section 6.5 below. The backfill should be placed in maximum 6-inch lifts, with each lift compacted with hand-held equipment as defined in Section 6.5. Backfill placed more than 5 feet away from the structure walls may be placed in lifts up to 12 inches in thickness, with each lift compacted with appropriate compaction equipment to achieve the same level of compaction. Dewatering should remain in place until the level of backfill is at least 2 feet above the groundwater table at the time of construction.

Should the 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, 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 50 feet from existing structures. Within this zone, use of a track-mounted bulldozer or a vibratory roller, operating in the static mode, is recommended.

6.5 Structural Backfill/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.

Structural fill and backfill is defined as a non-plastic, inorganic, granular soil having less than 10 percent material passing the No. 200 mesh sieve and containing less than 4 percent organic material. The fine sands and fine sands with silt (A-3), without roots, as encountered in the borings, are suitable as fill materials and, with proper moisture control, should densify using conventional compaction methods. It should be noted that soils with more than 10 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 95 percent of the modified Proctor maximum dry density (ASTM D 1557) have been achieved within each lift of the compacted structural fill and backfill.

We recommend that material excavated from the manholes, splitter box and associated pipeline areas, which 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.

6.6 Foundation Areas

The foundation 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 one foot below the bearing level. Compaction operations for these confined areas 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.

6.7 Excavation Protection

Excavation work for the planned 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.

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.

7.0 QUALITY CONTROL TESTING

A representative number of in-place soil density tests should be made in the upper 2 feet of compacted natural soils, in each lift of compacted backfill and fill, and in the upper 12 inches below the bearing levels in the footing excavations. The density tests are considered necessary to verify that satisfactory compaction operations have been performed. We recommend density testing be performed as listed below:

- One location at the bearing elevation for each base slab foundation.
- One test per lift of backfill placed against the manholes and splitter box walls alternating on all sides of each structure.

8.0 **REPORT LIMITATIONS**

This report has been prepared for the exclusive use of Mittauer & Associates, Inc. and JEA for specific application to the design and construction of the *Holiday Road Master Pump Station Splitter Box Improvements* 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 analyses and recommendations contained in this report are based on the data obtained from this project. 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 occurring 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.

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.

If changes in the design or location of the planned 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





Project Managar:	PRM	Project No	0146-0006			BORING LOCATION PLAN	FIG NO.
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Approved by:	WJM	Date:	4/2/2020	Meskel & Associates Engineering		JACKSONVILLE, FLORIDA	



Appendix A

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	1		Medium dense, Brown fine SAND with silt and gravel (rock fragments), poorly graded.	A-3		5 6 4 4	10								
	2	Ž	Loose. Gray brown to very dark gray to reddish $\underline{\nabla}$ yellow fine SAND with silt, poorly graded.	A-3		3 2 2 4	4								
5	3					5 10 10 12	20								
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-	1	Medium dense, Light brownish gray fine SAND _ with silt, poorly graded.	A-3		3 4 4 4	8									
	2	∠ Loose, Gray brown fine SAND with silt, poorly _ graded.	A-3		3 2 2 4	4									
5	3				1/18" ↓ 1	1/18"	27	7							
	4	poorly graded.	A-3		1/12 ⁺ 1 1	1	25	7							
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		Loose. Gray brown fine SAND with silt, few debris, poorly graded.	A-3											fluid circulation at c of about 10'; boring continued to termin depth of 25' withou regaining circulation	
- 15	6	-			5 4 5	9	27	6							
		Loose, Gray brown fine SAND with slit, trace debris, poorly graded.	A-3												
20	7				5 5 5	10	5								
		Loose, Light gray to gray brown fine SAND with silt, poorly graded.	A-3												
	8	Medium dense, Light brownish gray to light gray - fine SAND with silt, poorly graded.	A-3	1.1.1	767	13	0								

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-			Medium d SAND, po	ense, Gray brown to yello orly graded.	w silty fine	A-2-4												
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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.

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KEY TO BORING LOGS – AASHTO

Soil Classification

Soil classification of samples obtained at the boring locations is based on the American Association of State Highway and Transportation Officials (AASHTO) Classification System. 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						
Ν	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						
Pł	Plasticity Index						
NP	Non-Plastic						
PP	Pocket Penetrometer in tons per square foot (tsf)						

MODIFIERS							
SECONDARY CONSTIT	UENTS						
(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	ndy, Very Silty or Very Clayey 35% to 50%						
ORGANIC CONTEN	NT						
Trace	2% or less						
With	3% to 5%						
Organic Soils 5% to 20%							
Highly Organic Soils (Muck)	20% to 75%						
PEAT	Greater than 75%						
MINOR COMPONE	NIS						
(Shell, Rock, Debris, Roc	ots, 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							

KBL-AASHTO-Auto

	(fror	n AA:	SHTC) M 1	45 or	· AST	MDE	3282)			
General Classification	Granular Materials (35% or less passing the 0.075 mm sieve)							Silt-Clay Materials (>35% passing the 0.075 mm sieve)			
Group Classification	A-1-a	-1 A-1-b	A-3	A-2-4	A-2-5	-2 A-2-6	A-2-7	A-4	A-5	A-6	A-7 A-7-5* A-7-6*
Sieve Analysis, % passing:											
2.00 mm (No. 10)	50 max										
0.425 (No. 40)	30 max	50 max	51 min								
0.075 (No. 200)	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fracti	on passii	ng 0.425	mm (No	. 40):							
Liquid Limit	Liquid Limit			40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min
Plasticity Index	6 max		N.P.	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11 min
Usual types of significant constituent materials	stone fragments, gravel and sand		fine sand	silty or clayey gravel and sand				silty soils clayey		ey soils	
General local** rating as a subgrade	excellent to g		good	fair to poor							

AASHTO Soil Classification System

* Plasticity index of A-7-5 subgroup is equal to or less than the LL - 30. Plasticity index of A-7-6 subgroup is greater than LL – 30

** Northeast Florida

Meskel & Associates Engineering

Appendix B

Meskel & Associates Engineering, PLLC FL. Registry No. 28142 3728 Philips Highway, Suite 208

3728 Philips Highway, Suite 208 Jacksonville, FL 32207 P: (904)519-6990 F: (904)519-6992

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SUMMARY OF LABORATORY TEST RESULTS

PROJECT NO. 0146-0006

Meskel & Associates Engineering

DATE. 4/2/2020

PROJECT NAME _______ JEA Holiday Road MPS Splitter Box Improvements

PROJECT LOCAT	ION Jackson	ville, Florida			CLIE	CLIENT Mittauer & Associates, Inc.				
Borehole	Sample No.	Approx. Depth (ft)	%<#200 Sieve	Water Content (%)	Organic Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	AASHTO Classification	Comments
B-1	2	3	5	14			-		A-3	
B-2	3	5	7	27	-	444			A-3	
B-2	4	7	7	25			-	_	A-3	
B-2	6	14	6	27	-		-	-	A-3	
B-3	5	9	16	310	66.9			-	A-8	
B-3	6	14	4	25		-1-	-		A-3	

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.

Meskel & Associates Engineering
DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. The extent of demolition work is shown on the drawings or called for in the specifications and includes clearing and grubbing.
- B. Demolition includes the complete wrecking and removal and disposal of selected structures, walks, paving and other materials as shown on the drawings and specified.
- C. Clearing and grubbing includes the disposal of materials and debris resulting from the clearing and grubbing operations. The Contractor shall visit the site of the work and determine for himself the extent of the clearing and grubbing necessary for his construction operations.
- D. Demolition includes removal and disposal of utility services and appurtenances to such except as otherwise shown or specified.
- E. Trees and plants which are to remain and must be protected. Perform trimming and tree repair work for damages incurred or anticipated to occur by new construction to the satisfaction of the Engineer.
- F. Record Drawings related to the original electrical substation concrete pad are shown at the end of this section for the Contractor's review and for informational purposes only.

1.02 SUBMITTALS:

- A. Schedule Demolition: Submit written schedule of methods and operations of demolition to the Engineer for approval prior to the start of work. Include in the schedule the coordination for shut-off, capping, street interruption and continuation of utility services as required.
- B. Provide a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the Owner's operations.

1.03 JOB CONDITIONS:

A. Condition of Items to be Demolished: The Owner assumes no responsibility for the actual condition of items to be demolished. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner

insofar as practicable. However, variations within the items may occur by Owner's removal and salvage operations prior to the start of the demolition work. Contractor shall verify in writing to the Engineer, safe conditions prior to the commencement of demolition work.

- B. Protections: Ensure the safe passage of persons around the area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities and persons.
 - 1. Provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain.
 - 2. Provide temporary fencing, barricades, or guards to prevent unauthorized personnel from entering the construction zone.
- C. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to the Owner.
- D. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Owner. Timely notice shall be given to all parties affected by temporary interruptions to existing utilities, as acceptable to the governing authorities.
- E. Provide temporary fencing, barricades, or guards to protect trees and other plants which are to remain from damage.
- F. Existing facility components where the Contractor's work will interface are depicted on the Drawings except for the original electrical substation concrete foundation. To assist the Contractor's efforts, enclosed at the end of this section are drawings from the original design documents to assist defining demolition requirements for this project component.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.01 DEMOLITION:

A. Pollution Controls: Use water sprinkling, temporary enclosures and other suitable methods to limit the amount of dust and dirt rising and scattering in

the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.

- B. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations to the satisfaction of the Engineer or governing authorities. Return adjacent areas to condition existing prior to the start of the work.
- C. Noise Pollution: Comply with all applicable sections of Federal, State, local and OSHA Regulations for noise pollution control, suppression and equipment.
- D. Structure Demolition: Demolish structures completely and remove from the site. Use such methods as required to complete the work within the limitations of governing regulations. Use of explosives is NOT ALLOWED.
- E. Demolish paving (asphaltic or concrete) in small sections. Where new paving abuts, saw cut existing paving to provide straight, clean perimeter for new.
- F. Below-Grade Construction:
 - 1. Demolish and remove below-grade construction and concrete slabs on grade.
 - 2. Filling of Voids: Completely fill below-grade areas and voids resulting within the work area and from the demolition of structures.
 - 3. Use satisfactory soil materials as specified in Section 02300 Earthwork.
- G. Dispose of any existing trash piles, garbage, or debris encountered at the site.
- H. Disposal of Demolished Materials: Remove from the site debris, rubbish, excess excavations, displaced trees, trimmings and other materials resulting from demolition operations and clearing and grubbing. Burning or disposal of removed materials from demolished structures shall not be permitted on project site. Dispose of material in an approved manner meeting local requirements. Contractor shall pay all expenses including landfill fees associated with the disposal of material.

3.02 CLEARING AND GRUBBING: See Specification Section 02230.

3.03 PROTECTION OF TREES AND PLANTS:

- A. Protect root systems from damage due to materials in solution caused by run-off or spillage during mixing and placement of construction materials or drainage from stored materials. Protect root systems from flooding, erosion or excessive wetting resulting from dewatering operations.
- B. Repair and Replacement of Trees:
 - 1. Repair trees or plants damaged by construction operations in a manner acceptable to the Engineer. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees.





									SUBMITTED BY Conclusion for the submit	APPROVED E
À	SHEET RE-155UED PER ADD. No. 1	CV	FEA	4-78	GEG	4/78	(HH)	51178	FLOOD & ASSOCIATES INC	WATE
$\overline{\Lambda}$	PRE-BID REVISIONS	JB	F¢A	9-11	GEG	2/18) H.H	5/1/78	RECOMMENDED BY	AUTHORIZE
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	REVISIONS	SU	BMITT	AL	APPROVAL			SVERDRUP & PARCEL AND ASSOCIATES INC	CITY	

	CITY OF JACKSONVILLE, FLORIDA	FLOOD & ASSOCIATES, DESIGN CONSULTANT SVERDRUP & PARCEL AND ASSOCIATES, INC		
SEWER DIVISION	SEWERAGE IMPROVEMENT PROGRAM			
NO ADD DATE DATE DATE DIRECTOR OF PUBLIC WORKST ACKSONVILLE FLORIDA	GROVE PARK PUMPING STATION	DETAILED BY RCJ SCALE AS SHOWN		



12973 N	AS BUILT E-1						
NC.	ELECTRICAL SITE PLAN & LEGEND						
DATE NOV 1976	CONTR NO						

NOTE THROUGHOLIT DWGS E-I THRU E-9 REFER TO SQUARE D COMPANY SHOP DWGS. B/2-07551-147; C12-07551-1A3, C12-07551-1A4, C12-07551-1A5, C12-07551-1A12; C12-07551-2A5; C12-07551-2A6; D-12-07551-1A1; D12-07551-1A2, (PAGES 1-4),

DI2-07551-2A1; D12-07551-242



JUNCTION BOX MANUAL MOTOR STARTER - 2 POLE SAME AS SM WITH LOCKOUT COMB MOTOR STARTER & C/B CHECK VALVE RECORDING AMP METER

SITE CLEARING, STRIPPING AND GRUBBING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. The General Requirements are made a part of this section as fully as if repeated herein.
- B. Work includes but is not limited to:
 - 1. Site clearing.
 - 2. Stripping and removal or stockpiling topsoil.
 - 3. Grubbing and removal of vegetation within site boundaries or within limits shown on drawings.
 - 4. Tree removal within work limits and as indicated.
 - 5. Protection of existing trees to remain.
 - 6. Protection of streets, roads, adjacent property, and other facilities to remain.
 - 7. Disposal of all cleared materials.
 - 8. Disposal of all grubbed materials.

1.02 SUBMITTALS:

- A. Permit for transportation and disposal of debris.
- B. Disposal tickets from landfill.
- **1.03 DISPOSAL OF MATERIAL:** Remove all cleared and grubbed materials from project site.

1.04 REGULATORY REQUIREMENTS:

A. See Section 02370 for FDEP NPDES Permit requirements.

(Not Applicable)

PART 3 - EXECUTION

3.01 GENERAL:

- A. Segregation of Materials: Contractor shall be responsible for segregating dissimilar materials. Suitable fill, unsuitable fill, organics and/or trash shall not be mixed. Contractor shall stockpile material types independent of each other.
- B. Safety Procedures: The performance of the work shall be in strict compliance with all Local, State and Federal Regulations. This shall include, but not be limited to, Florida Trench Safety Act (F.S. 553.6) and OSHA 29 CFR 1926.651 and 1926.652.
- C. Trench excavations over 5 feet deep must provide a protective system for all personnel in the hole. Trench excavations over 20 feet in depth must provide a protective system designed by a Florida Registered Professional Engineer.

3.02 CLEARING:

- A. Limits of Clearing: Remove trees and other vegetative matter only as required for construction of the project.
- B. Remove all trees and shrubs to ground level and grub as described below.
- C. Remove all dead trees, dead shrubs, rubbish, debris, weeds, vines and undergrowth to ground level.
- D. Remove all other obstructions resting on or protruding through surface of existing ground.
- E. Do not pull up or rip out roots of trees and shrubs that are to remain. If excavation through roots is required, excavate by hand and cut roots with fine tooth saw.

3.03 STRIPPING TOPSOIL:

A. Strip existing vegetation layer from areas of site to receive improvements and remove from site prior to stripping topsoil for storage and reuse.

- B. After stripping vegetation layer, remove existing topsoil 6-inches deep minimum from areas of site to receive fill and store for later use. Coordinate with Owner for temporary storage location.
 - 1. Existing topsoil is property of Contractor (unless claimed by Owner) with restriction that topsoil is to be used first for Project landscape topsoil requirements and second for fill and backfill.
 - 2. After Project fill, backfill, and landscape topsoil requirements are satisfied, remove excess existing topsoil from site. Do not remove existing topsoil from site without Owner's prior approval.
- C. Do not include clay, stones larger than 3/4", weeds, roots, rubbish or any other foreign material in the stock piled topsoil.

3.04 GRUBBING:

- A. All areas to receive improvements shall be root raked; minimum of two (2) passes perpendicular to each other.
- B. Completely remove all stumps, roots over 1 inch in diameter, and matted roots.
- C. In case of footings, slabs on grade, bottom slabs of structures, roads and parking areas, or other construction on fills, greater depth shall apply.
- D. Unless further cut is required, fill depressions made by grubbing and compact to density of surrounding soil.

3.05 **PROTECTION OF TREES**:

- A. A visible barrier shall be constructed of 2x4 lumber standing 48" high and placed continuously 6 feet from the trunk of the tree or plant to remain.
- B. Barrier shall be secured in place and covered in safety orange netting.
- C. Barriers shall be completely removed at the conclusion of construction activities.
- D. Protect root systems from damage due to materials in solution caused by runoff or spillage during mixing and placement of construction materials or drainage from stored materials. Protect root systems from flooding, erosion or excessive wetting resulting from dewatering operations.

- E. Repair and Replacement of Trees to Remain:
 - 1. Repair trees or plants damaged by construction operations in a manner acceptable to the Engineer. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees.
 - 2. If trees die during the course of the project or within the warranty period, the Contractor shall remove them, and grind the stumps if the Owner so wishes, at no charge to the Owner.
 - 3. Trees that die during construction shall be replaced with same species, Grade A and 3" DBH. Trees shall be furnished and planted by the Contractor at no cost to the Owner.

3.06 CLEAN-UP:

- A. Remove from site trees, shrubs, uprooted stumps, vegetative layer, and surface debris. All material shall be disposed of legally.
- B. Remove and dispose of all stockpiled topsoil not claimed by Owner.
- C. Do not bury cuttings, stumps, roots, and other vegetative matter or burn waste material on site without prior authorization from Owner.
- D. Clean pavement, sidewalks and drainage features of debris and dirt.
- E. At the Contractor's discretion, he may acquire (at his expense) a burn permit from the Florida Department of Forestry and/or any other government agency having jurisdiction over the activity.
 - 1. All materials not completely consumed by the activity shall be removed from the site and legally disposed of.
 - 2. It shall be the Contractor's responsibility to comply with all Federal, State, and Local regulations governing the burning of vegetative debris.

DEWATERING

PART 1 - GENERAL

- **1.01 RELATED DOCUMENTS:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- **1.02 DESCRIPTION:** The Work to be performed under this section shall include furnishing all equipment and labor necessary to remove storm or subsurface waters from excavation areas in accordance with the requirements set forth and as shown on the drawings.
- **1.03 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS:** The dewatering of any excavation areas and the disposal of the water shall be in strict accordance with the latest revision of all local and state government rules and regulations. The Contractor shall obtain any required dewatering permit from the appropriate agencies prior to commencing dewatering operations.
- **1.04 SUBMITTALS:** Prior to the start of construction the Contractor shall provide a dewatering plan describing the surfacewater and groundwater controls which will be employed to control water levels in excavations so that construction is not inhibited.
 - A. Plan shall include temporary culverts, barricades and other protective measures to prevent damage to property or injury to any person or persons.
 - B. Plan shall indicate disposal method and location of point discharge.
 - C. Proof of Compliance with Florida Department of Environmental Protection Rule 62-621.300(2), F.A.C. See Paragraph 3.02 B.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.01 PERFORMANCE:

- A. General:
 - 1. The Contractor shall provide adequate equipment for the removal of storm or subsurface waters which may accumulate in any excavation.

- 2. The Contractor shall maintain groundwater levels as follows:
 - a. 2 feet (24") below foundation bearing elevation.
 - b. 2 feet (24") below pavement base bearing elevation.
 - c. 1 foot (12") below bottom of utility pipes and structures.
 - d. Bottom of trench or other excavation shall be dry so that work can proceed.
 - e. 1 foot (12") below any other working surface.
- 3. System shall intercept water on all sides of area to be drawn down.
- 4. Contractor shall adhere to submitted Dewatering Plan.
- 5. Engines driving any proposed dewatering pumps shall be equipped with residential type mufflers.
- B. Acceptable Methods:
 - 1. Wellpoint System.
 - 2. Trench and Sock Drain: Dewatering by trench pumping will not be permitted if migration of fine grained natural material from bottom, side walls or bedding material will occur.

3.02 DISPOSAL:

- A. General:
 - 1. Water pumped from an excavation shall be disposed (in strict compliance with all Local, State and Federal Regulations) or in the following:
 - a. Site Stormwater Pond or other Stormwater Facility serving the project.
 - b. Temporary disposal pit or trench.
 - 2. Direct discharge to waters of the state or other surface waters is strictly prohibited without prior written approval from the governing agency.
 - 3. No flooding of streets, roadways, driveways or private property shall be permitted.

- B. Regulatory Requirements:
 - 1. Contractor is responsible for acquiring and complying with all permits and approvals necessary to perform the dewatering activity.
 - a. The Florida Department of Environmental Protection may require testing of groundwater prior to dewatering (F.A.C. 62-621.300(2)) for each point source that discharges to waters of the State.
 - 2. All waterways shall be protected from turbidity during the dewatering operation.

3.03 RESTORATION:

- A. All temporary drains, pipe or other non-soil materials shall be removed at the conclusion of the dewatering activity.
- B. Soils disturbed by the removal process shall be recompacted and restabilized.

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions, along with the General Requirements, apply to the work specified in this Section.

1.02 **DESCRIPTION**:

- A. Work Included:
 - 1. Utility Locates.
 - 2. Protection.
 - 3. Slope Restrictions, Shoring & Bracing of Excavations.
 - 4. Existing Soil Handling.
 - 5. Fill Placement.
 - 6. Repair & Restoration.
 - 7. Clean Up.

1.03 REFERENCES:

- A. American Society for Testing and Materials (Latest Edition):
 - 1. ASTM D698, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort'.
 - 2. ASTM D1140, 'Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 Sieve'.
 - 3. ASTM D1557, 'Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort'.
 - 4. ASTM D2216, 'Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock'.
 - 5. ASTM D2487, 'Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)'.
 - 6. ASTM D2922, 'Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)'.
 - 7. ASTM D2974, 'Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils'.
 - 8. ASTM D3017, 'Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)'.
 - 9. ASTM D4318, 'Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils'.
 - 10. ASTM D5268, 'Standard Specification for Topsoil Used for Landscaping Purposes'.

- 11. ASTM D6913, 'Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis'.
- 12. ASTM D448, 'Standard Classification for Sizes of Aggregate for Road and Bridge Construction'.
- B. Florida Department of Transportation (FDOT):
 - 1. Standard Specifications for Roadway & Bridge Construction.
- C. Florida Statutes (F.S.):
 - 1. Chapter 556: Underground Facility Damage Prevention and Safety.

1.04 JOB CONDITIONS:

- A. Inspection of the Site: It is the Contractor's responsibility to have carefully inspected the Site during the bidding period to determine the extent and nature of the site work and the conditions under which it must be performed.
- B. Lines, Grades, Etc.: Verify all grades, lines and dimensions shown on Drawings and report any errors or inconsistencies to the Engineer before commencing work.
- C. Should any unusual conditions arise, contact the Engineer for instructions prior to continuation of clearing and grading operations.
 - 1. Review Section 02210 Soil Borings. Concrete debris and other materials were found during the geotechnical investigation. The Contractor shall remove all of these materials with the work area including additional removal of unsuitable material to allow for sufficient material to be furnished and installed to provide a proper foundation for the piping and structures.
- **1.05 TESTING:** Contractor shall employ (at the Contractor's expense) a geotechnical firm capable of performing the below compliance testing at the indicated intervals. Geotechnical firm subject to Engineer's approval.
 - A. The minimum compaction testing (ASTM D1557) shall be as follows for each lift of fill:
 - 1. One (1) test per 2,000 SF of backfilled area.
 - 2. One (1) test at each isolated footing, pad or equipment slab.

1.06 SUBMITTALS:

A. Copies of all soils testing showing compliance with this section. Copies of all retests are required.

- B. Shoring and bracing plans for excavations if required. Signed and sealed by a Florida Registered Professional Engineer.
- C. Copies of all hauling tickets confirming the amount of debris and/or unsuitable materials removed from the site.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Suitable On-Site or Imported Fill/Backfill:
 - 1. Well graded material conforming to ASTM D2487 (SW, SP) free from debris, organic material, fat clays, brick, lime, concrete, and other material which would prevent adequate performance of the backfill.
 - 2. Fill shall consist of an inorganic, non-plastic, granular soil containing less than 10 percent material passing the No. 200 mesh sieve.
- B. Topsoil:
 - 1. Well-graded sandy material with composited organic content in accordance with ASTM D5268.
 - 2. Material shall be friable, free draining, surface soil reasonably free of grass, roots, weeds, sticks, and trash.
 - 3. Material shall be free of odors.
 - 4. Material shall have a pH between 5.9 and 7.0, unless otherwise required by the sod supplier or landscaper.
- C. Crushed Stone/Gravel:
 - 1. Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2 inch sieve and 0 to 5 percent passing No. 8 sieve.

PART 3 - EXECUTION

3.01 NOTIFICATION OF UTILITY COMPANIES:

A. Coordinate with the JEA staff and the Contractor's Subsurface Utility Engineering (SUE) company to locate utilities around the work site prior to

starting any work. Have all utilities identified and located. See Specification Section 02590 for additional requirements.

- B. Active utilities shall be adequately protected from damage and removed or relocated only as indicated or specified. The work shall be adequately protected, supported or relocated as directed by the Engineer. Take responsibility for the repair or replacement of any lines or services damaged during the course of this work.
- C. Remove, plug or cap all abandoned lines, boxes, obstructions or piping in accordance with the requirements and Owner, or as directed by the Engineer.

3.02 **PROTECTION**:

- A. The Contractor shall design, furnish, install, and maintain all support, shoring, and sheet piling which may be required for the protection of site personnel and adjacent existing improvements.
- B. Maintain all bench marks, monuments, and other reference points furnished by others and replace any that are disturbed or destroyed during the course of the work.

3.03 STRIPPING AND STOCKPILING OF TOPSOIL:

- A. Strip all topsoil from the excavation areas and stockpile it on the site in a segregated pile as directed by the Engineer or Owner.
- B. Where additional topsoil is required for finish grading, it shall be equal to the topsoil of the surrounding area. All topsoil shall be kept clean and free of weeds and refuse.
- C. Any additional topsoil or suitable backfill shall be provided at the Contractor's expense.
- D. Topsoil not used in final grading shall be removed from the site.

3.04 OVEREXCAVATION, REMOVAL AND REPLACEMENT OF UNSUITABLE SOILS:

A. General: The following soil types shall be defined as unsuitable material: clay rich soils (SC, CL, CH, ML, MH) and organic rich soils (Pt, OH, OL). Unsuitable materials shall also include all construction debris (concrete, brick, roots, trash, etc.). If encountered, this material is not suitable for use as backfill. Excavations for project improvements that extend into or bear on or near an unsuitable soil layer should be visually inspected and probed by the Contractor's Geotechnical Engineer. Where indicated by the

Geotechnical Engineer, overexcavation and removal of unsuitable soils shall be mandatory. Extent and conditions for soil removal shall be as follows:

- 1. New Buildings, Tanks and Equipment Pads:
 - a. Vertical removal of all clay rich soils beneath the bearing elevation of the foundation shall be to a depth of 3'.
 - b. Horizontal limits removal of clay rich soils shall be extended 5 feet beyond the perimeter of the structure.
 - c. Overexcavation of organic rich soils shall be full depth or 10', whichever is greater, for an area extending 5' beyond the structure footprint.
 - d. Control of groundwater elevation is mandatory.
 - e. Backfill excavations with compacted suitable material.
- 2. All Utility Structures, Paving Areas and Underground Piping:
 - a. Where unsuitable material occurs at subgrade elevations within the limits of construction, the Contractor shall excavate such material (for the width of the excavation) down to suitable foundation material or to a depth of two feet, whichever is less, and backfill with suitable material obtained from grading operations, borrow or imported fill.
 - b. Control of groundwater elevation is mandatory.
- B. Under no circumstances shall unsuitable materials be mixed with clean fill on the job site. Contractor shall make every effort to separate materials including distinct separation of organics, unsuitable inorganics, and suitable fill.
- C. All utility structures (manholes, wetwells, precast units) shall be underlain by 12" of crushed stone (No. 57) or gravel extending 24" beyond the base. See Drawings for additional requirements.

3.05 SLOPE RESTRICTIONS, SHORING & BRACING OF EXCAVATIONS:

A. Excavations exceeding 5 feet in depth shall comply with the Trench Safety Act (F.S. 553.60-64) and shall employ the requirements of 3.03 B. or 3.03 C. as applicable.

- B. Excavation walls adjacent to existing structures and pavements, such that foundations or bearing elements could be undermined, shall be laterally supported by sheet piles.
 - 1. Contractor shall at his expense design, furnish, and install sheet piles.
 - 2. System shall use walers, tie-backs or deadman as necessary to prevent movement of soils under or adjacent to existing structures.
 - 3. System shall be designed under the supervision of a Florida Registered Professional Engineer.
 - 4. The use of jetting to install sheet piles is not allowed.
 - 5. Upon completion of excavation activities all shoring & bracing materials shall be removed.
- C. Excavations not adjacent to existing structures may be open cut.
 - 1. Excavation walls greater than 5 feet in depth shall not exceed 2:1 (H:V).
 - 2. Limits of excavation shall not advance beyond the property or right-ofway line.
 - 3. Slopes shall be protected from erosion.
 - a. Construct a perimeter berm redirecting stormwater.
 - b. Apply an impervious sheeting covering slopes during rain events as necessary.
 - 4. Excavation slopes shall be terraced every 5 feet vertically with a 4 foot wide continuous terrace. A shallow drainage ditch, 8-inches deep, shall be cut at the toe of each slope to collect stormwater.
 - 5. In lieu of 2:1 (H:V) sideslopes the Contractor may utilize a steel trench box and ladder designed for the purpose of protecting workers in steep wall excavations.
- D. All utilities exposed by the excavation shall be supported or redirected as required to remain in service.
- E. Differing materials removed from the excavation shall be segregated into separate piles. Suitable fill, unsuitable fill, organics and trash shall not be combined into a single pile.

3.06 EXISTING SOIL COMPACTION AND PREPARATION:

- A. Subsequent to clearing and stripping, compact the upper 12 inches of exposed surficial sandy soils to the requirements of Paragraph B of this section.
 - 1. Use non-vibratory or vibratory equipment (3 to 4 ton static weight roller) as allowed by groundwater levels and proximity to existing structures.
 - 2. Provide a minimum of 4 passes.
 - a. Provide an equal number of passes in directions perpendicular to each other.
- B. Minimum compaction requirements (per ASTM D1557) for excavations in or activities on existing soils shall be as follows:
 - 1. Foundations, slabs and sidewalks 95%
 - Paving areas
 98%
 Utility trenches/pipelines and structures
 98%
 - 4. Landscaping and athletic fields 90%
 - 5. All other areas 85%
- C. If encountered, surficial exposed clayey soils should not be compacted.
 - 1. Clayey soils beneath proposed improvements are unsuitable and shall be removed as described elsewhere in this Section.
 - 2. Elsewhere, cover exposed clayey soils as soon as possible with suitable fill, limit access to area until soil has been covered and protected from further disturbances.
- D. After completion of compaction activities, proofroll existing surface with a heavy, pneumatic tired vehicle such as a fully loaded dump truck.
 - 1. Remove and replace soft soils with suitable fill.
 - 2. Recompact and retest area.
 - 3. Proofrolling shall consist of (2) two complete passes of the vehicle in opposite directions.

3.07 FILL PLACEMENT:

- A. Backfill Placement:
 - 1. With 24" or less separation between compaction surface and groundwater table:
 - a. Place loose lifts not exceeding 6 inches in depth.
 - b. Compact each lift using non-vibratory equipment.
 - 2. With greater than 24" separation between compaction surface and groundwater table:
 - a. Place loose lifts not exceeding 12 inches in depth.
 - b. Compact each lift using vibratory equipment.
 - 3. Regardless of compaction achieved all lifts shall receive a minimum of 8 passes of the compaction equipment. Provide an equal number of passes in directions perpendicular to each other.
- B. Compact each lift or backfill until the % of the maximum dry density (per modified proctor max. dry density, ASTM D1557) is obtained per Paragraph 3.06.

Recompact areas which fail to meet the compaction requirements until passing results are achieved.

- C. Fill shall be moisture conditioned within 2 percent of optimum moisture content. Based on ASTM D1557.
- **3.08 LAYOUT AND ESTABLISHMENT OF GRADES:** The Contractor shall employ and pay for the services of a Florida licensed surveyor who shall make all required surveys for establishing all points, lines, grades and levels, and otherwise fully and completely lay out all the work required by the Contract.

3.09 GRADING AND RESHAPING SITE:

- A. Cut, fill, backfill, and rough grade as necessary to bring entire site level with elevations of undersides of concrete slabs, walks, paving and finished landscaping as indicated on Drawings or in Specifications.
- B. Grade areas to receive future topsoil and sod to allow for such material. Leave finished surfaces and surfaces to receive paving smooth, compacted and free from irregular surface drainage.
 - 1. For areas receiving top soil, set rough grades 4" below finish grades.
 - 2. For areas receiving sod, set finish grades 1" below final grade.
 - 3. For areas receiving seed, set grades at finish grades.

- 4. It is the intent of these grade offsets for the finish surface to be a flush condition with the adjacent hardscape. Differences in sod thickness may require the Contractor to adjust these requirements to suit.
- C. Surfaces and grade lines shall not vary from the established grades and slopes by more than the following tolerances:

1.	Drainage Features	0.10 feet
2.	Areas Under Paving and Structures	0.05 feet
3.	All Other Areas	0.10 feet

- D. Where elevations are indicated on the Drawings, obtain such finish elevations and establish uniform slopes of finish grades between indicated elevations. Grade lines between any given elevations shall conform to the above tolerances.
- E. Where elevations are not indicated, establish and obtain uniform slope from finished spot elevations at the exterior face of the building or other vertically described site element out to the nearest indicated elevations for finished grades as shown on the Drawings.
- F. The Contractor shall provide suitable fill as necessary to achieve all proposed grades.

3.10 REPAIR/RESTORATION:

- A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.
- B. Disturbed areas shall be sodded or seeded and mulched as described on the Drawings or elsewhere in these specifications.

3.11 CLEAN-UP:

- A. Minimize the transmission of dirt or debris by equipment or personnel to any property, public or private, outside the project Site. Immediately remove any such debris or dirt transmitted.
- B. Any excess materials left over at the conclusion of construction activities is first the property of the Owner. If not claimed by the Owner, then excess materials shall become the property of the Contractor and shall be disposed of legally at his expense.
- C. All streets, sidewalks, and paved driveways, adjacent to or within the construction limits, shall be swept clean of debris.

EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The General Provisions of the contract, including the General Conditions, Supplementary Conditions and Special Conditions, along with the General Requirements, apply to the work specified in this Section.

1.02 SUMMARY:

- A. Includes But Not Limited To: Provide, install, maintain, and remove erosion and sedimentation controls as described in Contract Documents and as required by Contractor's Pollution Prevention Plan.
- B. Related Sections:
 - 1. Section 02240 Dewatering.
 - 2. Section 02300 Earthwork.

1.03 **REFERENCES**:

- A. Florida Department of Transportation (Latest Editions):
 - 1. Standard Specification for Road & Bridge Construction.
 - 2. Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System.
- B. Florida Department of Environmental Protection:
 - 1. Rule 62-621 Generic Permits
- C. Environmental Protection Agency (EPA):
 - 1. National Manual of Stormwater Best Management Practices.
- **1.04 QUALITY ASSURANCE:** Contractor shall be certified by the Florida Department of Environmental Protection as an Erosion and Sedimentation Control Professional.

1.05 SUBMITTALS:

A. Provide copy of application and stormwater pollution prevention plan as submitted to Florida Department of Environmental Protection as required by 02370 3.02 A.

- B. Provide a copy of Notice of Termination (NOT) of coverage under FDEP Generic Permit for Large and Small Construction Activities.
- C. Name of Certified FDEP Professional and a copy of the page of the permit application identifying the FDEP individual and their contact information.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Filter Fabric: Florida Department of Transportation Class D-3 material.
- B. Sand Cement Bags:
 - 1. Portland Cement: ASTM C150 Type I/II material.
 - 2. Fine Aggregate: Clean silica sand or other inert natural material of similar characteristics.
 - a. 97% material passing No.4 sieve.
 - b. 20% material passing No.100 sieve.
 - c. 5% material passing No. 200 sieve.
 - 3. Sacks: Provide sacks of uniform size made of jute, cotton, or scrim reinforced paper capable of holding the sand cement mixture without leakage. Sacks shall provide a finished unit approximately 12x18x6 inches in measurement. Material shall be permeable and absorptive enough to permit passage of water to provide for hydration of cement. Materials shall be biodegradable and contain no asphalt, oil, or plastic lamination.
- C. Rubble:
 - 1. Provide clean, hard, durable rubble free of pollutants consisting of broken stone, concrete, or masonry. Material shall be free of reinforcing wire or steel rebar.
 - 2. Material shall have a minimum nominal dimension of 3 inches for any given piece of rubble.
- D. Fiber Rolls:
 - 1. Tube shaped rolls of straw, flax, rice, coconut fiber, or compost.
 - 2. Rolls shall be wrapped with UV degradable polypropylene netting or biodegradable netting.

- E. Silt Fence: Florida Department of Transportation Type III silt fence meeting all requirements of FDOT Index 103 of the 2010 version of the Standard Indices.
- F. Seed for Temporary Erosion Control:
 - 1. Winter Months (October to March): Annual Rye Grass.
 - 2. Summer Months (April to September): Millet Grass.
- G. Water: Clean and potable.

PART 3 - EXECUTION

3.01 PERFORMANCE:

- A. General:
 - 1. Provide and maintain temporary erosion and sedimentation control measures from time site is disturbed to time permanent controls, paving, landscaping, and site restoration measures are able to perform erosion and sedimentation control functions.
 - 2. Clean-out, repair, and maintain control structures as necessary to enable them to perform properly.
 - 3. Prevent pollution of streams, water impoundments, and channels leading to them with chemicals, fuels, lubricants, bitumens, raw sewage, and other harmful waste.
- B. Sediment Barriers/Silt Fence:
 - 1. Place fence as shown on Drawings and as necessary to maintain regulatory compliance with Contractor's Pollution Prevention Plan.
 - 2. At a minimum, Silt Fence shall be installed along all downstream project property lines and between any construction activity and all waterways, water bodies, sewer inlets and wetlands.
- C. Fiber Rolls: Place rolls as shown on Drawings and as necessary to maintain regulatory compliance with Contractor's Pollution Prevention Plan.
- D. Seed or Sod:
 - 1. All areas disturbed by construction, and to remain unpaved or outside the building envelope, shall be stabilized by permanent seed and

mulch or sod, as described elsewhere in the Contract Documents. Refer to Section 02921 for permanent grassing requirements.

- 2. Areas that will be regraded or otherwise disturbed later during construction may be seeded with a temporary seed mix to obtain temporary erosion control.
- E. Sand-Cement Bag Rip Rap:
 - 1. Proportion sand and cement in the ratio of 5 cubic feet of sand to 94 lbs of cement.
 - 2. Fill sacks to uniform size. Keep at least 6 inches of the sacks unfilled to allow for tying and closure.
 - 3. Place sacks as shown on the Drawings. Place sacks in a running bond type pattern. Align sacks/bags so that continuous joints are perpendicular to the primary flow and staggered joints are parallel to the primary flow.
 - 4. Stake alternating bags in place with an 18" length of #3 rebar centered in bag. Set top of bar 1" below surface of bag.
 - 5. After placement saturate bags with water.
- F. Rubble:
 - 1. Place rubble as required by Drawings or Specifications.
 - 2. Dump rubble in place so as to provide a minimum depth of 18 inches.
 - 3. Ensure that rubble does not segregate so that smaller pieces evenly fill the voids between the larger pieces.

3.02 REGULATORY REQUIREMENTS:

- A. Florida Department of Environmental Protection (FDEP) NPDES Program.
 - 1. Contractor shall notify Florida Department of Environmental Protection of proposed construction and file Notice of Intent (NOI) to use Generic Permit for Stormwater Discharge from Large and Small Construction Activities with Florida Department of Environmental Protection.

- 2. Contractor shall be responsible for application fee and preparation of all attachments. Attachments shall include a Pollution Prevention Plan.
 - a. The minimum requirements for pollution prevention are described on the Contract Drawings and in these Specifications.
 - b. The Contractor may use the pollution controls presented in these documents as the basis for his Pollution Prevention Plan.
 - c. The Contractor shall supplement the Contract Drawings and Specifications as necessary to satisfy the Contractor's permit application and the Contractor's means and methods of construction.
- 3. It shall be the Contractor's responsibility to familiarize himself with the permit conditions and maintain the site in a condition that will be compliant with the permit.
- 4. Any testing or other requirements required by the governing agency to remain compliant or in response to a non-compliance event shall be the financial and material burden of the Contractor.
- 5. Contractor shall notify FDEP of conclusion of project and submit a notice of termination (NOT) coverage.

3.03 DUST CONTROL:

- A. Contractor shall make every effort to limit the transport of windborne dust and particulates from the disturbed site.
- B. Soil erosion due to wind shall be controlled with the application of water to dampen soil.

3.04 REPAIR AND RESTORATION:

- A. If any seed is washed out before germination, repair damage, refertilize and reseed.
- B. Maintain silt fence in a functional condition. Repair any damage immediately. Implement a routine maintenance schedule for all erosion schedule. All erosion control features shall be inspected immediately following all storm events.

3.05 CLEANING:

- A. Remove temporary controls and accumulated sediments when permanent facilities are able to perform function and when approved by Engineer.
- B. Remove accumulations of silt and other erosion products from all permanent facilities.

PIPE WORK - GRAVITY SEWERS

PART 1 - GENERAL

- **1.01 DESCRIPTION:** Work under this Section consists of furnishing all materials, supplies, equipment and labor in accordance with the requirements set forth herein and as shown on the Drawings.
- **1.02 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS:** The work under this Contract shall be in strict accordance with the following codes and standards.
 - A. All Local, County, Municipal and Federal Codes.
 - B. American National Standards Institute (ANSI).
 - C. American Society for Testing and Materials (ASTM).
 - D. American Water Works Association (AWWA).
 - E. American Association of State Highway and Transportation Officials (AASHTO).
 - F. Florida Department of Transportation Standard Specifications for Road & Bridge Construction (DOT).
 - G. Recommended Standards for Wastewater Facilities, (10-States Standards).
 - H. Florida Department of Environmental Protection (FDEP).

1.03 QUALITY ASSURANCE STANDARDS:

- A. American National Standards Institute, Inc. (ANSI)/American Water Works Association (AWWA):
 - 1. ANSI/AWWA C105, Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
 - 2. ANSI/AWWA C110, Ductile-Iron and Gray-Iron Fittings, 3 In. through 48 In., for Water and Other Liquids.
 - 3. ANSI/AWWA C111, Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

- 4. ANSI/AWWA C115, Flanged Ductile-Iron Pipe with Threaded Flanges.
- 5. ANSI/AWWA C150, Thickness Design of Ductile-Iron Pipe.
- 6. ANSI/AWWA C151, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
- 7. ANSI/AWWA C153, Ductile Iron Compact Fittings, 3-inch through 16 inch, for water and other liquids.
- 8. AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.
- 9. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C828, Standard Practice for Low-Pressure Air Test of Vitrified Clay Pipe Lines.
 - 2. ASTM D2321, Standard Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
 - 3. ASTM D2412, Standard Practice for external loading properties of plastic pipe by parallel plate loading.
 - 4. ASTM D2444, Standard Test Method for determination of the impact resistance of thermoplastic pipe and fittings by means of a TUP (falling weight).
 - 5. ASTM D3034, Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 6. ASTM D3212, Joints for Drain and Sewer Pipes using Flexible Elastomeric Seals.
 - 7. ASTM F477, Standard Specification for Elastomeric seals (gaskets) for joining plastic pipe.
 - 8. ASTM F679, Standard Specification for Poly (Vinyl Chloride) (PVC) large diameter plastic gravity sewer pipe and fittings.
- C. Manufacturer's name and model numbers are listed to establish a standard of quality. Equivalent items of other manufacturers are acceptable.

1.04 SUBMITTALS:

- A. Submit manufacturer's certification of materials' conformance to specifications.
- B. Submit manufacturer's literature, catalog data and installation instructions.
- C. Submit certified field pressure test reports.
- D. Submit pipeline video testing results.
- E. Submit as-built drawings of completed system.

1.05 PRODUCT DELIVERY AND HANDLING:

- A. Exercise care to prevent damage of product during loading, transporting, unloading and storage.
- B. Do NOT drop pipe or fittings.
- C. Do not store directly on ground and assure that materials are kept clean. Pipe shall be kept bundled and strapped until it is ready for installation in order to prevent warping or disfiguring.
- D. Store material in areas approved by the Owner.
- E. Store material in such a manner as to not create a nuisance or safety hazard.

PART 2 - PRODUCTS

See JEA's Water and Wastewater Standards, Specification Section 428.II.

PART 3 - EXECUTION

See JEA's Water and Wastewater Standards Specification Sections 428.III, 428.IV, and 428.V.

PRECAST CONCRETE MANHOLES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: The work under this section shall include the furnishing of all labor, materials and equipment necessary for the construction and installation of all manholes, splitter boxes, etc. as called for on the Drawings. All precast units shall be completely lined in accordance with JEA requirements.

PART 2 - PRODUCTS

See JEA's Water and Wastewater Standards, Specification Section 427.II.2 and II.3.

All precast structures as part of this project shall receive a JEA Approved protective lining in accordance with JEA's Specification Section 446.

PART 3 - EXECUTION

See JEA's Water and Wastewater Standards, Specification Sections 427.III.1, III.3, III.5, IV, and V.

UNDERGROUND FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION: Work under this Section consists of furnishing all tools, equipment, and labor as described herein.

1.02 SUBMITTALS:

- A. Submit sketches of all conflicts and proposed resolution of conflicts.
- B. Record Drawings shall depict all Underground Facilities encountered in the work.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Location of Underground Facilities:
 - 1. Underground Facilities are underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any other encasements containing such facilities, including those which convey electricity, gases, compressed air, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
 - 2. Prior to excavation, the Contractor shall conduct an investigation into the location of all Underground Facilities. The objective of this investigation is to determine the locations of Underground Facilities in advance of actual construction in order to resolve ahead of time conflicts with the proposed work. Underground Facilities that are shown or indicated are based on limited information. The locations shown or indicated are only approximate and it is probable that there are Underground Facilities that are not shown or indicated.

- 3. The Contractor shall, by means of standard geophysical prospecting techniques, designate (to indicate by marking) the presence and approximate depths of Underground Facilities along the routes of proposed construction. All Underground Facilities within five (5) feet of the proposed work shall be designated.
- 4. The Contractor shall locate Underground Facilities to obtain accurate horizontal and vertical positions and may utilize any methods or procedures he deems appropriate for locating, but not damaging, the Underground Facilities. These methods may include, but not be limited to, careful hand excavation, pot-holing, and the use of ground penetrating radar (GPR). All Underground Facilities shall be located, both those shown or indicated and those that are not shown or indicated. The Contractor shall have full responsibility for the safety and protection of all Underground Facilities and repairing any damage thereto resulting from the work.
- 5. If an Underground Facility is uncovered or revealed which constitutes an unforeseen obstruction, the Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any work in connection therewith, give notice to the Engineer. The Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is needed in the Contract to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: The extent of asphaltic concrete paving work is shown on the Drawings.

1.02 SUBMITTALS:

- A. Material Certificates: Provide copies of material certificates including design mixes, signed by the Contractor, certifying that each specified material complies with, or exceeds requirements.
- B. Copies of all compliance testing, certifications and retests.
- C. Comply with Section 01300, Submittals.

1.03 JOB CONDITIONS:

- A. Weather Limitations: Apply prime and tack coats only when ambient temperature is above 50 degrees F and when temperature has not been below 35 degrees F for 12 hours immediately prior to application. Do not apply when base contains an excess of moisture.
- B. Construct asphalt concrete surface only when atmospheric temperature is above 50 degrees F and when base is dry. Base course may be placed when air temperature is above 30 degrees F and rising.
- C. Do not lay base or asphalt when free surface water is present on the material below.

1.04 RELATED SECTIONS:

A. Section 02745, Rework Existing Pavement

1.05 REFERENCES:

- A. American Society For Testing And Materials (ASTM), latest edition:
 - 1. ASTM C131, 'Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.'
 - 2. ASTM D977, 'Standard Specification for Emulsified Asphalt.'

- 3. ASTM D1075, 'Standard Test Method for the Effect of Water on Compressive Strength of Compacted Bituminous Mixtures.'
- 4. ASTM D1188, 'Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens.'
- 5. ASTM D1559, 'Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.'
- 6. ASTM D2027, 'Standard Specification for Cutback Asphalt (Medium-Curing Type).'
- 7. ASTM D2041, 'Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.'
- 8. ASTM D2397, 'Standard Specification for Cationic-Emulsified Asphalt.'
- 9. ASTM D2939, 'Standard Test Methods for Emulsified Bitumens Used as protective Coatings'
- 10. ASTM D2726, 'Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens.'
- 11. ASTM D3381, 'Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.'
- 12. ASTM D5167 Practice for Melting of Hot-Applied Joint and Crack Sealant and Filler for Evaluation.
- 13. ASTM D5329, 'Standard Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements.'
- 14. ASTM D6690, 'Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.'
- B. American Association of Safety, Highway and Traffic Officials (AASHTO)
 - 1. AASHTO M 173 Standard Specification for Concrete Joint-Sealer, Hot-Poured Elastic Type.
- C. Florida Department of Transportation (FDOT), latest edition:
 - 1. FDOT 'Standard Specifications for Road and Bridge Construction.'
 - 2. FM 5 515 'Florida Method of Test for Limerock Bearing Ratio.'

PART 2 - PRODUCTS

2.01 MATERIAL:

 A. Asphaltic Concrete Pavement: Asphalt pavement shall be Type SP, Fine, Traffic Level C. However, the wear course shall be Type SP-12.5 only. Materials shall conform to the following: Section 334, Superpave Asphalt Concrete; Section 901, Coarse Aggregate; Section 902, Fine Aggregate;
Section 916, Bituminous Material; and Section 917, Mineral Filler of the FDOT Standard Specifications for Road and Bridge Construction (latest edition).

- 1. Use of RAP (Recycled Asphalt Pavement) shall be limited to a maximum of 15% of mix by weight of total aggregate.
- 2. If used, provide RAP with a minimum average asphalt content of 4.0% by weight.
- 3. If used, RAP must be from a traceable source.
- 4. RAP shall use a PG 58-22 binder.
- B. Priming: Prime coat shall be emulsified asphalt of a grade applicable to the base used meeting the requirements of Section 916, Bituminous Material of the FDOT Standard Specifications. Cover material for prime coat shall be hot asphalt coated sand meeting the requirements of Section 902, Fine Aggregate of the FDOT Standard Specifications.
- C. Tack Coat: Use RA-500 material meeting the requirements of section 916-2 of FDOT Standard Specifications.
- D. Crushed Concrete Base Material shall be as specified in Section 911, Base and Stabilized Base, of the Standard FDOT Specifications. Material shall be FDOT approved.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Survey and stake surfaces to show grading required by Contract Documents. Use a Florida Registered Professional Land Surveyor to provide all horizontal and vertical layout.
- B. Reworked Pavement: See Section 02745 for requirements of those roadways designated for "reworking". After existing pavement section is "reworked", it may be paved upon approval of the Owner.
- C. Asphaltic Concrete Pavement: Thickness and Type shall be as shown on the Drawings and shall be constructed as specified in Section 320, Hot Bituminous Mixtures-Plant, Methods, and Equipment; Section 330, Hot Bituminous Mixtures-Quality Assurance, General Construction Requirements and Acceptance Procedures; and Section 334, Superpave Asphaltic

Concrete of the FDOT Standard Specifications for Road and Bridge Construction (latest edition).

- 1. Wear course shall be Type SP-12.5, (Fine) only.
- 2. Surface shall be uniform and free of birdbaths.
- 3. Surface variations in wear surface shall not exceed 1/4" when measured with a 12' straight edge.
- 4. Spreading:
 - a. Spread material in a manner that requires the least handling.
 - b. Where thickness of finished paving will be 3" or less, spread in one layer.
- 5. Rolling:
 - a. After the material has been spread to the proper depth, roll until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown on the Drawings.
 - b. Roll in at least two directions until no roller marks are visible.
- 6. Temperature: Asphalt mix shall be between 240 degrees Fahrenheit and 360 degrees Fahrenheit at time of placement.
- D. Priming: All base material shall be primed. Prime coat shall be applied in accordance with Section 300, Prime and Tack Coats For Base Courses of the FDOT Standard Specifications. Cover material for prime coat shall be applied with approved distributor.
- E. Tack Coat: All base and any concrete surfaces that will be in contact with the asphalt course shall receive a tack coat. Tack coat shall be applied in accordance with Section 300 Prime and Tack Coats For Base Courses of the FDOT Standard Specifications.
- F. Paving shall not proceed if subgrade and base are too wet or too dry. Subgrade and Base materials shall be within their respective acceptable range of optimum moisture content. Under no circumstances shall pavement be installed if standing water is present on the base material or during a rain event.

3.02 FIELD QUALITY CONTROL:

A. All work shall meet the requirements of the FDOT.

B. Surface of completed work shall not contain irregularities greater than 1/4" when checked with a 12 foot straight edge.

3.03 TESTING:

- A. Reworked subgrade material tests shall be made as follows:
 - 1. Determine optimum moisture/density relationship of stabilized subgrade material in accordance with ASTM D1557. Verify moisture content of in-place material (ASTM D2216) is within 4% ± of optimum.
 - 2. Perform in-place density tests (ASTM D1557) in the compacted stabilized subgrade material at the rate of one test for every 5,000 SF or fraction thereof. Recompact areas which fail to meet compaction requirements, then retest until passing results are obtained. Reference test locations to easily identified points on Site Plan.
 - 3. Contractor shall perform bearing value tests on samples of in-place material by the Limerock Bearing Ratio (LBR) Method. One (1) test shall be performed for each 10,000 SF, or fraction thereof. For areas failing to meet the minimum LBR, additional stabilizing material shall be spread, mixed and retested until satisfactory results are obtained.
- B. Asphalt tests shall be made as follows:
 - 1. At the start of paving operations, obtain one sample each of binder (if specified) and wearing surface asphalt delivered to the job. Conduct extraction and gradation analysis, Marshall Stability, and laboratory-compacted bulk specific gravity for each sample.
 - 2. Upon completion of paving, obtain at least two 4-inch diameter cores through the asphalt paving for all areas up to 10,000 sq. feet and one additional core for each additional 10,000 sq. feet or fraction thereof. Grout core holes with non-shrink grout after core removal. Reference test locations to easily identified points on the Site Plan.
 - 3. Measure each asphalt core for thickness and test for bulk specific gravity. Compute the compaction percentage of each core, using the bulk specific gravity of the laboratory compacted specimen as the compaction standard.
 - 4. Asphalt thickness shall not be more than 1/4" thinner than the specified thickness.
- C. Copies of all testing shall be provided to the Owner and Engineer directly from the testing laboratory.

- D. All testing, retesting and remedial work shall be at the Contractor's expense.
- E. Failing results for any of the testing above shall be cause for rejection of all or part of the work performed. Contractor shall reconstruct deficient work at no additional cost to the Owner.

3.04 CLEAN-UP:

- A. Contractor shall remove excess and waste material and properly dispose of off-site.
- B. Subsequent to Substantial Completion, the Contractor shall perform a final sweeping of all newly paved areas and existing pavement immediately adjacent to the work area as necessary to provide a clean and neat appearance.

END OF SECTION

SECTION 02745

REWORK EXISTING PAVEMENT

PART 1 - GENERAL

1.01 DESCRIPTION: Reworking existing asphalt pavement shall consist of pulverizing and mixing existing asphalt pavement and base course material to produce a dense, hard, base. It shall be mixed, placed, and compacted in accordance with this specification, and shall conform to the lines, grades, thicknesses, and typical section shown in the Drawings. The intended mixing depth is 10".

1.02 SUBMITTALS:

- A. Material Certificates: Provide copies of material certificates including design mixes, signed by the Contractor, certifying that each specified material complies with, or exceeds requirements.
- B. Copies of all compliance testing and retests.
- C. Comply with Section 01300, Submittals.

1.03 REFERENCES:

- A. American Society For Testing And Materials (ASTM), latest edition:
- B. Florida Department of Transportation (FDOT), latest edition:
 - 1. FDOT 'Standard Specifications for Road and Bridge Construction.'
 - 2. FM 5 515 'Florida Method of Test for Limerock Bearing Ratio.'
- C. Section 02740, Asphaltic Concrete Paving.
- D. Existing pavement cores attached at end of this Section.

PART 2 - PRODUCTS

2.01 RECYCLED ASPHALT PAVEMENT (RAP) AND BASE MATERIAL:

A. Shall consist of the existing asphalt pavement, existing base course material and/or subgrade material to a minimum depth of four inches below existing grade.

B. The existing side grading shall be modified during the reworking process. See Drawings for design intent.

PART 3 - EXECUTION

3.01 EQUIPMENT:

- A. Reworking asphalt pavement may be constructed with any machine or combination of machines or equipment that will produce a satisfactory product meeting the requirements for pulverization, mixing, compacting, and finishing as provided in this specification. Generally, equipment shall consist of the following:
 - 1. Asphalt Reclamation Machine.
 - 2. Motor Grader.
 - 3. Rubber Tire Roller.
 - 4. Drum Roller.
 - 5. Water Truck.
 - 6. Front End Loader, if portable reclaimer used.
- **3.02 MIXING METHODS:** Mixing shall be accomplished in place, using single-shaft or multiple-shaft mixers. Agricultural disks or motor graders are not acceptable mixing equipment.
- **3.03 COMPACTION:** The processed material shall be compacted with one or a combination of the following:
 - A. Tamping or grid roller, pneumatic-tire roller, steel-wheel roller, vibratory roller, or vibrating-plate compactor.
 - B. The full depth recycled material shall be rolled with a vibratory pad/tamping foot roller and a vibratory steel drum soil compactor.
 - C. The pad/tamping foot roller drum shall have a minimum of 112 tamping feet 3 inches in height, a minimum contact area per foot of 17 inches², and a minimum width of 84 inches.
 - D. The vibratory steel drum roller shall have a minimum 84 inches width single drum.
- **3.04 PREPARATION:** Prior to the start of the reclamation, all utilities and drainage systems shall be relocated as necessary.
 - A. Methods, equipment, tools, and any machinery to be used during construction shall be approved by the Engineer prior to the start of the project. Prior to the actual reclaiming of the roadway, drop inlets or catch

basins that might be affected shall be sufficiently barricaded to prevent reclaimed subbase material, silt or runoff from plugging the drainage system.

- B. Sufficient surface drainage must be provided for each stage of construction so that ponding does not occur on the reclaimed sub-base course prior to the placement of bituminous concrete.
- C. Reclamation shall be accomplished by means of a self-propelled, traveling rotary reclaimer or equivalent machine capable of cutting through existing bituminous concrete pavement to depths of up to 15 inches with one pass. The machine shall be equipped with an adjustable grading blade leaving its path generally smooth for initial compaction. Equipment such as road planers or cold milling machines designed to mill or shred the existing bituminous concrete, rather than crush or fracture it, shall not be allowed.
- D. Existing bituminous concrete pavement and any underlying granular material must be pulverized and mixed so as to form a homogenous mass of reclaimed sub-base material which will bond together when compacted.
- E. In areas where the vertical or horizontal geometry of the proposed roadway is different than that of the existing, the roadway shall be reclaimed in-place and the reclaimed material sub-base placed in windrows or stockpiled while any filling or excavation is performed. When the proposed sub-grade elevation is achieved, the reclaimed sub-base material will be placed back onto the roadway in lifts no greater than five (5) inches in depth before being compacted.
- F. The reclaimed sub-base material shall be compacted to the requirements above prior to the placement of traffic on the roadway.
- G. A motor grader shall be used for shaping, fine grading, and finishing the surface of the reclaimed material or any other granular materials placed to form the surface prior to paving.
- H. Any surface irregularities which develop during or after the above described work shall be corrected until it is brought to a firm and uniform surface satisfactory to the Engineer.

3.05 MIXING AND PLACING:

A. Reworking procedures shall not commence when the soil aggregate or sub-grade is frozen, or when the air temperature is below 40°F (4°C). Moisture in the base course material shall not exceed the quantity that will permit a uniform and intimate mixture of the pulverized asphalt and base material during mixing operations, and shall be within 2% of the optimum moisture content for the processed material at start of compaction.

- B. The operation of mixing, spreading, compacting, and finishing shall be continuous and completed within 2 hours from the start of mixing. Any processed material that has not been compacted and finished shall not be left undisturbed for longer than 30 minutes.
- **3.06 SCARIFYING:** Initial pulverization or scarification may be required to the full depth of mixing. Scarification or pre-pulverization is a requirement for the following conditions:
 - A. When the processed material is more than 3% above or below optimum moisture content. When the material is below optimum moisture content, water shall be added. The pre-pulverized material shall be sealed and properly drained at the end of the day or if rain is expected.
- **3.07 MIXING:** Mixing shall continue until a uniform mixture is produced. Mixing shall be continued until the product is uniform in color. The entire operation of water application and mixing shall result in a uniform pulverized asphalt, soil, limerock base and water mixture for the full design depth and width.

3.08 COMPACTION:

- A. The processed material shall be uniformly compacted to a minimum of 98% of maximum density based on a moving average of five consecutive tests with no individual test below 96%. Field density of compacted material can be determined by nuclear method in the direct transmission mode (ASTM D2922, AASHTO T 310), sand cone method (ASTM D1556, AASHTO T 191), or rubber balloon method (ASTM D2167). Optimum moisture and maximum density shall be determined prior to start of construction and also in the field during construction by a moisture-density test (ASTM D558 or AASHTO T 134).
- B. At the start of compaction, the moisture content shall be within 2% of the specified optimum moisture. No section shall be left undisturbed for longer than 30 minutes during compaction operations. All compaction operations shall be completed within 2 hours from start of mixing.

3.09 FINISHING:

A. As compaction nears completion, the surface of the material shall be shaped to the specified lines, grades, and cross sections. If necessary or as required by the Owner, the surface shall be lightly scarified or broom-dragged to remove imprints left by equipment or to prevent compaction planes. Compaction shall then be continued until uniform and adequate density is obtained.

- B. During the finishing process the surface shall be kept moist by means of water spray devices that will not erode the surface. Compaction and finishing shall be done in such a manner as to produce a dense surface free of compaction planes, cracks, ridges, or loose material. All finishing operations shall be completed within 4 hours from start of mixing.
- **3.10 TRAFFIC**: Completed portions of the base can be opened immediately to low-speed local traffic and to construction equipment, provided the base is sufficiently stable to withstand marring or permanent deformation. The section can be opened up to all traffic after the base has received a subsequent surface and is sufficiently stable to withstand marring or permanent deformation. If continuous moist curing is employed in lieu of a curing compound or subsequent surfacing within 7 days, the base can be opened to all traffic after the 7-day moist curing period, provided the base has hardened sufficiently to prevent marring or permanent deformation.
- **3.11 SURFACING:** Subsequent asphalt pavement layers can be placed any time after finishing, as long as the reclaimed base is sufficiently stable to support the required construction equipment without marring or permanent distortion of the surface. See Section 02740 for asphaltic pavement requirements.

3.12 MAINTENANCE:

- A. The contractor shall maintain the roadway in good condition until all work is completed and accepted. Such maintenance shall be done by the contractor at his own expense.
- B. Maintenance shall include immediate repairs of any defects that may occur. If it is necessary to replace any processed material, the replacement shall be for the full depth with vertical cuts. No skin patches will be permitted.

3.13 INSPECTION AND TESTING:

- A. The contractor shall make such inspections and tests as deemed necessary to ensure the conformance of the work to the contract documents. These inspections and tests may include, but shall not be limited to:
 - 1. Recycling operations including recycling speed, yield monitoring, monitoring treatment depth, procedures for avoiding recycling and curing in inclement weather, methods to ensure that segregation is minimized, procedures for mix design modification, grading and compacting operations, and cement application procedure.
 - 2. Density testing of the recycled material will be performed using the nuclear method.
- B. Only those materials, machines, and methods meeting the requirements of the contract documents shall be used unless otherwise approved by the Engineer.

C. All testing of processed material or its individual components, unless otherwise provided specifically in the contract documents, shall be in accordance with the latest applicable ASTM or AASHTO specifications in effect as of the date of advertisement for bids on the project.

END OF SECTION



LOCATIONS: Atlanta Daytona Beach Fort Myers Fort Pierce Gainesville Jacksonville

- Miami
- Ocala
- Orlando (Headquarters)
- Palm Coast
- Panama City
- PensacolaRockledge
- Rockledg
 Sarasota
- St. Petersburg
- Tampa

September 13, 2019

- Tifton
- West Palm Beach

Mittauer & Associates, Inc. 580 Wells Road Orange Park, Florida 32073

Attention: Mr. Jason Shepler

Reference: **REPORT OF EXPLORATORY BORINGS** JEA Holiday Road Pump Station (0801-40-2) Jacksonville, Florida UES Project No. 0930.1900175.0000 and Report No. 17090204

Dear Mr. Shepler:

Universal Engineering Sciences, Inc. has completed a subsurface exploration at the subject site located in Jacksonville, Florida. This report contains the results of our exploration.

PURPOSE

The purpose of this exploration was to to determine depths of asphalt, base, and subgrade the the site. This report presents the soil conditions encountered on the basis of traditional geotechnical procedures for site characterization. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. Universal Engineering Sciences would be pleased to perform these services if you desire.

Our exploration was confined to the zone of soil within the upper 2 to 4 feet below the ground surface. Our work did not address the potential for surface expression of deep geological conditions. This evaluation requires a more extensive range of field services than performed in this study. We will be pleased to conduct an exploration to evaluate the probable effect of the regional geology upon the proposed construction if you desire.

FIELD EXPLORATION

To explore the subsurface conditions at the site, we located and drilled three (3) auger borings to depths of 2 feet below the existing ground surface in general accordance with the methodology outlined in ASTM D 1586. A summary of the field procedures are included in Appendix A. Representative soil samples recovered from the borings were returned to our laboratory for further evaluation.

LABORATORY TESTING

Representative soil samples obtained during our field exploration were returned to our office and reviewed by a geotechnical engineer. The samples were visually classified in general accordance with ASTM D 2488 (Unified Soil Classification System).

Two (2) fines content tests and two (2) moisture content tests were conducted in the laboratory on representative soil samples obtained from the borings. These tests were performed to aid in classifying the soils and to help quantify and correlate engineering properties. The results of these tests are presented on the Boring Logs in Appendix A. A brief description of the laboratory procedures used is also provided in Appendix A.

GENERAL SUBSURFACE CONDITIONS

The boring locations and detailed subsurface conditions are illustrated in Appendix A: Boring Location Plan and Boring Logs. It should be noted that soil conditions will vary away from the boring locations. The classifications and descriptions shown on the logs are based upon visual characterizations of the recovered soil samples. Also, see Appendix A: Key to Boring Logs, for further explanation of the symbols and placement of data on the Boring Logs. The following tables summarize the soil conditions encountered.

		TABLE 1 General Soil Profile (B1-B3)
Typical of	lepth (ft)	Soil Descriptions
From	То	Son Descriptions
0	0.1	Asphalt (1-1/4 to 1-5/8")
0.1	0.4 to 0.5	Limerock (4 to 5-3/4")
0.4 to 0.5	1.5 to 3	Fine sand (SP) and fine sand with clay to clayey fine sand (SP-SC/SC) with some to trace limerock
1.5 to 3	4*	Fine sand (SP) and fine sand with clay (SP-SC)
* Terminatio	n Depth of D	eepest Boring
() Indicates I	Unified Soil	Classification

There is a table at the end of the report showing the asphalt, base, and subgrade types and thicknesses.

The groundwater levels were not encountered in the upper 2 feet below the existing ground surface. Fluctuations in groundwater levels should be anticipated throughout the year, primarily due to seasonal variations in rainfall, surface runoff, construction activity, and other site specific factors that may vary from the time the borings were conducted. The rainy season in Northeast Florida is normally between June and September.

LIMITATIONS

During the early stages of most construction projects, geotechnical issues not addressed in this report may arise. Because of the natural limitations inherent in working with the subsurface, it is not possible for a geotechnical engineer to predict and address all possible problems. A Geotechnical Business Council (GBC) publication, "Important Information About This Geotechnical Engineering Report" appears in Appendix B, and will help explain the nature of geotechnical issues.

We trust this report meets your needs and addresses the geotechnical issues associated with the proposed construction. We appreciate the opportunity to have worked with you on this project and look forward to a continued association. Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Respectfully submitted,

UNIVERSAL ENGINEERING SCIENCES, INC.

Stephen R. Weaver, P.E. Geotechnical Services Manager FL P.E. Number 37389 Date: Secono antill

THE !!

Staff Geotechnical Engineer



	JEA	Pump Station Holiday	Road (0801-40-2) Pavement Conditions
		093	0.1900175.0000
Auger #	Aspahlt Thickness (in)	Base Type/Thickness	Subgrade Type/Thickness
			Clayey fine sand and Fine sand with clay and trace
1	1-5/8	Limerock/5"	limerock(SP-SC/SC)/2'
2	1-1/2	Limerock/4"	Fine sand and limerock mix (SP)/1'
3	1-1/4	Limerock/5-3/4"	Fine sand with clay and limerock mix (SP-SC)/1.5'

APPENDIX A

BORING LOCATION PLAN BORING LOGS KEY TO BORING LOGS FIELD EXPLORATION PROCEDURES LAB TESTING PROCEDURES



		BURING LUCATION	PLAN	
DR	AWN BY: TW	DATE: 9/13/19	CHECKED BY: JF	DATE: 9/13/19
SC	ALE: 1"=150'	PROJECT NO: 0930.1900175.0000	REPORT NO: 1709204	PAGE NO: A-1

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UNIVERSAL ENGINEERING SCIENCES **BORING LOG**

PROJECT NO :	0930 1900175 0000	
REPORT NO		
PAGE:	A-1	

PROJECT:	GEOTECHNICAL EXPLORATION
	JEA HOLIDAY ROAD PUMP STATION
	JACKSONVILLE, FLORIDA
CLIENT:	MITTAUER & ASSOCIATES, INC

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION:	A-1
SECTION:	TOWNSHIP:

SHEET:	1	of	1
RANGE:			

G.S. ELEVATION (ft)	
WATER TABLE (ft):	NE
DATE OF READING:	9/3/19
EST W S W T (ft):	

DATE STARTED: 9/3/19 DATE FINISHED: 9/3/19 DRILLED BY: DB/DH

TYPE OF SAMPLING: ASTM D 1452

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	0 —						ASPHALT (1 5/8") LIMEROCK (5")	-					
							Reddish-brown Clayey fine SAND with trace Limerock (SC)						
IRING LOG 0930 1900175.0000-JEA HOLIDAY ROAD PUMP STATION GPJ UNIENGSC GDT 9/13/19							Light brown fine SAND with Clay and trace Limerock (SP-SC)	10.8	8.5				

	UNIVERSAL	. ENGINEERING SCIENCE BORING LOG	S	PR		NO : O	0930.19001	75 0000
PROJECT:	GEOTECHNICAL EXPLORATION JEA HOLIDAY ROAD PUMP STATION JACKSONVILLE, FLORIDA	BORING DESIGN/ SECTION:	ATION: TO\	A-2 WNSHIP:	GE:	SHE RAN	ET: 1 (GE:	of 1
CLIENT:	MITTAUER & ASSOCIATES, INC	G.S. ELEVATION	(ft):	DA	TE STAF		9/3/19 9/3/19	1
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DEPTH (FT) E	BLOWS PER 6" INCREMENT	DESCRIPTION	-200 (%)	MC (%)	ATTER LIM	RBERG IITS PI	K (FT / DAY)	ORG CONT. (%)

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					LIMEROCK (4")	_					
						-1					
					Light brown fine SAND with Limerock (SP)						
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CLIENT:	MITTAUER & ASSOCIA	TES, IN	Deer		G S ELEVATION (ft):	DA	ATE STARTED:	9/3/19	
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REMARKS:					DATE OF READING	: 9/3/19	DF	RILLED BY:	DB/DH	ł
					EST_WSWT_(ft):		ΤY	PE OF SAMPLING	G ASTM	D 1452
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	(FT ,)	P INCREMEN	T FT		B	DESCRIPTION	(%)	(%)	 -	DAY)	(%)
-	-	Ĕ	-	-	Ĺ		-	-	PI		
	0 —					ASPHALT (1 1/4") LIMEROCK (5 3/4")					
	-					Light brown fine SAND with Clay and Limerock (SP-SC)					
GPJ UNIENGSC GDT 9/13/19	-					Light brown to light gray fine SAND with Clay (SP-SC)					
75 0000-JEA HOLIDAY ROAD PUMP STATION											
BORING LOG 0930.190017							8 5	6.9			



SYMBOLS AND ARREVIATIONS

KEY TO BORING LOGS

SYMBOL	DESCRIPTION
N-Value	No. of Blows of a 140-lb. Weight Falling 30 Inches Required to Drive Standard Spoon 1Foo
WOR	Weight of Drill Rods
WOH	Weight of Drill Rods and Hammer
	Sample From Auger Cuttings
Ø	Standard Penetration Test Sample
	Thin-wall Shelby Tube Sample (Undisturbed Sampler Used)
% REC	Percent Core Recovery from Rock Core Drilling
RQD	Rock Quality Designation
	Stabilized Groundwater Level
∇	Wet Season High Groundwater Level
NE	Not Encountered
вт	Boring Terminated
-200	Fines Content or % Passing No. 200 Sieve
МС	Moisture Content
LL	Liquid Limit
PI	Plasticity Index
к	Coefficient of Permeability
Org. Cont.	Organic Content

RELATIVE DENSITY (Sands and Gravels)

Very Loose - 0 to 4 Blows / Foot Loose - 5 to 10 Blows / Foot Medium Dense - 11 to 30 Blows / Foot Dense - 31 to 50 Blows / Foot Very Dense - More than 50 Blows / Foot

CONSISTENCY (Silts and Clays)

Very Soft - 0 to2 Blows / Foot Soft - 3 to 4 Blows / Foot Firm - 5 to 8 Blows / Foot Stiff - 9 to 15 Blows / Foot Very Stiff - 16 to 30 Blows / Foot Hard - More than 30 Blows / Foot

RELATIVE HARDNESS

(Limestone) Soft - 100 Blows for more than 2" Hard - 100 Blows for less than 2"

MA	JOR DIVIS	IONS	GROUP SYMBOLS	TYPICAL NAMES
00 sieve *	GRAVELS		GW	Well-graded gravels and gravel- sand mixtures, little or no fines
	50% or more of	GRAVELS	GP	Poorly graded gravels and gravel sand mixtures, little or no fines
SOILS No. 2	fraction retained on	GRAVELS	GM	Silty gravels and gravel-sand-silt mixtures
On the	No. 4 sieve	FINES	GC	Clayey gravels and gravel-sand- clay mixtures
E-GRA		CLEAN SANDS	SW**	Well-graded sands and gravely sands, little or no fines
SO% rel	SANDS More than 50% of coarse fraction passes No. 4 sieve	5% or less passing No. 200 sieve	SP**	Poorty graded sands and gravelly sands, little or no fines
e than		SANDS with 12% or	SM**	Silty sends, send-silt mixtures
Mor		passing No. 200 sieve	SC**	Clayey sands, sand-clay mixtures
	011 70 44		ML	inorganic silts, very fine sands, rock flour, silty or clayey fine sands
LS 200 sieve *	SILTS AN Liqui 50% d	d limit or less	CL	Inorganic clays of low to medium plasticity. gravelly clays, sandy clays, lean clays
NED SOI s the No.	() -		OL	Organic silts and organic silty clays of low plasticity
NE-GRAI			мн	Inorganic slits, micaceous or diamicaceous fine sands or silts, elastic slits
or mo	SILTS AN Liquid	D CLAYS d limit ban 50%	СН	Inorganic clays or clays of high plasticity, fat clays
503	groutor t		он	Organic clays of medium to high plasticity
			РТ	Peat, muck and other highly organic solls

* Use dual symbol (such as, SP-SM and SP-SC) for soil with more than 5% but less than 12% passing the No. 200 sleve

MODIFIERS

These Modifiers Provide Our Estimate of the Amount of Minor Constituents (Silt or Clay Size Particles) in the Soil Sample Trace - 5% or Less With Silt or With Clay - 6% to 11% Silty or Clayey - 12% to 30% Very Silty or Very Clayey - 31% to 50%

These Modifiers Provide Our Estimate of the Amount of Organic Components In the Soil Sample Trace - Less than 3% Few - 3% to 4% Some - 5% to 8% Many - Greater than 8%

These Modifiers Provide Our Estimate of the Amount of Other Components (Shell, Gravel, Etc.) in the Soil Sample Trace - 5% or Less Few - 6% to 12% Some - 13% to 30% Many - 31% to 50%

FIELD EXPLORATION PROCEDURES

Auger Borings

The auger borings were performed mechanically by the use of a continuous-flight auger attached to the drill rig and in general accordance with the latest revision of ASTM D 1452, "Soil Investigation and Sampling by Auger Borings". Representative samples of the soils brought to the ground surface by the augering process were placed in glass jars, sealed and transported to our laboratory where they were examined by our engineer to verify the driller's field classification.

LABORATORY TESTING PROCEDURES

Natural Moisture Content

The water content of the sample tested 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.

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.

APPENDIX B

IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL ENGINEERING REPORT

CONSTRAINTS AND RESTRICTIONS

Important Information about Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one* — *not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

 the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors tors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that

have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenviron-mental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the express purpose of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/THE BEST PEOPLE ON EARTH exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.



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CONSTRAINTS & RESTRICTIONS

The intent of this document is to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

WARRANTY

Universal Engineering Sciences has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

The nature and extent of variations between borings may not become known until excavation begins. If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations.

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Universal Engineering Sciences of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

MISINTERPRETATION OF SOIL ENGINEERING REPORT

Universal Engineering Sciences is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Universal Engineering Sciences.

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Universal Engineering Sciences.

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations.

Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. Universal Engineering Sciences cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects. Universal Engineering Sciences cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

TIME

This report reflects the soil conditions at the time of exploration. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.



SECTION 02750

CONCRETE PAVING, SIDEWALK AND CURB

PART 1 - GENERAL

- **1.01 RELATED DOCUMENTS:** The General Provisions of the contract, including the General Conditions, Supplementary Conditions and Special Conditions, along with the General Requirements, apply to the work specified in this Section.
- 1.02 REFERENCES: All work shall be in accordance with Section 522 Concrete Sidewalk, Section 350 Cement Concrete Pavement, and Section 520 Concrete Gutter, Curb Elements & Traffic Separator of the January 2020 edition of the "Florida Department of Transportation Standard Specifications for Road and Bridge Construction" unless specifically stated or directed otherwise.

1.03 SUBMITTALS:

- A. Material Certificates: Provide copies of material certificates including design mixes, signed by the Contractor, certifying that each specified material complies with, or exceeds requirements.
- B. Provide manufacturer's literature and installation instructions for all concrete accessories such as joint filler and detectable warning textures.
- C. Copies of all compliance testing and retests.
- D. Comply with Section 01300, Submittals.

PART 2 - PRODUCTS

2.01 CONCRETE MIX, DESIGN AND TESTING:

- A. Comply with requirements of applicable FDOT Section 346 for Class I concrete mix design, sampling and testing, and quality control, and as herein specified.
- B. Design the mix to produce standard weight concrete consisting of portland cement, aggregate, air-entraining admixture and water to produce the following properties.
 - 1. Compressive Strength:
 - a. Sidewalks: 3,000 psi @ 28 days, W/C ratio \leq 0.59
 - b. Pavement: 4,000 psi @ 28 days, W/C ratio \leq 0.48
 - c. Curb: 3,000 psi @ 28 days, W/C ratio \leq 0.59
 - 2. Air Content: 3% to 6%.

- C. Concrete placement slump shall not exceed plus or minus 1 inch from approved mix design slump.
- D. Aggregates: Aggregate shall be 3/8" round with the following sieve graduation:

Size% Passing1"1003/4"1003/8"90-100#440-60#80-10

- E. Water: Potable, clean, fresh, free from oil, acid, organic matter or other deleterious substances.
- **2.02 WELDED WIRE FABRIC:** ASTM A185, welded steel wire fabric, 65 ksi, flat sheets only.
- 2.03 **DEFORMED BARS:** ASTM A615, carbon steel, Grade 60.
- **2.04 JOINT MATERIAL:** Closed cell expanded polyethylene foam of dimensions shown on Drawing.
- **2.05 FORM MATERIALS:** Unless otherwise indicated, construct formwork with plywood, metal, metal framed plywood faced or other acceptable panel type materials to provide continuous, straight, smooth, exposed surfaces.

PART 3 - EXECUTION

3.01 CONCRETE PAVEMENT INSTALLATION:

- A. General: Pavement shall be installed where indicated on the drawings. Width of surface and thickness shall be as called out on the drawings.
- B. Surface Preparation:
 - 1. Construct stabilized sub-grade within limits of proposed pavement and level with the underside of concrete. Stabilization material and procedures shall be as described in the FDOT Standard Specifications for Road and Bridge Construction.
 - a. Pavement: Construct 12" thick stabilized subgrade.
 - 2. Proof-roll prepared sub-grade surface to check for unstable areas and the need for additional compaction.

- 3. Remove loose material from the compacted sub-grade surface immediately before placing the concrete.
- 4. Subgrade: Unless otherwise noted, subgrade shall be a minimum of twelve (12) inch deep and extend 12 inches beyond the limits of base material and/or curbing. Contractor may, at his own discretion, increase the depth of the prepared subgrade as necessary to accommodate his equipment needs at no additional cost. Constructed stabilized subgrade shall be mixed, moisture conditioned and compacted to 98% of the maximum density (ASTM D 1557). Prepared material shall provide a limerock bearing ratio (LBR) of 40. The subgrade shall be constructed as specified in Section 160, Stabilizing of the FDOT Standard Specifications for Road & Bridge Construction (Latest Edition).
 - a. Fine grade surface area to accommodate finish grades required by Contract Documents.
 - b. Prepared surface shall be proof-rolled with a heavy pneumatic tired vehicle.
 - 1) Proof-roll entire surface area a minimum of two passes in each direction.
 - Remove material from soft areas and replace with new material. Failing areas shall be reconstructed to the full depth of the material. If necessary, additional stabilizing material shall be added. Recompact and retest.
 - c. Plasticity index shall not exceed 8 and liquid limit shall not exceed 30 in prepared material.
- 5. Stabilized subgrade material tests shall be made as follows:
 - Determine optimum moisture/density relationship of stabilized subgrade material in accordance with ASTM D1557. Verify moisture content of in-place material (ASTM D2216) is within 4% ± of optimum.
 - b. Perform in-place density tests (ASTM D1557) in the compacted stabilized subgrade material at the rate of one test for every 5,000 sf or fraction thereof. Recompact areas which fail to meet compaction requirements, then retest until passing results are obtained. Reference test locations to easily identified points on Site Plan.

- c. Contractor shall perform bearing value tests on samples of inplace material by the Limerock Bearing Ratio (LBR) Method. One (1) test shall be performed for each 10,000 SF, or fraction thereof. For areas failing to meet the minimum LBR, additional stabilizing material shall be spread, mixed and retested until satisfactory results are obtained.
- C. Concrete Placement:
 - 1. Do not place concrete until sub-base and forms have been checked for line and grade. Moisten if required to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around meter boxes or other structures until they are completed to required finish elevation and alignment.
 - 2. Place concrete using methods which prevent segregation of the mix. Consolidate concrete along the face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels and joint devices. Do not use vibrators to push or move concrete in forms or chute.
 - 3. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than ½ hour place a construction joint.
 - 4. Joints: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of the concrete, unless otherwise indicated. Construct transverse joints at right angles to the centerline, unless otherwise indicated. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.
 - a. Weakened-Plane Joints: Construct weakened-plane joints for a depth equal to at least 1 1/4-inch thickness or 1/4 the pavement thickness whichever is greater, by sawing within six to eight hours of placement or formed during finishing operations. Place joints as described on drawings.
 - b. Construction Joints: Place construction joints at the end of all pours and at locations where placement operations are stopped for a period of more than ½ hour, except where such pours terminate at expansion joints. Construction joints shall be standard metal keyway-section form of appropriate height.

- c. Expansion Joints:
 - 1) Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.
 - 2) Locate expansion joints as described on the drawings.
 - 3) Extend joint fillers full-width and depth of joint, and not less than ½" below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
 - 4) Furnish joint fillers in one-piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together. Pieces shorter than 4' shall not be used unless specifically shown as such.
 - 5) Protect the top edge of the joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.
 - 6) Fillers and Sealants: Comply with the requirements of these specifications for preparation of joints, materials installation, and performance and as herein specified.
- D. Concrete Finishing:
 - 1. After striking-off and consolidating concrete, smooth the surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.
 - 2. All sidewalk surfaces shall be cross sloped (1.0%) to provide positive drainage towards curbing or grassed area.
 - 3. All pavement surfaces shall be sloped to grades shown on the drawings.
 - 4. After floating, test surface for trueness with a 20' straightedge. Variations exceeding 1/4" for any two points within 10' shall not be acceptable. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

- 5. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round 10 ½" radius, unless otherwise indicated. Eliminate any tool marks on concrete surface.
- 6. After completion of floating and when excess moisture or surface sheen has disappeared, broom finish surface by drawing a fine-hair broom across concrete surface, perpendicular to the line of traffic.
- 7. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean up ends of joints and point-up any minor honeycombed areas.
- E. Curing: Protect and cure finished concrete paving and walks, as required. Use moist-curing methods for initial curing whenever possible or approved concrete curing compounds.
- F. Repairs and Protections:
 - 1. Repair or replace broken or defective concrete as directed by the Engineer.
 - 2. Drill test cores where directed by the Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy resin grout.
 - 3. Protect concrete from damage until acceptance of work. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
 - 4. Sweep concrete pavement and wash free of stains and discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION

SECTION 02820

CHAIN LINK FENCING

PART 1 - GENERAL

- **1.01 RELATED DOCUMENTS:** See Drawings for JEA High-Security Fencing requirements and installation requirements referenced herein and detailed in JEA Water and Wastewater Standards Specification Section 492.
- **1.02 DESCRIPTION OF WORK:** Extent of chain link fences and gates is indicated on drawings. Drawing requirements prevail if any conflict between the Drawing, JEA's Standard Specification, or the enclosed specification requirements.
- **1.03 QUALITY ASSURANCE:** Provide chain link fences and gates as complete units controlled by a single source including necessary erection accessories, fittings and fastenings.

1.04 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical data, and installation instructions for metal fencing, fabric, gates and accessories.
- B. Manufacturer's Certification of Zinc-Coating Compliance.

1.05 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - 1. A121 Zinc Coated Carbon Steel Barbed Wire
 - 2. A392 Zinc Coated Steel Chain-Link Fence Fabric
 - 3. A817 Metal Coated Steel Wire for Chain-Link Fence Fabric and Marcelled Tension Wire
 - 4. C94/C94M Ready-Mixed Concrete
 - 5. F567 Installation of Chain-Link Fence
 - 6. F626 Fence Fittings
 - 7. F668 PVC Coated Steel Chain-Link Fence Fabric
 - 8. F900 Industrial and Commercial Swing Gates
 - 9. F1043 Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework
 - 10. F1083 Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

PART 2 - PRODUCTS

- 2.01 **POSTS AND FRAMEWORK:** See JEA Standard Section 492.IV.
- 2.02 STEEL FABRIC: See Drawings and JEA Standard Section 492.I.

2.03 FRAMING AND ACCESSORIES:

- A. Miscellaneous Framework, General: Match posts and fabric.
- B. Fittings and Accessories, General: Match posts and fabric.
- C. End, Corner, and Pull Posts: See Drawings and JEA Standard Section 492.IV.
- D. Gate Posts: See Drawings.
- E. Line Post: Minimum size as required for the purpose intended but no less than than 2-7/8" (2-1/2" ID) Schedule 40 per JEA Standard Section 492.IV. The maximum horizontal spacing of line post shall be 10'.
- F. Top Rail: See Drawings and JEA Standard Section 492.IV.
- G. Intermediate Rail: Minimum size and frequency as required for the purpose intended but no less than 1-5/8" (1-1/4" ID) Schedule 40 pipe. Provide intermediate rail on fences over 5' high at sections adjacent to end, corner, pull and gate post.
- H. Truss Rod and Tightener: See Drawings with finish to match fabric
- I. Bottom Tension Wire: See Drawings, continuous along the bottom of all height fences.
- J. Wire Ties: 9 ga. galvanized steel to match fabric core material.
- K. Post Brace Assembly: Manufacturer's standard adjustable brace at end of gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener.
- L. Post Caps: Provide weather-tight closure cap with loop to receive tension wire or top rail; one cap for each post.
- M. Stretcher Bars: One-piece lengths equal to full height of fabric, with minimum cross-section of 3/16" x 3/4". Provide one stretcher bar for each gate and end post, and 2 for each corner and pull post, except where fabric is integrally woven into post.

- N. Stretcher Bar Bands: Space not over 15" o.c. to secure stretcher bars to end, corner, pull and gate posts.
- 2.04 GATES: See Drawings.
- 2.05 CONCRETE: Provide concrete consisting of portland cement, ASTM C 150, aggregates ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3,000 psi using at least 4 sacks of cement per cu. yd., 1" maximum size aggregate, maximum 3" (+/- 1") slump, and 2% to 4% entrained air.

PART 3 - EXECUTION

- **3.01 GENERAL:** Fences along property lines shall be set inside the property line per the Drawings. Layout of property line fences shall be verified by a Florida Licensed Land Surveyor.
- **3.02 INSTALLATION:** Do not begin installation and erection before final grading is completed, unless otherwise permitted. Install fence in accordance with ASTM F567, manufacturers printed instructions and as specified herein.
 - A. Excavation: Hand excavate (using post hole digger) holes for post to diameters and spacing indicated, in firm, undisturbed or compacted soil. Existing concrete shall be drilled to the dimensions shown on the Drawings.
 - 1. If not indicated on Drawings, excavate holes in earth for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times largest cross-section of post.
 - 2. Unless otherwise indicated, excavate hole depths approximately 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.
 - B. Setting Posts: Center and align posts in holes 3" above bottom of excavation.
 - 1. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
 - 2. Unless otherwise indicated, extend concrete footings 2" above grade and trowel to a crown to shed water.
 - C. Top Rails: Run rail continuously through post caps, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer.

- D. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.
- E. Tension Wire: Install tension wires through post cap loops before stretching fabric and tie to each post cap with not less than 6 ga. galvanized wire. Fasten fabric to tension wire using 11 ga. galvanized steel hog rings spaced 24" o.c.
- F. Fabric: Leave approximately 2" between finish grade and bottom selvage, unless otherwise indicated. Pull fabric taunt and tie posts, rails and tensions wires. Install fabric on security side of fence and anchor to framework so that fabric remains in tension after pulling force is released.
- G. Stretcher Bars: Thread through or clamp to fabric 4" o.c., and secure to posts with metal bands spaced 15" o.c.
- H. Gates: Install gates plumb, level and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.
- I. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.
 - 1. Tie fabric to line posts, with wire ties spaced 12" o.c. Tie fabric to rails and braces, with wire ties spaced 24" o.c. Tie fabric to tension wires, with hog rings spaced 24" o.c.
- J. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score thread to prevent removal of nuts.
- K. Cane Bolt or Plunger Bar Pad: Provide a 12"x12"x8" concrete pad for any ground level device receiving a cane bolt or plunger bar. Pad shall be centered on the device. Concrete surface shall be flush with surrounding grade.

3.03 QUALITY ASSURANCE:

- A. Gates shall swing or roll smoothly and latch without difficulty.
- B. All gate operations shall be capable of being performed by any able bodied Owner personnel with a minimum of effort.
- C. Gates shall be adjusted and aligned to the satisfaction of the Engineer prior to final acceptance.
3.04 CLEANING:

- A. Remove waste fencing materials from the project site and dispose of off-site.
- B. Remove accumulations of silt and other erosion products from all permanent facilities.

END OF SECTION

SECTION 02921

GRASSING, SEEDING AND SODDING

PART 1 - GENERAL

- **1.01 RELATED DOCUMENTS:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- **1.02 SCOPE:** The work specified in this Section consists of the establishing of a stand of grass within the areas disturbed by construction, or otherwise described on the drawings, and maintaining such areas until completion and final acceptance of the project. The methods specified herein are grassing by seeding and grassing by sodding.

1.03 JOB CONDITIONS:

- A. Sodding: It is the intent of this section that all areas disturbed by construction and to remain unimproved by hardscape shall be stabilized with sod.
- B. Seeding: Seeding shall be required by the Engineer for temporary erosion control at his discretion.

1.04 SUBMITTALS:

- A. Seed Mix: Manufacturer's warranted analysis for percentages of mixture, purity and germination.
- B. Sod: State certification of origin and health of sod. Sod Supplier's recommended fertilizer application rates.
- C. Soil Test Results and soil amendment recommendations.
- D. Fertilizer: Manufacturer's literature and data describing NPK ratio and recommended application rates.
- E. Pre-emergent Herbicide: Manufacturer's literature and data describing proposed chemical and compatibility with grassing products.

1.05 QUALITY CONTROL:

A. All work in this section shall be in accordance with Section 570-1 through 570-4 of the FDOT Standard Specifications (Latest Edition) for Road and Bridge Construction, except as modified herein.

- B. All grassing operations shall provide a thick and vibrant covering of disturbed areas by final completion of the work. The requirement for adequate growth and coverage shall not be waived due to seasonal influences.
- C. The Contractor shall be responsible for scheduling the work to ensure grass has adequate time to take hold and to adjust mixes (with Engineer's approval) to meet the quality assurance standards required by this Section.

PART 2 - PRODUCTS

2.01 FERTILIZER:

A. For bidding purposes, the fertilizer shall be considered 16-4-8 which has a chemical analysis as follows:

Total Nitrogen:	Not less than 16%
Available Phosphoric Acid:	Not less than 4%
Water-soluble Potash:	Not less than 8%

- B. All fertilizer shall comply with state and local laws and regulations and shall be fully labeled at the time of delivery to the job site.
- C. Lime and pH adjustment shall be dependent on the results of the Soil Analysis.

2.02 SEED MIXTURE:

- Unless other types of seed are called for, seed shall be a mixture of twenty (20) parts of hulled Millet seed and eighty (80) parts of Bermuda seed thoroughly dry mixed immediately before sowing.
- B. Seed germination rates shall be as follows:
 - 1. Argentine Bahia Grass Seed shall have a minimum pure seed content of 95 percent with a minimum germination of 90 percent.
 - 2. Pensacola Bahia Grass Seed shall have a minimum pure seed content of 95 percent with a minimum active germination of 40 percent and a total germination of 80 percent including firm seed.
 - 3. Bermuda Grass Seed shall be of common variety with a minimum pure seed content of 95 percent with a minimum germination of 85 percent.
 - 4. Annual Type Rye Grass Seed shall have a minimum pure seed content of 95 percent with a minimum germination of 90 percent.

- C. Seed which has become wet or moldy shall not be used.
- D. During the period from October 15 to February 15, rye grass seed shall be added and thoroughly dry mixed with the regular mixture at the rate of twenty (20) pounds rye seed per one hundred (100) pounds of regular seed mixture.
- **2.03 MULCH:** The mulch shall consist of Milet, Rye, or Bahia straw. Other types of mulch may be used only when approved by the Engineer.

2.04 SOD:

- A. Types:
 - 1. Generally, sod shall be Common Bermuda Grass in all typical applications and in non-maintained areas.
 - 2. Where proposed sod abuts other established stands of grass the Engineer or his representative may, at his discretion, require the Contractor to match the existing grass for all or a portion of the abutment. No additional compensation shall be allowed for providing other sod types.
- B. The sod shall be taken up in commercial-size rectangles, preferably 12 x 24 inches or larger, or continuous rolls. The sod shall be sufficiently thick to secure a dense stand of live grass. The sod shall be green, live, fresh, and uninjured, at the time of planting. It shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. It shall be reasonably free of weeds and other grasses. It shall be planted as soon as possible after being dug and shall be shaded and kept moist from the time it is dug until it is planted. The source of the sod may be inspected and approved by the Engineer prior to being cut for use in the work. After approval, the area from which the sod is to be harvested shall be closely mowed and raked as necessary to remove excessive top growth and debris.
- C. Approved devices, such as sod cutters, shall be used for cutting the sod and due care shall be exercised to retain the native root soil intact.
- **2.05 HYDROMULCH SEED:** At the Contractor's option, Hydromulch Seed may be substituted for Seed and Mulch where required by Contract.
 - A. State-approved of the latest season's crop delivered in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures, purity, germination, weedseed content, and inert material. Label in conformance with all applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected. Field mixes will be acceptable when mix is performed on site in the presence of the Owner's Representative.

- B. Composition: Proportion seed mixtures by weight as specified by Seed Manufacturer. Mixture shall be a combination of rye, millet and Common Bermuda.
- **2.06 WATER:** The water shall be free of excess and harmful chemicals, acids, and alkalies or any substance which might be harmful to plant growth or obnoxious to traffic. Salt water shall not be used. The Contractor shall make all arrangements for obtaining and transporting water to the job site. All grassing shall be watered until grass is well established at the Contractor's expense.

2.07 PRE-EMERGENT HERBICIDE:

- A. Selective type pre-emergence control chemical suitable for use under the proposed grass or landscaped surface.
- B. Application personnel shall be certified in the State of Florida for application of agricultural chemicals.

PART 3 - EXECUTION

3.01 SCHEDULE: Grass shall be in place by substantial completion of the project.

3.02 PREPARATION OF GROUND:

- A. Final grading and cleaning shall be completed prior to preparation of ground for grassing. Sod installer is not responsible for final grades, but shall not lay sod on soil that has not been properly prepared or is obviously damaged by erosion or heavy equipment, etc.
- B. The areas to be grassed shall be scarified or loosened to a depth of at least six (6) inches.
- C. All areas shall be smooth and free of large clods, roots and other materials which may interfere with the work or future mowing and maintenance operations.
- D. No subsequent operations shall be commenced until the Engineer, or designated representative, has approved the condition of prepared areas.
- E. Areas receiving specialty grassing such as Athletic Fields, shall be treated with a pre-emergent herbicide in accordance with chemical manufacturer's and grassing supplier's instructions.
- F. Fertilizer, pH and Lime adjustments shall be spread and mixed in accordance with these specifications and the grass supplier's recommendations.

- G. Sod shall not be laid on soil too hot receive new grass. If in question the Contractor shall lightly water the exposed soil and keep soil damp until sod is laid.
- H. For Athletic Fields all grades shall be set with laser grading techniques and equipment.

3.03 APPLICATION:

- A. Fertilizer and soil amendments:
 - 1. As a minimum, Commercial fertilizer shall be spread uniformly over the area to be grassed at the rate of twenty (20) pounds per one thousand (1000) square feet or as recommended by the Grassing Supplier. No additional payment shall be made to achieve grass supplier's recommended fertilizer spread rate. Soil amendments shall include Lime and pH adjustments in accordance with the Soil Analysis.
 - 2. Immediately after the fertilizer and other soil amendment are spread, it shall be raked in and thoroughly mixed with the soil to a depth of approximately two (2) inches.
 - 3. Refertilize approximately sixty (60) calendar days after initial application if project has not been accepted prior to this time.
- B. Seeding: Where required, Seeding shall be done immediately after fertilizing, while the soil is still loose and moist. The seed shall be scattered uniformly over the area to be grassed by a mechanical hand spreader or other approved type of spreader.
 - 1. Mechanical Spreader:
 - a. Sow ½ seed in one direction and sow remainder at right angles to the first sowing.
 - b. Seeded areas shall be harrowed, raked, or otherwise worked to ensure seed is covered by soil.
 - c. After seeding firm entire area with appropriate rolling equipment or cultipacker.
 - 2. Hydroseeding: Seed and slow release fertilizer shall be mixed with mulching medium and water to produce a homogenous slurry. Application shall be in accordance with manufacturer's mix requirements.

- C. Mulch:
 - Immediately after completion of mechanical seeding, dry mulch shall be uniformly applied over the seeded area approximately one inch (1"), loose thickness.
 - 2. The mulch shall then be cut uniformly into the soil so as to produce a loose mulched thickness of two inches (2") and rolled with a cultipacker, traffic roller or other suitable equipment.
 - 3. After seeding and mulching is completed, the entire area shall be watered so as to provide optimum growth conditions for establishment of the grass.
- D. Placement of Sod:
 - 1. Sod shall be laid immediately after the application of the fertilizer.
 - 2. Sodding shall be incorporated into the project at the earliest practical time in the life of the Contract, but no later than project substantial completion.
 - 3. No sod which has been cut for more than seventy-two (72) hours shall be used unless specifically authorized by the Engineer, or his representative, after his careful inspection thereof.
 - 4. Any sod which is not planted within twenty-four (24) hours after cutting shall be stacked in an approved manner and maintained properly moistened.
 - 5. Sodding shall not be performed when weather and soil conditions are, in the Engineer's opinion, unsuitable for proper results.
 - 6. The sod shall be placed on the prepared surface, with edges in close contact, and shall be firmly and smoothly embedded by rolling with approved roller.
 - 7. Where sodding is used in drainage ditches, the setting of the pieces shall be staggered, such as to avoid a continuous seam along the line of flow. Along the edges of such staggered areas the offsets of individual strips shall not exceed six inches (6"). In order to prevent erosion caused by vertical edges at the outer limits, the outer pieces of sod shall be tamped so as to produce a featheredge effect.

- 8. On areas where the sod may slide, due to height and slope, the Engineer may direct that the sod be pegged, with pegs driven through the sod blocks into firm earth, at suitable intervals. Any pieces of sod which, after placing, show an appearance of extreme dryness, shall be removed from the work.
- 9. RIBs shall be stabilized with sod as follows:
 - a. All banks from top of bank to RIB bottom
 - b. Ten feet beyond top of bank
- 10. All swales shall be sodded top of bank to top of bank.
- E. Watering of Grassed Areas: The grassed areas shall be watered for the duration of the Contract so as to provide optimum growth conditions for the establishment of the grass. The water used shall be obtained from the construction well or other means at the Contractor's expense.
- F. All areas of sod installation shall be rolled to remove bumps and ruts. The tolerance for acceptance of finished surfaces shall be as described in 02300 Earthwork.

3.04 MAINTENANCE OF GRASSED AREAS:

- A. The Contractor shall, at his expense, maintain the planted areas in a satisfactory condition until Final Acceptance of the Project. Such maintenance shall include:
 - 1. Watering and mowing of all grassed areas.
 - 2. Filling, leveling, grading, repairing and regrassing of any washouts or eroded areas, as may be necessary.
 - 3. Refertilization of areas maintained more than 60 days beyond installation.

3.05 ACCEPTANCE:

- A. All grass must be established upon final acceptance of the work. Established shall mean:
 - 1. Grass is rooted (leaves break before plant separates from soil).
 - 2. No bare spots greater than 1 SF.
 - 3. No deformation of grass due to Contractor equipment or erosion.
 - 4. No obviously diseased, infested, or dead zones.
 - 5. No exposed sod netting.
 - 6. No noxious weeds.

- B. Areas in which the establishment of the grass is not achieved, due to disease, infestations, bare spots or dead zones, shall be removed and replaced. All other areas shall be repaired in place prior to final payment.
- C. If a planted area must be replanted, replacement shall be at the Contractor's expense.
- **3.06 CLEANUP:** All excess materials associated with this activity shall be removed from the site. Site shall be left in a neat and tidy condition, free from trash and debris.

END OF SECTION

SECTION 03050

CONCRETE BONDING AGENTS AND TOPPINGS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included: Provide concrete bonding, toppings, and waterproofing materials where shown on the drawings, as specified herein, and as needed for a complete and proper installation.

1.02 QUALITY ASSURANCE:

- A. Manufacturing Qualifications: The manufacturer of the specified product shall have in existence, for a minimum of 10 years, a program of training, certifying, and technically supporting a nationally organized Approved Contractor Program. The manufacturer shall also be certified as meeting the ISO 9000 Quality Standard at all facilities producing the specified product.
- B. Contractor Qualifications: Contractors shall be an "Approved Contractor" of the manufacturer of the specified product who has completed a program of instruction in the use of the specified product and provide a notarized certification from the manufacturer attesting to their "Approved Contractor" status.

1.03 SUBMITTALS:

- A. Submit product data and application data for all materials to be used in the project.
- B. Submit certification that the application contractor has been trained and approved by the manufacturer.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver the specified product in original unopened containers with the manufacturer's name, labels, product identification, and batch numbers.
- B. Store and condition the specified product as recommended by the manufacturer.

PART 2 - PRODUCTS

2.01 CONCRETE BONDING, TOPPINGS AND WATERPROOFING MATERIALS:

- A. The following materials are approved for their purpose as manufactured by Sika Corporation, Lyndhurst, New Jersey.
 - 1. Bonding Agent: Sika Armatec 110 Epocem bonding agent.
 - 2. Concrete Filler: Sika Repair 222 cementitious material with aggregate filler.
 - 3. Waterproofing Topcoat: SikaTop Seal 107 waterproofing surface coating.
 - 4. Expansion Joint Filler: SikaFlex 2C expansion joint filler. Not for use in potable water tanks.
- B. Substitutions: The use of other than the specified product will be considered providing the Contractor requests its use in writing to the Engineer. This request shall be accompanied by (a) a certificate of compliance from an approved independent testing laboratory that the proposed substitute product meets or exceeds the specific performance criteria, tested in accordance with the specified test standards; and (b) documented proof that the proposed substitute product has a one year proven record of performance of coating of substrates, confirmed by actual field tests and five successful installations that the Engineer can investigate.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS: Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 ENVIRONMENTAL CONDITIONS:

- A. Do not place materials when air temperature is below 40 degrees F, or as recommended by manufacturer.
- B. Protect construction from direct exposure to wind, rain and sun.
- **3.03 INSTALLATION:** General: Install all products in accordance with manufacturer's written application data.

3.04 INSPECTION AND ADJUSTMENT: Upon completion of the work addressed by this specification section, make a thorough inspection of the work areas with JEA's inspector and verify that the work has been installed in accordance with the provisions of this section. If JEA's inspector determines additional review by the manufacturer's representative is required, the Contractor shall provide these services at no additional cost to the Owner.

END OF SECTION

SECTION 03310

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: The extent of concrete work required is as shown in the drawings.

1.02 QUALITY ASSURANCE:

- A. Codes and Standards:
 - 1. Comply with the provisions of the following codes, specifications and standards, except where more stringent requirements are shown or specified.
 - a. ACI 301 "Specifications for Structural Concrete for Buildings".
 - b. ACI 304 "Guide for Measuring, Mixing, Transporting and Placing Concrete".
 - c. ACI 305 "Hot Weather Concreting".
 - d. ACI 306 "Cold Weather Concreting".
 - e. ACI 308 "Standard Practice for Curing Concrete".
 - f. ACI 311 "Guide for Concrete Inspections".
 - g. ACI 318 "Building Code Requirements for Reinforced Concrete".
 - h. ACI 347 "Guide to Formwork for Concrete".
 - i. ACI 350R-01 "Code Requirements for Environmental Engineering Concrete Structures".
 - 2. American Society for Testing and Materials (ASTM):
 - A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - A185 Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 - A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

- C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- C33 Standard Specification for Concrete Aggregates.
- C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- C94 Standard Specification for Ready-Mixed Concrete.
- C143 Standard Test Method for Slump of Hydraulic Cement Concrete.
- C150 Standard Specification for Portland Cement.
- C171 Standard Specification for Sheet Materials for Curing Concrete.
- C172 Standard Specification for Sampling Freshly Mixed Concrete.
- C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- C192 Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
- C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- C260 Standard Specification for Air-Entraining Admixtures for Concrete.
- C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- C330 Standard Specification for Lightweight Aggregates for Structural Concrete.
- C494 Standard Specification for Chemical Admixtures for Concrete.
- C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- C881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- C989 Standard Specification For Slag Cement For Use in Concrete and Mortars.
- C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
- D1752 Standard Specification for Preformed Sponge Rubber Cork & Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- D4397 Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications.
- D6690 Std. Specification For Joint and Crack Sealants, Hot Applied For Concrete and Asphalt Pavement.

- American Welding Society (AWS):
 D1.4 Structural Welding Code Reinforcing Steel.
- 4. Concrete Reinforcing Steel Institute (CRSI): DA4 Manual of Standard Practice.
- 5. Florida Department of Transportation, Standard Specifications for Road and Bridge Construction.
- B. Workmanship:
 - 1. The Contractor is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed by the Engineer.
 - 2. Test for Concrete Materials:
 - a. Test aggregates by the method of sampling and testing of ASTM C33.
 - b. For Portland Cement, sample the cement and determine the properties by the methods of tests as specified herein.

1.03 SUBMITTALS:

- A. Submit written reports to the Engineer, Owner and Contractor for each material sampled and tested, prior to the start of work. Provide the project identification name and number, date of report, name of contractor, name of concrete testing services, source of concrete aggregates, material manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material and test results. Indicated whether or not material is acceptable for intended use.
- B. Certificates of material properties and compliance with specified requirements may be submitted in lieu of testing when acceptable to the Engineer. Certificates of compliance must be signed by the materials producer and the Contractor.
- C. Manufacturer's Data, Concrete Work: Submit manufacturer's product data with application and installation instructions for propriety materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, chemical floor hardeners, dry-shake finish materials and others as requested by the Engineer.

- D. Shop Drawings, Concrete Reinforcement: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with the ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangements of concrete reinforcement. Include special reinforcement required at openings through concrete structures.
- E. Laboratory Test Reports, Concrete Work: Submit copies of laboratory test reports for concrete materials and mix design tests as specified.

PART 2 - PRODUCTS

2.01 REINFORCING MATERIALS:

A. Reinforcing Bar:

ASTM A615, Grade 60 for Rebar Nos. 3 to 18.

- B. Steel Wire: ASTM A82, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A185, welded steel wire fabric, flat sheets.
- D. Stainless Steel Mesh: T-304 stainless steel, 0.105" wire diameter, 1" mesh with plain weave.
- E. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type support complying with CRSI recommendations unless otherwise indicated. Wood, brick and other devices will not be acceptable. For slabs-on-grade use supports with sand plates or horizontal runner where wetted base materials will not adequately support chair legs.
- F. Splice Devices: Coupler type to develop 125% yield strength of bar.

2.02 CONCRETE MATERIALS:

- A. Concrete: Air entrained ready mix concrete, ASTM C94.
- B. Cement: ASTM C150, Type II.

- C. Chemical Admixtures: Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
 - 1. Air Entraining: ASTM C260. Acceptable:
 - a. Sika AER, Sika Chemical Corporation;
 - b. Darex AEA, W.R. Grace & Company;
 - c. Sealtight Air Entraining Agent, W.R. Meadows, Inc.;
 - d. MB-VR, Master Builders, Co., or equal.
 - 2. Retarder: ASTM C494, Type B. Acceptable:
 - a. Plastiment, Sika Chemical Corporation;
 - b. Daratard, W.R. Grace & Company;
 - c. Pozzolith-R, Master Builders Company, or equal.
 - 3. Water Reducing Agent: ASTM C494, Type A. Acceptable:
 - a. Plastocrete 160, Sika Chemical Corp.;
 - b. WRDA with Hycol, W.R. Grace & Company;
 - c. Pozzolith-N, Master Builders Co., or equal.
 - 4. Waterproofing Agent: Required in all cast-in-place concrete liquid containing structures:
 - a. Approved manufacturers: Xypex, Inc.; Aquafin, Inc.; ICS Penetron International.
 - b. Product shall be a mixture of fine treated silica sand and activating chemicals that will create a non-soluble crystalline structure within the pores and capillary tracts of the concrete rendering the concrete impermeable to water or water based solution.
 - c. Pre-stressed and post-tensioned wire wound structures are not required to use a waterproofing agent in the concrete mix.
- D. Aggregates: ASTM C33 (Normal Weight), ASTM C330 (Light Weight).
 - 1. Fine Aggregate: Fineness modulus, 2.10 to 2.50.
 - 2. Coarse Aggregate: Size Number 57.
- E. Water: Potable.
- F. Fly Ash: ASTM C618 Class C or F, LOI not to exceed 5 percent.
- G. Calcined Pozzolan: ASTM C618, Class N.

- H. Silica Fume: ASTM C1240.
- I. Ground Granulated Blast Furnace Slag: ASTM C989.

2.03 RELATED MATERIALS:

- A. Expansion Joint Material:
 - 1. Preformed, closed cell PVC or polyurethane foam, Type IV.
 - a. Acceptable: Rescor, W.R. Meadows, Inc.; Rodofoam, Grade 327, W.R. Grace & Co., or equal.
- B. Waterstops: Type and size as indicated on Drawings.
 - 1. PVC: Natural or synthetic rubber polyvinyl. Acceptable: Vinylex PVC Waterstop, Vinylex Corporation; Efficiency Waterstop, Williams Products, Inc.; Vulco, Vulcan Metal Products, Inc., or equal.
 - 2. Hydrophilic: Non-Bentonite, modified chloroprene rubber. Acceptable: Sika Hydrotite, or equal.
- C. Joint Sealing Compound: Conform to Florida Department of Transportation Specifications, see Section 932 and ASTM D6690.
 - 1. Non-Liquid Containing Concrete Structure: One part, non-sag silicone material; cold applied; weather and UV resistant. Sikasil 728 NS, or approved equal.
 - 2. Liquid Containing Concrete Structure:
 - a. Potable Water Tanks: NSF Approved, 2 component, 100% solids, solvent free, high-modulus, structural epoxy paste adhesive providing a watertight seal Sikadur 31 Hi-Mod gel, or approved equal.
 - b. Sewage Treatment Tanks: Water tight, permanently elastic, UV resistant joint sealing system consisting of hypalon sheeting and epoxy sealant. Sikadure Combiflex, or approved equal.
- D. Moisture-Retaining Cover: One of the following, complying with ASTM-C171.
 - 1. Waterproof paper,
 - 2. Polyethylene film, and
 - 3. Polyethylene-coated burlap.

- E. Membrane-Forming Curing Compound: ASTM C309, Type 1, colored unless other type is acceptable to the Engineer.
- F. Hi-Strength Non-Shrink Grout: ASTM C1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Minimum Compressive Strength at 24 Hours: 2,000 psi.
 - 2. Minimum Compressive Strength at 28 Days: 6,000 psi.

2.04 PROPORTIONING AND DESIGN OF MIXES:

- A. Prepare design mixes for each type and strength of concrete in accordance with applicable provisions of ASTM-C94. Use an independent testing facility acceptable to the Engineer for preparing and reporting proposed mix designs.
- B. Submit written reports to the Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not being concrete production until mixes have been reviewed and approved by the Engineer.
- C. Design mixes in compliance with ACI 211.1 recommendations to provide normal weight concrete with the following properties:
 - 1. Slump:
 - a. Pile caps, foundations and slabs on grade: 3 inch ± 1 inch.
 - b. All other, unless indicated otherwise: 2 inch \pm 1 inch.
 - 2. Mix Proportioning:

Class	Strength*	Cement Content	Water/Cement Ratio
	(f ′c)	(Minimum)	(Maximum)
A**	4,500 psi	680 lbs.	0.42

*Compressive strength of laboratory cured cylinder at 28 days. **Normal weight concrete. Where specified, lightweight concrete shall be proportioned to achieve the same strength.

- 3. Portland Cement content shall be not less than 50% of total cement content by weight.
- 4. Aggregate: 3/4", bulk specific gravity = 2.70 (Normal Weight Conc.) Lightweight concrete aggregate shall be selected to achieve an inplace density of not more than 100 pcf.
- D. Adjustment of Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results or other circumstances warrant at no additional cost to the

Owner. Laboratory test data for revised mix design and strength results must be submitted to and approved by the Engineer before using in the work.

- E. Admixtures:
 - 1. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having air content within the following limits:
 - a. Concrete structures and slabs exposed to freezing and thawing or subjected to hydraulic pressure.
 - 1) 4% for maximum 2" aggregate.
 - 2) 5% for maximum 1" aggregate.
 - 3) 6% for maximum 3/4" aggregate.
 - 4) 7% for maximum $\frac{1}{2}$ " aggregate.
 - b. Other concrete: 2% to 4% air.
 - 2. Retarder: At the option of the Contractor, all concrete unless temperature is expected to go below 45°F or average below 55°F during the 6 hours following placement of concrete.
 - 3. Water Reducing Agent: All concrete when temperature is expected to go below 45°F or average 55°F during the 6 hours following placement of concrete.
 - 4. Waterproofing Admixture: Include in all mix designs for liquidcontaining structures. Follow manufacturers instructions for the approved product. Procedures may vary depending the type of batch plant supplying concrete to the project.
 - a. Basis of Design: Xypex Admix C-1000 manufactured by Xypex Chemical Corporation, Richmond, BC, Canada. Tel: (800) 961-4477.
- F. Fly Ash Content: Fly Ash shall not exceed 20% of total cementitious materials by weight.
- G. Calcined Pozzolan Content: Calcined Pozzolan shall not exceed 10% of total cementitious materials by weight.
- H. Ground Granulated Blast Furnace Slag: Not more than 10% of cementitious material by weight.
- I. Silica Fume Content: Not more than 10% of cementitious material by weight.

- J. Total of Fly Ash, Slag & Other Pozzolans shall not exceed 50% of cementitious materials by weight.
- K. Chloride Content: Maximum allowable chloride content shall be 0.40 lb/yd³.

2.05 CONCRETE MIXING:

- A. Provide a batch ticket for each batch discharged and used in the work, indicating the project identification name and number, date, mix type, mix time, quantity and amount of water introduced.
- B. Ready-Mix Concrete: Comply with the requirements of ASTM C94 and as herein specified.
- C. Maximum allowable time between initial mixing of water into mix and placement of concrete at project shall be 90 minutes.
- D. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM-C94 is required.
 - 1. When the air temperature is between 85°F and 90°F, reduce the mixing and delivery time from 1½ hours to 75 minutes; and when the air temperature is above 90°F, reduce the mixing and delivery time to 60 minutes.
 - 2. Placement of concrete from any truck shall be discontinued when fresh mix leaving the truck attains temperatures in excess of 90°F, using Type I Cement, 95°F using Type II Cement.
- E. During cold weather, do not mix concrete when air temperature is below 45° and falling.
- **2.06** SCHEDULE: Class A; all concrete unless specified or indicated otherwise.

2.07 CURING MATERIALS:

- A. Sheet Form: ASTM C171.
- B. Liquid Membrane Curing Compound: ASTM C309, TT-C-800, Type 1, clear or translucent. Acceptable:
 - 1. Dress & Seal, L & M Construction Chemicals;
 - 2. Masterseal, Master Builders;
 - 3. Kure-n-Seal 0800, Sonneborn-Contech, or approved equal.
- C. Cotton Mats: FS DDD-M-148.
- D. Moisture Cure.

- **2.08 BONDING AGENT:** (Fresh concrete to Hardened concrete) high modulus, high strength, moisture tolerant, 2 component, structural epoxy adhesive, ASTM C881. Acceptable:
 - A. Permunite, L & M Construction Chemicals;
 - B. Sika Armatec 110 EpoCem;
 - C. #2385 Epoxtite Binder, A.C. Horn Co.; or approved equal.
- **2.09 REPAIR MORTAR (HORIZONTAL):** One component, solvent-free, cementitious system, mixed in accordance with manufacturer's instructions used for patching interior or exterior horizontal slabs. Acceptable: SikaQuick 1000.
- **2.10 REPAIR MORTAR (VERTICAL AND OVERHEAD)**: One-component, polymer-modified, portland cement, fast-setting, non-sag mortar for vertical and overhead surfaces. Acceptable: SikaQuick VOH, or equal.
- **2.11 FLOWABLE FILL:** Low strength mixture of Portland cement, flyash, fine aggregate, air entraining admixture, and water.
 - A. Mix design shall produce a minimum compressive strength of 300 psi at 28 days.
 - B. Product shall be non-excavatable and conform to Section 121 of the FDOT Specifications for Road & Bridge Construction.
 - C. Minimum cement content of 75 lb/cy.
 - D. Minimum flyash content of 150 lb/cy.
- 2.12 EPOXY ANCHORING SYSTEM: Two-component, 1:1 ratio, high-solids, epoxy-based adhesive for use as a high strength, non-shrink anchor grouting material in concrete. Resin and hardener shall be dispensed and mixed simultaneously through a mixing nozzle. Product shall meet or exceed ASTM C-881 specification for Type I, II, IV and V, Grade 3, Class B and C.

2.13 FORMWORK AND ACCESSORIES:

- A. Form Facing Material:
 - 1. Form facing material shall be plywood, tempered form grade hardboard, metal, plastic, paper or other approved material capable of producing the desired finish.
 - 2. Do not use products with a raised grain or other surface imperfections.

- B. Formwork Accessories shall be commercially manufactured for the intended purpose.
 - 1. Form ties designed to remain permanently within liquid containing structures shall be fitted with an integral water stop.
 - 2. Taper Rod Plugs: PVC, cone shaped plugs sized to fit in the rod cavity and completely seal the hole against the design head pressure.
 - 3. Formwork cavities in liquid containing structures shall be filled with a leak preventing mortar containing a hydrophillic crystalline admixture. Acceptable products are Xypex Patch and Go.
- C. Release Agents: Use commercially manufactured release agents designed to prevent the bonding of concrete to the form surface.

PART 3 - EXECUTION

3.01 FORMS:

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms complying with ACI 347, to sizes, shapes, lines and dimensions shown and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required to work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up joints to prevent leakage of cement paste.
- D. Fabricate forms for easy removal without hammering or prying against the concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses and the like to prevent swelling and for easy removal.
- E. Provide temporary openings where interior area of formwork is inaccessible for clean out, for inspection before concrete placement and for placement of concrete. Securely brace temporary opening and set tightly to forms to

prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

- F. Form Ties: Factory-fabricated, adjustable length, removable or snap-off metal form ties, design to prevent form deflection and to prevent spalling concrete surfaces upon removal.
- G. Unless otherwise shown, provide ties to portion remaining within concrete after removal is at least 1½" inside concrete.
- H. Unless otherwise shown, provide form ties which will not leave holes larger than 1" diameter in concrete surfaces.
- I. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms. Insert sleeves as required.
- J. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms after concrete placement if required to eliminate mortar leaks.

3.02 FORM REMOVAL:

- A. Under typical conditions Form Removal should occur upon successful cylinder break(s) which achieve the design strength.
- B. For liquid retaining structures and other vertical construction, forms may be loosened within 24-hours and removed within 3-days to allow application of appropriate curing methods.
- C. Under no circumstances shall concrete be loaded by construction or service loads prior to achieving design strength as evidenced by satisfactory cylinder breaks.

3.03 PLACING REINFORCEMENT:

- A. Comply with the specified codes and standards and Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bar," for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.

- C. Accurately position, support and secure reinforcement against displacement by formwork, constructions or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers as specified or required.
- D. Place reinforcement to obtain at least the minimum coverages required for concrete protection. Arrange space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete not toward exposed concrete surfaces.
- E. Do not place reinforcing bars more than 2" beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and construction loads.
- F. Install welded wire fabric in as long lengths as practicable. Lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either directions.
- G. Dovetail anchor slots shall be positioned accurately and supported against displacement. Provide in precast or poured in place concrete where masonry units meet concrete wall or column.
- H. With prior approval from the Engineer, the Contractor may use an approved epoxy anchoring system to install specific dowels in hardened concrete in accordance with the epoxy manufacturers installation instructions.

3.04 JOINTS:

- A. Construction Joints: Locate and install construction joints, which are not shown on the drawings, so as not to impair the strength and appearance of the structure as acceptable to the Engineer.
- B. Provide keyways at least 1¹/₂" deep by 1/3 member thickness in all construction joints in walls, slabs and between walls and footings or as otherwise detailed on drawings.
- C. Waterstops: Install where indicated in maximum practical lengths. Develop effective water-tightness at joints full equal to that of the continuous material and 50 percent of the mechanical strength.
- D. Place construction joints perpendicular to the main reinforcement. Continue all reinforcement across construction joints.
- E. Isolation joints in Slabs-on-Ground: Construct isolation joints in slabs on ground at all points of contact between slabs on ground and vertical surfaces

such as column pedestals, foundation walls, grade beams and elsewhere as indicated.

- F. Control Joints in Slabs-on-Ground: Joints to be held in straight alignment by whatever means necessary. Control joints to be saw cut within 8 hours of slab placement. Cuts to be 1/4 of slab depth. See plans for control joint layout.
- G. All joints shall be sealed with an appropriate joint sealant. Suitable for the use of the structure.

3.05 INSTALLATION OF EMBEDDED ITEMS:

- A. General:
 - 1. Set and built into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.
 - 2. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.
 - 3. With the Engineers Approval, Contractor may use an approved injected epoxy anchoring system for post pour installation of certain embeds.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain the required elevations and contours in the finished slab surface. Provide and secure units sufficiently strong to support the types of screed strips by the use of strike-off templates or accepted compacting type screeds.

3.06 CONCRETE PLACEMENT:

- A. Pre-Placement Inspection: Before placing concrete, inspect and complete the formwork installation, reinforcing steel and items to be embedded or castin. Notify other crafts to permit the installation of their work; cooperate with other trades in setting such work as required. Thoroughly wet wood forms immediately before placing concrete as required where form coatings are not used.
- B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

- C General: Comply with ACI 304 and as herein specified.
 - Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.
 - 2. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 - 3. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices for ACI 309 to suit the type of concrete and project conditions.
 - 4. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the placed layer of concrete and at least 6" into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.
 - 5. Chuting: Provide equipment of proper size and design to insure continuous flow of concrete in chute. Minimum slope of 1 to 3 and maximum of 1 to 2 horizontal. Provide spout and baffles at discharge and to prevent segregation of concrete. Do not allow free fall in excess of 5 ft. Keep lower end of spout as close as possible to surface.
 - 6. Fresh to Hardened Concrete: All existing concrete surfaces to receive fresh concrete shall be coated with an approved bonding agent.
 - 7. Existing joints shall be mirrored in any applied fresh concrete. Joints shall be treated with appropriate joint sealing compound.

- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.
 - 1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Bring slab surfaces to the correct level with a straightedge and strikeoff. Use bull floats or darbies to smooth the surface leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.
 - 3. Maintain reinforcing in the proper position during concrete placement operations.
- E. Cold Weather Placing:
 - 1. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions or low temperatures in compliance with ACI 306 and as herein specified.
 - 2. When air temperature has fallen to or is expected to fall below 40°F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50°F and not more than 80°F at point of placement.
 - 3. Do not use frozen materials or materials containing ice or snow.
 - 4. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 5. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- F. Hot Weather Placing:
 - 1. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
 - 2. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F for Type I cement and below 95°F for Type II cement. Mixing water may be chilled or chopped ice may be

used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing.

3. Cover reinforcing steel with water soaked burlap if it becomes too hot so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

3.07 FINISH OF FORMED SURFACES:

- A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work, unless otherwise indicated. This concrete surface shall have the texture imparted by the form facing material used. Tie holes and defective areas shall be repaired and patched and fins and other projections exceeding 1/4" in height shall be rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed to view, or that are to be covered with a coating material applied directly to the concrete, or a covering material applied directly to the concrete, or a covering material bonded to the concrete, such as waterproofing, dampproofing, painting or other similar system. Smooth form finish is the as-cast concrete surface as obtained with selected smooth form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas such as voids and pockets. All fins or other projections shall be completely removed and smoothed.
- C. Smooth Rubbed Finish: Provide smooth rubbed finish to exposed concrete surfaces, which have received smooth form finish treatment, no later than the day after form removal. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At top of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continuous final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise shown.
- E. Edges: Chamfer exposed corners and edges as shown using wood, metal, PVC or rubber chamfer fabricated to produce uniform smooth lines and tight edge joints. Chamfer to be 3/4" unless otherwise noted.

3.08 CONCRETE CURING AND PROTECTION:

A. General: Comply with ACI 308. Protect freshly placed concrete from premature drying and excessive cold or hot temperature and maintain

without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening.

- 1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- 2. Begin final curing procedures immediately following initial curing, after removal of forms and before concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- 3. Low water cement ratio (≥0.45) concrete shall receive special attention during the curing process to prevent plastic shrinkage cracking. The Contractor shall fog or otherwise wet the concrete continuously until material strengths are achieved.
- B. Curing shall continue for a period of 28-days or until design strengths are achieved, unless otherwise directed by Engineer.
- C. Curing Methods: Perform curing of concrete by moist curing or by moistureretaining cover curing or by membrane curing, or by combinations thereof, as herein specified.
 - 1. Provide moisture curing by following methods.
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Continuous water-fog spray.
 - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges with a 4" lap over adjacent absorptive covers.
 - 2. Provide moisture-cover curing by covering concrete surfaces with moisture-retaining cover for curing concrete, placed is widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Provide membrane curing to slabs as follows:
 - a. Apply pigmented membrane-forming curing compound to concrete surfaces as soon as final finishing operations are

complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Re-coat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

- b. Do not use membrane curing compounds on surfaces which are to be covered with a coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to the Engineer. Use moisture cure as previously specified.
- D. Curing Vertical Construction:
 - 1. Concrete form ties may be loosened 24-hours after completion of pour provided concrete surface is adequately hardened to prevent damage.
 - 2. Water shall be applied to the top of wall allowing water to run down the inside of the formwork as soon as the concrete has adequately hardened to prevent surface damage.
 - 3. Immediately following form removal, surfaces should be kept continuously moist until curing compounds or mats are applied.
- E. Curing Other Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- F. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of the appropriate curing compound.
 - 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- B. Curing Methods: Perform curing of concrete by moist curing or by moistureretaining cover curing or by membrane curing, or by combinations thereof, as herein specified.
 - 1. Provide moisture curing by following methods.
 - a. Keep concrete surface continuously wet by covering with water.

- b. Continuous water-fog spray.
- c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges with a 4" lap over adjacent absorptive covers.
- 2. Provide moisture-cover curing by covering concrete surfaces with moisture-retaining cover for curing concrete, placed is widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- 3. Provide membrane curing to slabs as follows:
 - a. Apply pigmented membrane-forming curing compound to concrete surfaces as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Re-coat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - b. Do not use membrane curing compounds on surfaces which are to be covered with a coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to the Engineer. Use moisture cure as previously specified.
- C. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of the appropriate curing compound.

3.09 SHORES AND SUPPORTS:

A. Design, furnish, and install all temporary shoring and supports necessary to complete the Work.

- B. Comply with ACI 347 for shoring and reshoring in multistory construction and as herein specified.
 - 1. Extend shoring from ground to second floor.
 - 2. Shore floor directly under the floor being places so that loads from construction above will transfer directly to these shores. Space out shoring in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums if required to ensure the proper distribution of loads throughout the structure.
 - 3. Remove shores and reshore in a planed sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support the work without excessive stress or deflection.
 - 4. Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until the concrete has attained its required 28 day strength and heavy loads due to construction operations have been removed.

3.10 REMOVAL OF FORMS:

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing not less than 50°F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beams, soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete location or members. Reshore per above for minimum 14 days.

3.11 RE-USE OF FORMS:

- A. Clean and repair surfaces of forms to be re-used in the work. Split, frayed delaminated or otherwise damaged from facing material will not be acceptable. Apply new form coating compound material to concrete contact form surfaces as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance and tighten forms to close joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces except as acceptable to the Engineer.

3.12 MISCELLANEOUS CONCRETE ITEMS:

- A. Filling-in: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified to blend in-place construction. Provide other miscellaneous concrete filling shown or required to complete the work. A latex bonding agent is to be used on all repair surfaces.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations; comply with certified diagrams or templates of the manufacturer furnishing machines and equipment.

3.13 CONCRETE SURFACE REPAIRS:

- A. Surface Preparation: Concrete surface shall be cleaned of all existing surface treatments, loose particles, oil, dust and other contaminate prior to placement of any repair material or coating.
- B. Patching Defective Areas: Repair and patch defective areas with epoxy resin cement mortar. Use in accordance with manufacturer's recommendations.
- C. Cut out voids over 1/4" in any dimension down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar or proprietary patching compound, thoroughly clean. Dampen with water and brush-coat the area to be patched with approved proprietary bonding agent.
- D. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Engineer. Surface defects include cracks, spalls, void pockets, and other projections or indentations on surface.
- E. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and brush with concrete bonding agent.
- F. Repair isolated random cracks by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and brush with concrete bonding agent. Mix dry-pack, consisting of one part Portland cement to 2½ parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place. Keep patched areas continuously moist for not less than 72 hours.

G. Use epoxy-based mortar for structural repairs where directed by the Engineer. Repair methods not specified above may be used only with specific approval of the Engineer.

3.14 QUALITY CONTROL TESTING DURING CONSTRUCTION:

- A. Notify testing laboratory of time and place of each concrete placement requiring testing. Allow adequate time between notification and placement for testing laboratory personnel to arrive at site approximately 3 hours in advance of concrete placement.
- B. Sampling and testing for quality control during the placement of concrete shall include the following:
 - 1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
 - 2. Slump: ASTM C143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens. Test concrete shall be taken from the middle of each load.
 - 3. Air Content: ASTM C231 pressure for normal weight concrete; one for each set of compressive strength test specimens.
 - 4. Concrete Temperature: Test hourly when air temperature is 40°F and below, and when 80°F to 90°F; and each time a set of compression test specimens are made. When air temperature is above 90°F, test temperature of mix on arrival and retest in chute every 15 minutes. Do not place concrete when mix is above 95°F.
 - 5. Compression Test Specimens: Field molded (ASTM C31) and laboratory cured (ASTM C192); one set of 4 standard cylinders for each 50 cubic yards or fraction thereof of each concrete class placed in any one day. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
 - 6. Compressive Strength Tests: ASTM C39; 1 specimen tested at 7 days; 2 specimens tested at 28 days; and one specimen retained in reserve for later testing.
 - 7. When the total quantity of a given class of concrete is less than 50 cubic yards, the strength tests may be waived by the Engineer if, in his judgement, adequate evidence of satisfactory strength is provided.
- C. Test results will be reported in writing to the Engineer, the Owner and the Contractor on the same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date

of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials, breaking strength and type of break for both 7-day test and 28-day test.

- D. Additional Tests: The testing service will make additional test of in-place concrete when test results indicate the specified concrete strengths and other characteristics have not been attained in the structure as directed by the Engineer. The testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is to be verified.
- E. Acceptance of Results: The strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:
 - 1. Every arithmetic average of any three consecutive strength tests equals or exceeds the design strength (f 'c).
 - 2. No individual strength test (average of two cylinders) falls below f'_c by more than 500 psi (3.45 MPa) when f'_c is 5,000 psi (34.45 MPa) or less, or by more than 0.10 f'_c when f'_c is more than 5,000 psi.
- F. Repair or replacement of defective concrete will be subject to the Engineer in accordance with ACI 318.5.6.5 (Investigation of Low Strength Test Results). The cost of additional testing and/or replacement of defective concrete shall be borne by the Contractor.

END OF SECTION
MORTAR AND GROUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The General Provisions of the Contract, including the General Requirements, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.

1.02 SCOPE:

- A. Work Included in this Section:
 - 1. Mortar for brick masonry work (standard grey color).
 - 2. Grout.

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM), Latest Editions:
 - 1. C91, "Masonry Cement"
 - 2. C94, "Standard Specification for Ready-Mixed Concrete"
 - 3. C144, "Standard Specification for Aggregate for Masonry Mortar"
 - 4. C150, "Standard Specification for Portland Cement"
 - 5. C207, "Standard Specification for Hydrated Lime for Masonry Purposes"
 - 6. C270, "Standard Specification for Mortar for Unit Masonry"
 - 7. C404, "Standard Specification for Aggregates for Masonry Grout"
 - 8. C476, "Grout for Masonry"
 - 9. C780, "Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry"
 - 10. C1019, "Standard Test Method for Sampling and Testing Grout"

1.04 SUBMITTALS:

- A. Quality Assurance/Control:
 - 1. If pre-mixed wet mortar or pre-blended dry mortar mix are to be used, provide certification from Manufacturer or Supplier verifying that mixes meet Contract Document requirements.
 - 2. If site mixed/blended mortar is to be used, provide written description of proposed method of measuring and mixing of materials.
- B. Certified Results of Compressive Tests.

- C. Mix Designs.
- D. Comply with Section 01300.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Cementitious Materials:
 - 1. Masonry Cement shall conform to ASTM C91, Type N
 - 2. Portland Cement:
 - a. Masonry Grout: ASTM C150, Type II
 - b. Masonry Mortar: ASTM C150, Type II
- B. Hydrated Lime shall conform to ASTM C207, Type N.
- C. Sand shall be clean Builder's Sand. Conforming to ASTM C144.
- D. Aggregate: Aggregate for masonry grout shall conform to requirements of ASTM C404.
- E. Water shall be clean, potable and free from deleterious amounts of alkalies, acids, or organic materials.

2.02 MIXES:

- A. Mortar shall conform to ASTM C270, Type "N" per Drawings.
 - 1. Minimum Compressive Strength: 750 psi.

PART 3 - EXECUTION

3.01 MIXING:

- A. Mix in a mechanically operated mortar mixer for a minimum of three minutes.
- B. Measure ingredients by volume. Measure by the use of a container of known capacity.
- C. Mix water with dry ingredients in sufficient amount to provide a workable mixture which will adhere to vertical surfaces of masonry units.

- D. Re-temper material that has lost water through evaporation by adding clean, potable water until plasticity and workability is restored. Do not re-temper material that is more than 1-1/2 hours old.
- E. Discard mortar that has reached its initial set or has not been used within 1-1/2 hours.
- F. Pointing Mortar:
 - 1. Mix dry ingredients with enough water to produce a damp mixture of workable consistency which will retain its shape when formed into a ball.
 - 2. Allow mortar to stand in dampened condition for one to 1-1/2 hours.
 - 3. Add water to bring mortar to a workable consistency prior to application.
- **3.02 INSPECTION:** Provide inspection clean-out holes at the bottom of all cells with vertical reinforcement when high-lift grouting (over 5 ft. high) is used.

END OF SECTION

MASONRY REPOINTING AND RECONSTRUCTION

PART 1 GENERAL

1.01 SUMMARY:

- A. Section Includes:
 - 1. Removal of all prior Portland cement replacement mortar, including pointing and reconstruction.
 - 2. Raking out of all unsound mortar from all exterior brick joints.
 - 3. Repointing of exterior brick joints.

1.02 REFERENCES:

- A. American Society for Testing and Materials:
 - 1. ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 2. ASTM C141 / C141M Standard Specification for Hydrated Hydraulic Lime for Structural Purposes.
 - 3. ASTM C144 Standard Specification Aggregate for Masonry Mortar.

1.03 SUBMITTALS:

- A. Product Data:
 - 1. Natural Hydraulic Lime: Product Data Sheets.
 - 2. Aggregate: Sieve Analysis.

1.04 QUALITY ASSURANCE:

A. Installer: Work must be performed by a firm having not less than 5 years successful experience in comparable masonry restoration projects and employing personnel skilled in the restoration process and operations indicated.

- B. Masons:
 - 1. Raking, repointing, removal, material salvage, and finishing operations shall be performed by craftspersons who are familiar with historic lime mortar formulations, curing conditions and performance characteristics. Contractor shall provide proof of such knowledge.
 - 2. Only skilled journeymen masons who are familiar and experienced with the materials and methods specified and are familiar with the design requirements shall be used for masonry restoration.
- **1.05 APPROVALS:** Retain Owner's approval of completed work. Owner shall provide reasonable judgement/acceptance of the completed work. Any unsatisfactory work shall be removed and replaced.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to site and store in manufacturer's original unopened containers and packaging.
- B. Protect restoration materials during storage and construction from adverse conditions.

1.07 PROJECT CONDITIONS:

- A. Do not perform any masonry application unless air temperature are between 40 degrees Fahrenheit and 85 degrees Fahrenheit and will remain so for at least 48 hours after completion of work or provide proper protection.
- B. Provide sun, wind and rain protection.

PART 2 – PRODUCTS

2.01 MORTAR MATERIALS, MIXES, ETC.: See Specification Section 04100.

2.02 TOOLS AND ACCESSORIES:

- A. Shims: Hard Plastic; removable; size and shape as required for temporary support of brick.
- B. Chisels: Carbide-tipped stone carving chisels.
 - 1. Hand Chisels.
 - 2. Barre $\frac{1}{2}$ " type B short stroke pneumatic carving tool.

- C. Pointing Irons: Width slightly less than joint width. Various widths required to suit project conditions.
- D. Brushes of various sizes for cleaning raked-out joints.
- E. Garden sprayer, water hose, and shop-type vacuum for cleaning raked-out joints.
- F. Hand water mister bottle and garden sprayer for curing, cleaning, and finishing pointed joints.
- G. Grinders:
 - 1. Blade width limited to 1/16".
 - 2. Equip grinders with source extraction vacuum units to contain dust.
- H. Mortar Injectors: For full-depth pointing, if Contractor so elects, Contractor will be permitted to use powered injection equipment of suitable design, providing that Contractor demonstrates that joints can be completely filled and compacted to the same degree as accomplished by hand placement of mortar by conventional methods. Where mortar injectors are employed, the final 5/8" shall be placed by hand.
- I. Mixing Equipment: Standard paddle mixer for mixing mortar.
- J. Other tools as necessary for the Work.

PART 3 – EXECUTION

3.01 EXAMINATION:

- A. Examine conditions, with installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.
- B. Do not proceed until unsatisfactory conditions have been corrected.
- C. Before removing any deteriorated work, establish bonding patterns, levels, and coursings.

3.02 PROTECTION:

A. Prevent repointing mortar from staining the face of masonry or other surfaces to be left exposed. Remove repointing mortar that comes in contact with such surfaces.

- B. Cover partially completed work when work is not in progress.
- C. Protect sills, ledges and projections from droppings.
- **3.03 TEMPORARY SUPPORT:** Provide temporary support where necessary to prevent displacement of brick during repointing and until mortar has achieved sufficient strength.

3.04 REMOVING ANCHORS:

- A. Remove and discard anchors, nails, pins, and similar devices.
- B. Remove ferrous material completely. Do not allow portions to remain embedded.
- C. Point hole with mortar.

3.05 REMOVING JOINT SEALANT FROM JOINTS:

- A. Cut out joint sealant with a caulking cutter (Fein tool) assisted by hand tools.
- B. Trim joint sealant from joint faces.
- C. Grind remaining sealant from joint faces without appreciably widening joint width or altering appearance of units. Leave edges of units square and perpendicular to exposed face of unit. Do not round off edges of units.
- D. Vigorously scrub joint faces with a stiff brush to remove embedded dust and debris from joint faces, followed by vacuuming, working from top to bottom of wall.
- E. Remove existing underlying mortar to the depth specified prior to repointing.

3.06 REMOVING EXISTING MORTAR:

- A. Existing horizontal mortar joints (bed joints) that are pointed with a Portland cement mortar may be raked out by a skilled mason by carefully scoring the center of the mortar joint with a rotary grinder to relieve the stress on the joint. The remaining mortar in head and bed joints shall be removed to the required depth using hard or pneumatic stone carving chisels or by hand. Do not grind the mortar from the face of the joints.
- B. Vertical joints (head joints) shall not be raked out using a grinder. All vertical head joints must be removed by hand in brickwork.

- C. All joints shall be raked back to sound, solid, back up material. Raking out shall leave a clean, square face at the back of the joint to provide for maximum contact of pointing mortar with the masonry back up mortar. Shallow or feather edging will not be permitted.
- D. Existing historic lime-based mortar shall be removed using only smallheaded hand or pneumatic stone carving chisels that are no wider than half the width of the existing masonry joints.
- E. Do not widen the existing masonry joints. Do not spall or chip the surrounding masonry edges in the process of mortar removal. Damage to surrounding brick resulting from rotary blade over running shall not be permitted. Contractor shall replace brick damaged during mortar removal with replacement units that match the original as determined by the Engineer.
- F. Brush joint faces and vacuum debris from joint to remove dirt and loose debris, working from top to bottom of wall.

3.07 MORTAR REMOVAL DEPTH:

- A. Existing mortar joints shall be raked out to a whichever depth is greatest:
 - 1. 5/8 inch.
 - 2. 2-1/2 times the width of the existing mortar joint.
 - 3. The depth necessary to remove previously pointed Portland cement mortar.
 - 4. Until bonded, cohesive existing lime mortar is encountered.

3.08 FULL DEPTH POINTING:

- A. Provide temporary support where necessary to prevent displacement of brick during repointing and until mortar has achieved sufficient strength.
- B. Where required to maintain support of units, rake out and repoint each unit in stages, allowing freshly repointed portions to cure sufficiently before raking out and repointing remaining portion of joints supporting the unit.
- C. Remove temporary shims and supports when no longer necessary, and repoint voids left by temporary shims and supports.

3.09 PREWETTING:

- A. Brush joint faces and flush out joints with water to remove dirt and loose debris, working from top to bottom of wall. Rinse brick joints with water to remove dust and mortar particles. Thoroughly wet wall below to avoid soiling. Joint surfaces should be damp but free from standing water.
- B. Prior wetting is necessary to achieve the proper absorption rate before masonry repair commences and is essential to good masonry practice. Presoak walls and joints with water as required by project and weather conditions. During hot or windy weather, wet walls and joints several times in advance of pointing. Re-wet walls and joints yet to be pointed if masonry dries out before pointing. Masonry units shall be damp but without standing water at the time of pointing.
- C. Maintain hand mister bottles or a garden sprayer with clean, clear, potable water immediately available to masons at all times during the repointing process. A very low pressure spray (garden hose with nozzle adjusted to a fine, low-volume mist) may be used over large areas providing erosion of joints is prevented.
- D. Exposed surface of masonry adjacent to joint shall be wet prior to repointing.

3.10 REPOINTING OF MORTAR JOINTS:

- A. Joints shall be pointed in layers or "lifts" where the joints are deeper than 3/4 inch.
 - 1. Joints greater than 3/4 inches deep shall be pointed with an initial lift to bring the joint depth to a uniform 3/4 inches deep.
 - 2. Compact each layer at the time it is placed in the joint by applying firm pressure with the pointing tool.
 - 3. Allow each lift to become thumbprint hard before applying the next lift.
- B. Finish joints uniformly. Do not overwork. Leave the surface of the masonry clean.

3.11 CLEANING:

A. Maintain clean surfaces on the face, sills, ledges, and projections of masonry on a daily basis.

- B. With a trowel, strike off minor dabs of adherent mortar from face of masonry.
- C. Remove minor mortar marks from masonry by misting with water and brushing with a small, stiff-bristle brush.

3.12 CURING:

- A. Keep mortar from drying out too quickly.
- B. Mist walls with water as required by project and weather conditions to ensure slow curing of the lime mortar.

END OF SECTION

RAILINGS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. The extent of Railings is shown on the Drawings and indicated herein.
- B. The work includes:
 - 1. All hand railing as shown, implied or required for the new stairs, platforms, and structures.
 - 2. Kick plate.
 - 3. Connection members and fasteners.
- C. Related Work Specified Elsewhere:
 - 1. Concrete: Section 03310.

1.02 QUALITY ASSURANCE:

- A. Codes and Standards:
 - 1. Florida Building Code, 5th edition.
 - 2. ANSI A117.1, Standard For Accessible and Usable Buildings and Facilities.
 - 3. OSHA Part 1920.23 and 1910.24
 - 4. Florida Fire Prevention Code, latest edition
 - 5. AWS "Structural Welding Code"
- B. Acceptable Fabricator: Minimum 5 years experience in the fabrication of aluminum stairs, platforms and railings.
- C. Aluminum work shall be fabricated of plates and rolled or extruded shaped conforming (unless otherwise approved) to the following alloy designations of the Aluminum Co. of America, or approved equal:

Rolled and Structural Shapes	6061-T6
Extruded Shapes	6063-T5/6
	6061-T6
Kick Plate	6063-T6
Railings & Posts	6105-T5
	Rolled and Structural Shapes Extruded Shapes Kick Plate Railings & Posts

- D. The Contractor shall furnish to the Engineer a certified statement from the fabricator that all aluminum work furnished is of the approved alloys.
- E. Coat all aluminum to Class I anodized finish.

1.03 SUBMITTALS:

- A. Shop Drawings:
 - 1. Indicate profiles, sizes, alloy, temper, connection attachments, reinforcing, anchorage, openings, size and type of fasteners, accessories and finish or coating.
 - 2. Include erection drawings, elevations, and details where applicable.
 - 3. Indicate welded connections using standard AWS welding symbols.
 - 4. Indicate net weld lengths.
 - 5. Manufacturer's descriptive literature.

1.04 DESIGN CRITERIA

- A. Live Load (unless otherwise noted):
 - 1. Railings 50 plf (applied horizontally to top rail) plus 100 plf applied vertically

200 lb. concentrated load applied to any point along top rail in any direction (non-concurrent)

B. Dead Load: Use actual material weights.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. The general dimensions and details of the aluminum work is indicated on the drawings, but the Contractor shall be responsible for the correctness of the details and shall carefully check the same in order to avoid possible errors.
- B. Fabricate with joints tightly fitted and secured.
- C. Fit and shop assemble sections in largest practical sizes, for handling through building openings.

D. Grind exposed welds flush and smooth with adjacent finished surface.

2.02 WORKMANSHIP:

- A. Aluminum shall be well formed to shape and size with sharp lines and angles. Shearing and punching shall leave clean, true lines and surfaces. Permanent connections shall be welded or riveted.
- B. The workmanship shall conform to the best practice and shall be subject to the approval of the Engineer. Where welding is used, it shall conform to the current requirements of the American Welding Society for the type of work in question.

2.03 ALUMINUM HANDRAILS:

- A. Handrails shall be the product of a company normally engaged in the manufacture of pipe railing. Railing shall be shop assembled in lengths not to exceed 24 feet for field erection.
- B. Handrails shall be designed to withstand design loads applied in any direction to the top rail.
- C. The manufacturer shall submit calculations to the Engineer for approval. Testing of base castings or base extrusions by an independent lab or manufacturer's lab (if manufacturer's lab meets the requirements of the Aluminum Association) will be an acceptable substitute for calculations. Calculations will be required for approval of all other design aspects.
- D. Post spacing shall be a maximum of 6'-0". Post and railings shall be a minimum of 1-1/2" Schedule 40 aluminum pipe alloy 6105-T5, their posts are of adequate strength to meet the loading requirements. If the manufacturer's posts are not of adequate strength, the manufacturer may reduce the post spacing or add reinforcing dowels or may do both in order to meet loading requirements.
- E. The handrail shall be made of pipes joined together with component fittings. Components that are pop-riveted or glued at the joints will not be acceptable. All components must be mechanically fastened with stainless steel hardware.
- F. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations. The top surface of the top railing shall be smooth and shall not be interrupted by projecting fittings. "Speed Rail" type fittings will not be accepted.

- G. The midrail at a corner return shall be able to withstand design concentrated loads without loosening. The manufacturer shall determine this dimension for their system. Provide physical tests from a laboratory to confirm compliance.
- H. Expansion bolts shall be spaced 10d apart and 5d edge distance for no reduction in pullout strength. A safety factor of 4 shall be used on expansion bolt pullout values published by the manufacturer. Expansion bolts shall be stainless steel type 304 wedge bolts and shall be furnished by the handrail manufacturer.
- I. Toe plate shall conform to OSHA standards. Toe plate shall be a minimum of 4" high and shall be an extrusion that attaches to the posts with clamps which will allow for expansion and contraction between posts. Toe plates shall be set 1/4" above the walking surface. Toe plates shall be provided on handrails as required by OSHA and/or as shown on drawings. Toe plates shall be shipped loose in stock lengths with pre-manufactured corners for field installation.
- J. Openings in the railing shall be guarded by a self-closing gate. Safety chains shall not be used unless specifically shown on drawings.
- K. Finish: Clear, Class I, anodized finish, matte, non-directional, minimum 0.7 mil minimum coating, unless otherwise indicated.
- L. Railings shall extend one tread width beyond the final nosing at the bottom of the stairway and 12" at the top.
- **2.04 FASTENERS:** All clamps, clips, bolts nuts and washers shall type 316 stainless steel unless otherwise noted.
- 2.05 NEOPRENE BEARING PADS: 1/4" random oriented fiber, rubber coated fabric (80% duck cloth and synthetic rubber) with Teflon. Acceptable products: Korolath, or equal.
- **2.06 OTHER ITEMS:** Other items of the miscellaneous nonferrous metalwork not particularly specified shall be of the shape, size, details and finish indicated on the drawings or suitable for the purpose, as approved.

PART 3 - EXECUTION

3.01 EXAMINATION: Installer must examine the areas and conditions under which items are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 PREPARATION: Furnish setting drawings, diagrams, templates, instructions and directions for the installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate the delivery of such items to the project site.

3.03 GENERAL INSTALLATION:

- A. Fastening to In-Place Construction:
 - 1. Provide anchorage devices and fasteners where necessary for securing rail items to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, and other connectors as required.
 - 2. Use manufacturer's standard methods of installation when acceptable to the Engineer.
- B. Cutting, Fitting, and Placement:
 - 1. Perform cutting, drilling and fitting required for installation. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.
 - 2. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Grind joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of units which have been coated or finished after fabrication and are intended for field connections. Adjust items prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length.
- C. Field Welding: Comply with AWS Code for the procedures of manual shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

3.04 **PROTECTION**:

A. Aluminum surfaces which, after erection, would otherwise be in contact with concrete or brick masonry shall be protected from contact therewith by a coat of Socony 35J6, Armstrong Zinc Chromate Alkyd primer, or approved equal. Areas where this coating has been damaged by abrasion or other causes shall be cleaned and recoated so that the aluminum will have a complete, protective paint film when brought into contact with the material against which it is being protected.

- B. Before application of the coating, the surface shall be cleaned free of all dirt, heavy deposits of grease or oil, and other foreign substances; immersed in or swabbed with a solution of phosphoric acid and organic solvents such as Deoxidine No. 670, Sol-Klean No. 110-3, or Oakite No. 35, diluted with water in the ratio of 1:3, and then rinsed with clear water and thoroughly dried. The cleaning solution shall then be at a temperature between 50°F and 90°F and shall remain in contact with the metal (without being allowed to dry) for at least five minutes. On sections more than 1/8-inch thick, a mild sandblast may be used in lieu of the solution-rinsing procedure specified above.
- C. Where aluminum is to be used in connection with dissimilar metals, suitable insulation, such as impregnated roofing felt, shall be provided between contact surfaces so as to eliminate direct contact and the resultant electrolysis, or the aluminum surface shall be cleaned and painted with the coatings specified above.
- D. Where indicated on Drawings, aluminum bearing surfaces shall be protected by neoprene bearing pads. Pads shall be continuous for the entire width and length of the bearing area.
- E. During construction, care shall be taken to prevent damage to the aluminum work from splashing or the accumulation of paint, concrete, mortar, etc.
- **3.05 CLEANING:** After aluminum has been erected, it shall be cleaned by use of a mild soap and water, followed by a clear water rinse.
- **3.06** COMPLETED PRODUCT: Shall meet all Federal standards for Health and Safety.

END OF SECTION

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 QUALITY ASSURANCE:

- A. Factory-mark each piece of lumber with type, grade, mill and grading agency identification.
- B. Comply with applicable sections of American Lumber Standard Committee (ALSC), American Society of Testing & Materials (ASTM), American Wood Preservers' Association (AWPA), National Timber Piling Council, Inc. (NTPC), AWPI and APA.

1.02 REFERENCES:

- A. 6th Edition Florida Building Code (FBC) With Revisions.
- B. Minimum Design Loads for Buildings & Other Structures (ASCE 7-16).
- C. American Wood Council (AWC): National Design Specification.

1.03 SUBMITTALS:

- A. Provide manufacturers product data for all posts, beams and headers. Include lumber species, grade, allowable stresses, load tables, installation requirements and instructions as applicable.
- B. Provide chemical used and saturation rate for all pressure treated material.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Dimension Lumber:
 - 1. Meet requirements of PS 20-70 and National Grading Rules for softwood dimension lumber.
 - 2. Bear stamp of WWPA, SPIB, or other association recognized by American Lumber Standards Committee identifying species of lumber by grade mark or by Certificate of Inspection.

- 3. Lumber 2 inches or less in nominal thickness shall not exceed 19 percent in moisture content at time of fabrication and installation and be stamped 'S-DRY', 'K-D', or 'MC15'.
- 4. Lumber shall be S4S.
- 5. Pressure Treated Top Plates & Sills:
 - a. 2x4: Standard and better Douglas Fir, Southern Pine, HemFir
 - b. 2x6 And Wider: No. 2 Douglas Fir, Southern Pine, HemFir
 - c. Permanently identify treated lumber with name of inspection agency, preservative used, name of treating plant, retention in lbs/cu ft, and suitable end use.
 - d. Treat pressure treated material in accordance with American Wood Preservers Association (AWPA) requirements
- B. Anchorage and Fastening Materials: If not otherwise shown on the drawings, select proper type, size, material and finish for each application. Comply with the following:
 - 1. Nails and Staples: FS FF-N-105
 - 2. Tacks: FS FF-N-103
 - 3. Wood Screws: FS FF-S-111
 - 4. Bolts and Studs: FS FF-B-575
 - 5. Washers: FS FF-W-92
 - 6. Lags Screws and Lag Bolts: FS FF-B-561
 - 7. Masonry Anchoring Devices for expansion shields, nails and drive screws, comply with: FS FF-S-235
 - 8. Toggle Bolts: FS FF-B-588
 - 9. Bar or Strap Anchors: ASTM A 575 carbon steel bars
- C. All fasteners to be used in Pressure Treated Lumber which is treated with alkaline copper quat (ACQ Types B and D) or copper azole (CBA-A, CA-B) shall be hot dipped galvanized (post fabrication) to a G185 rating or electro-galvanized to a Class 40 rating.

- D. Wall, Floor and Roof Sheathing:
 - 1. Meet requirements of PS 1-95, PS 2-92, PRP-108 (APA), or PRP-133 (TECO). Except where plywood is specifically indicated on Drawings, oriented strand board (OSB) is acceptable.
 - 2. Every sheet of sheathing shall be stamped as follows:
 - a. Appropriate APA, TECO, or PFS grade stamp identifying thickness and span rating.
 - b. Sheathing shall be stamped 'Sized for Spacing'.
 - c. Exposure 1 or Exterior.
 - 3. Sheathing shall not exceed 18 percent moisture content when fabricated nor more than 19 percent when installed in Project.
 - 4. Sheathing 3/4 inch thick and thicker used for single-layer subflooring shall be tongue and groove.
 - 5. Sheathing used for same purpose shall be of same thickness. Thicknesses specified are minimum required regardless of span rating.
 - 6. Minimum span ratings for given thicknesses shall be as follows:

Thickness	Span Rating
3/8 inch	24/0
15/32 inch actual	32/16
1/2 inch nominal	32/16
19/32 inch actual	40/20
5/8 inch nominal	40/20
23/32 inch actual	48/24
3/4 inch nominal	48/24

- 7. Nails:
 - a. 3/8 inch panel: 8d common
 - b. 15/32 inch and thicker panels: 10d common.

PART 3 - EXECUTION

3.01 FRAMING INSTALLATION:

- A. General:
 - 1. Set Carpentry accurately to required levels and lines with members plumb and true.
 - 2. Securely attach carpentry work to substrates by anchoring and fastening as shown and as required by recognized standards.
- B. Fasteners:
 - 1. Nails:
 - a. Meet requirements of ASTM F 1667.
 - b. Unless noted otherwise, nails listed on Drawings or in Specifications shall be common nail diameter, except 16d nails shall be box diameter.
 - 2. Powder Actuated Fasteners:
 - a. Acceptable Manufacturers:
 - 1) Hilti, Tulsa, OK (800) 333-1150 or (918) 252-6000
 - 2) Ramset / Redhead Division of ITW, Wood Dale, IL (630) 350-0370
 - 3) Equals as approved by Architect through shop drawing submittal before installation.
 - 3. Wood Screws: Standard type and make for job requirements
 - 4. Do not wax or lubricate fasteners that depend on friction for holding power.
 - 5. Select fasteners of size that will not penetrate member where opposite side will be exposed to view or will receive finish materials.
 - 6. Make tight connections between members. Install fasteners without splitting of wood; predrill as required. Do not drive threaded friction type fasteners; turn into place.
 - 7. Tighten bolts and lag screws at installation and retighten as required for tight connections prior to closing in or at completion of work.
 - 8. Provide galvanized washers under bolt heads and nuts in contact with wood.

- C. Walls:
 - 1. Top Plates:
 - a. CMU: Double plate and all joints lapped. Stagger joints at least 48 inches. Lap at all corners and intersections.
 - 2. Nailing:
 - a. Stud To Sill Plate And Top Plate:
 - 1) Nominal Dimension Lumber Studs:

		End Nail	Toe Nail
a)	2x4	Two 16d	Four 8d
b)	2x6	Three 16d	Six 8d

- b. Top Plates: Spiked together with (2) 16d nails, 16 inches on center.
- c. Top Plate Laps: Lap members 48 inches minimum and nail with (4) 16d nails each side of lap.
- d. Top Plates: Intersections, three 16d.
- e. Backing And Blocking: Three 8d, each end.
- f. Built-Up Corner Studs And Angles: Face Nail 16d, 16 inches on center.
- D. Nailers, blocking and sleepers: Provide wherever shown and as required for attachment of other work. Form to shapes shown and cut as required for true line and level of work to be attached.
- E. Attach lumber materials to substrates securely with anchor bolts or other attachment devices as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.
- **3.02 CLEAN UP:** Remove and dispose of all unused scrap lumber, plywood, nails and other debris associated with this section.

END OF SECTION

BUILDING INSULATION

PART 1 - GENERAL

1.01 SUBMITTALS: Manufacturer's data and product certification including specifications and installation instructions must be submitted on each type of insulation.

PART 2 - PRODUCTS

2.01 MATERIALS: Sprayed on closed cell polyurethane Foam, R30 or 4 ½" thickness, whichever is greater.

PART 3 - EXECUTION

3.01 INSTALLATION: Install the work of this section in strict accordance with the original design, requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Engineer, anchoring all components firmly into position.

END OF SECTION

BITUMINOUS BUILT-UP ROOFING

PART 1 - GENERAL

1.01 DESCRIPTION:

This section includes bituminous built-up roofing, aggregate surfacing, with base flashing for repairs and alterations to existing construction.

1.02 APPLICABLE PUBLICATIONS:

- A. Applicable publications listed below form a part of this Specification as referenced. Publications are referenced in the text by the number designation only.
- B. American Society for Testing and Materials (ASTM), latest editions:

D41-94	Asphalt Primer Used in Roofing, Dampproofing and Waterproofing
D43	Coal Tar Primer Used in Roofing, Dampproofing and Waterproofing
D227	Coal-Tar Saturated Organic Felt Used in Roofing and Waterproofing
D312	Asphalt Used in Roofing
D450	Coal-Tar Pitch Used in Roofing, Dampproofing and Waterproofing
D1863	Mineral Aggregate Used on Built-Up Roofs
D2178	Asphalt Glass Felt Used in Roofing and Waterproofing
D3909	Asphalt Roll Roofing (Glass Felt) Surfaced with Mineral Granules
D4586	Asphalt Roof Cement, Asbestos Free
D4601	Asphalt Coated Fiberglass Base Sheet Used In Roofing
D4897	Asphalt Coated Glass Fiber Venting Base Sheet Used in Roofing
D6163	Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements
E108	Fire Tests of Roof Coverings
E119	Test Method for Fire Tests of Building Construction and Materials
F1667	Driven Fasteners: Nails, Spikes, Staples

C. FM Global (FMG):

P7825C	Approval Guide Building Materials
4450	Approved Standard for Class 1 Insulated Steel Deck Roofs
4470	Approved Standard for Class 1 Roof Coverings

D. National Roofing Contractors Association (NRCA):

"Quality Control Guidelines for the Application of Built-up Roofing." "The NRCA Roofing and Waterproofing Manual"

1.03 WARRANTY:

The replacement 'Roofing System' shall include a warranty period of five years.

1.04 QUALITY CONTROL:

- A. Applicator Qualifications: Installer experienced in installation of systems similar in complexity to that required for this Project, including specific requirements indicated:
 - 1. Work shall be performed by installer approved in writing by roofing material manufacturer.
 - 2. Work shall comply with printed instructions of the roofing materials manufacturer.
- B. Product/Material Qualifications:
 - 1. Provide manufacturer's label on each container or certification with each load of bulk bitumen, indicating Flash Point (FP), Finished Blowing Temperature (FBT), Softening Point (SP), Equiviscous Temperature (EVT).
 - 2. Provide manufacturer's certification that field applied bituminous coatings and mastics, and field applied roof coatings comply with limits for Volatile Organic Compounds (VOC) per the National Volatile Organic Compound Emission Standards for Architectural Coatings pursuant to Section 183(e) of the Clean Air Act with limits as follows:
 - a. Bituminous Coatings and Mastics: 4.2 lbs/gal.
 - b. Roof Coatings: 2.1 lbs/gal.
 - 3. Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system.

- C. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to built-up roofing for storage, handling and installation.
- D. FMG Listing: Provide roofing membrane, base flashing, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a roofing system and that are listed in FMG "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.
 - 1. Windstorm Classification: Class 120.

1.05 SUBMITTALS:

- A. Submit in accordance with Section 01300.
- B. Product Data:
 - 1. Asphalt materials, each type.
 - 2. Roofing cement, each type.
 - 3. Fastening requirements.
- C. Certificates:
 - 1. Indicate materials and method of application of roofing system meet requirements of FMG.
 - 2. Statements of qualification for manufacturers and installers.
 - 3. Inspection Report: Copy of roofing system manufacturer's inspection report certifying completed roofing complies with manufacturer's warranty requirements.
- D. Warranty: As specified in Part 1 of this Section:
 - 1. Warranty sample form with specific language to address Contract provisions.
- E. Contract Close-out Submittals:
 - 1. Maintenance Manuals.
 - 2. Warranty signed by installer and manufacturer.

1.06 DELIVERY, STORAGE AND MARKING:

A. Deliver roofing materials to the site in original sealed packages or containers marked with the name and brand or trademark of the manufacturer or seller.

- B. Keep roofing materials dry and store in a dry, weather-tight facility or under canvas covers. Do not use polyethylene or plastic covers to protect materials. Store above ground or deck level on wood pallets. Cover ground under pallet stored materials with plastic.
 - 1. Store rolled materials (felts, base sheets, and paper) on end. Do not store hems on top of rolled materials.
 - 2. Aggregates shall be maintained surface dry as defined by ASTM D1863.
- C. Protect from damage due to handling, weather and construction operations before, during and after installation.

1.07 ENVIRONMENTAL REQUIREMENTS:

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

PART 2 - PRODUCTS

2.01 ROOFING SYSTEM:

- A. Install built-up roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of NRCA "Quality Control Guidelines for the Application of Built-up Roofing."
- B. Glass sheet, asphalt bitumen, mineral surfaced.
 - 1. Substrate: Cast-in-place Concrete.
 - 2. Components: Quantity
 - a. Ventilating Base Sheet: 1 Ply
 - b. Ply Sheet: 3 Plies
 - c. Mineral Surfaced Cap Sheet: 1 Ply
 - d. Asphalt Between Substrate, Ventilating Base Sheet, and First Ply: 20-35 lbs/100 sq. ft.
 - e. Asphalt Between Each Ply 20-35 lbs/100 sq. ft.
 - 3. Provide asphalt quantities within the indicated ranges, unless recommended otherwise in the roofing materials manufacturer's printed data.

2.02 MATERIALS:

- A. Primer: ASTM D41.
- B. Base Sheet: ASTM D4601, Type II, nonperforated, asphalt-impregnated and coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.
- C. Venting Base Sheet: ASTM D4897, Type II, venting, nonperforated, heavyweight, asphalt-impregnated and -coated, glass-fiber base sheet with coarse granular surfacing or embossed venting channels on bottom surface.
- D. Asphalt: ASTM D312, Type III or IV for roof membrane. Use Type I for pour coat unless specified otherwise.
- E. Ply Sheet/Backer Sheet: ASTM D2178, Type VI, heavy-duty ply sheet.
- F. Cap Sheet: ASTM D3909, asphalt-impregnated and -coated, glass-fiber cap sheet, with white coarse mineral-granule top surfacing and fine mineral surfacing on bottom surface.
- G. Roof Cement: ASTM D4586, Type I.
- H. Flashing Sheet: ASTM D6163, Type I or II, glass-fiber-reinforced, SBSmodified asphalt sheet; granular surfaced; suitable for application method specified.

2.03 FASTENERS:

- A. Nails and Staples: ASTM F1667.
- B. Nails for Securing built-up Flashing and Base Sheets to Concrete Deck:
 - 1. Zinc coated steel roofing nails with knurled shank through metal discs at least one-inch across.
 - 2. One-piece nails with an integral flat cap at least 15/16-inch across.
 - 3. Low velocity powder actuated fasteners with 1" plate.
- C. Fasteners for Securing Wood:
 - 1. Zinc coated steel roofing nails, 5/8-inch minimum head diameter.
 - 2. Staples, Flat top Crown, zinc coated may be used.

- D. Nails for Plywood:
 - 1. Use annular thread type at least 3/4-inch penetration of plywood.
 - 2. 5/8-inch minimum head diameter.
 - 3. Nails with flat cap at least 15/16-inch across.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Examine existing roof, protect existing penetrations as required to allow for future connection to replacement roofing materials, and remove existing system to concrete decking.
- B. Following removal of existing roofing system, verify existing deck conditions: Examine substrates, areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion:
 - 1. Do not proceed until unsatisfactory conditions, including moisture, have been corrected.
 - 2. Do not install roofing materials over wet insulation.
 - 3. Do not install roofing materials unless roof openings, wood nailers, edge venting, insulation board, flashing, curbs, and roof joints are constructed.
 - 4. Do not install roof materials unless deck and/or insulation provides designed drainage to working drains.
- C. Uninsulated Concrete Decks, except Insulating Concrete:
 - 1. Test deck for moisture prior to application of roofing materials.
 - 2. Test by pouring one pint of hot bitumen at 400 degrees F. or EVT on deck at start of each day's Work and at start of each new roof area or plane. Do not proceed if test sample foams or can be easily (cleanly) stripped after cooling.
- D. Insulating Concrete:
 - 1. Allow deck to dry before installing materials.

- E. Do not apply roof system if roofed deck will be used as a work platform.
- F. Existing Intake Louvers:
 - 1. Use large fans during placement to direct airflow away from existing intake louvers.
 - 2. If required to install roof near intake louvers after work hours, it shall be done so without additional cost.

3.02 PREPARATION:

- A. Sweep substrate to broom clean condition. Remove all dust, dirt and debris.
- B. Remove surface irregularities that may damage materials or cause installation defects.
- C. Prime concrete deck or precast units.
 - 1. Keep primer back 4 inches from joints in precast units.
- D. Coordinate operations with roof insulation and sheet metal work to permit continuous roofing operations.

3.03 INSTALLATION:

- A. Comply with roofing system manufacturer's written instructions and applicable recommendations of NRCA "Quality Control Guidelines for the Application of Built-up Roofing."
- B. Cooperate with inspection and test agencies required to perform services in connection with built-up roofing system installation.
- C. General:
 - 1. Provide uniform and positive adhesion between all installed materials, including adhesion to insulation or substrate, and between each ply of felt.
 - 2. Substrate Penetrations: Do not allow bitumen to penetrate joints or enter building. Where mopping is applied directly to a substrate, tape joints. When applying steep asphalt, hold mopping back 2-inches from each side of joint.

- D. Asphalt Products Schedule:
 - 1. Use asphalt only with asphalt-saturated or asphalt-impregnated felts.
 - 2. Use Type I asphalt for pour coats up to 1:12 (one inch per foot) slope.
 - 3. Use asphalt roof cement with asphalt products.
- E. Bitumen Schedule:
 - 1. Per square, unless otherwise specified.
 - 2. Between substrate and plies of organic felt:
 - a. Asphalt 15 to 25 pounds.
 - 3. Between substrate and plies of glass fiber felts asphalt, 20 to 30 pounds.
 - 4. Glaze Coats:
 - a. Asphalt 15 to 25 pounds.
 - 5. Pour coats:
 - a. Asphalt 55 to 65 pounds.
- F. Heating Bitumen:
 - 1. Heat the asphalt to the equiviscous temperature (EVT) plus or minus 25 degrees F at the time of application.
 - a. Do not heat asphalt greater than 100 degrees F above the EVT.
 - When the EVT is not furnished do not heat asphalt above 475 degrees F for Type I and 525 degrees F for Type II and IV, with an application not less than 425 degrees F and 475 degrees F respectively.
 - 2. Do not heat bitumen above the flash point temperature.
 - 3. Provide heating kettles with a thermometer kept in operating condition. Attend, during heating, to insure the bitumen is heated within the temperatures specified.
 - 4. Do not mix different types of bitumen in kettle.

- G. Terminations:
 - 1. Where cants occur at vertical surfaces, cut off plies of membrane 2inches above top of cant strip, (except at prefabricated curbs, scuttles and other roof accessories having integral cants) extend membrane over cant and up vertical surface to top of curb or blocking.
 - 2. Where wood blocking occurs at roof edge, under gravel stops or penetrations to receive base flashing, nail a continuous strip of 16-inch wide, loose applied organic felt envelope over the blocking before the first ply sheet is applied.
 - a. Install strip on top of venting base sheet.
 - b. After membrane is installed, turn the dry felt back over the roofing and secure in place with hot bitumen before gravel stops or metal flanges extending onto the membrane are installed.
 - 3. Where fascia/cant occurs at roof edges, extend membrane beyond outside face and cut off after base flashing is installed. Do not cut off venting base sheet outside cant face, extend down over outer cant face to allow for venting.
- H. Venting Base Sheet:
 - 1. At vertical surfaces: Extend venting base sheet up vertical surface over cants to top of base flashing or curb.
 - 2. At roof edge under gravel stops install venting base sheet over blocking: Extend base sheet not less than 2-inches beyond outer edge and turn down to allow venting at the edge.
 - 3. At roof edge over fascia-cant: Extend base sheet over top of cant and turn down over outer face of cant to allow venting at the edge.
- I. Roof Ply Installation:
 - 1. Install, asphalt, glass fiber felt construction. Base sheet is not considered a ply.
 - 2. Extend the first ply 4-inches beyond the insulation and the second ply 3-inches beyond the first. Lap ends 3-inches with joints broken 18-inches in each ply.

- J. Laps for Felts and Base Sheet:
 - 1. Base sheet, lapped 2-inches.
 - 2. Three plies of felt with 12-inches, 24-inches, and 36-inch starting widths, lapped 24-1/2 inches.
 - 3. End joints of felt and base sheet, lapped 2-inches. Stagger end joints in relation to joints in adjacent and proceeding plies.
- K. Flashing:
 - 1. Prime vertical surfaces of masonry and concrete with asphalt primer except where vented base sheet is required to provide edge venting.
 - 2. Apply flashing on top of built-up roofing, up face of cant and vertical surfaces, at least 8-inches above the roof, full height beneath counter flashing or top of curb flashing:
 - a. At fascia-cants, extend to top of cant and cut off.
 - 3. Except at metal fascia cants, secure top edge of base flashing with nails on a line approximately one inch below top edge, spaced not more than 8-inches on center.
 - a. Cover all nail heads with roof cement.
 - 4. Install flashing using longest pieces practicable. Complete splices between flashing and main roof sheet before bonding to vertical surface. Seal splice not less than 3-inches beyond fasteners that attach membrane to blocking. Apply bonding adhesive to both flashing and surface to which flashing is being adhered per manufacturer recommendations. Nail top of flashing 12-inches on center under metal counter flashing or cap.
 - 5. Install flashing before final roofing coat and aggregate are installed.

END OF SECTION

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Metal flashing and trim.
- B. Gutters and downspouts.
- C. Miscellaneous sheet metalwork.

1.02 REFERENCES:

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

1.	ASTM A167	Specification for stainless and heat- resisting chromium nickel steel plate, sheet and strip.
2.	ASTM A653/A653M	Specification for steel sheet, zinc-coated (galvanized) or A653M zinc-iron alloy coated (galvannealed) by the hot-dip process.
3.	ASTM A924/A924M	Specifications for general requirements for steel sheet, metallic-coated by hot-dip process.
4.	ASTM B29	Specification for refined lead.
5.	ASTM B32	Specification for solder metal.
6.		
	ASTM B209	Specification for aluminum and aluminum-alloy sheet and plate.
7.	ASTM B209 ASTM B306	Specification for aluminum and aluminum-alloy sheet and plate. Specification for copper drainage tube (DWV).

B. Federal Specification (FS):

1.	FS TT-S-230	Sealing Compound: Elastomeric Type, single component (for caulking, sealing, and galvanizing in buildings and other structures).
2.	FS TT-S-1543	Sealing Compound: Silicone rubber base (for caulking, sealing, and glazing in buildings and other structures).
3.	FS UU-B-790	Building paper, vegetable fiber (kraft, waterproofed, water repellent and fire resistant).

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): SMACNA Architectural Sheet Metal Manual.

1.03 SUBMITTALS:

- A. General: Refer to Section 01300 Submittals, for submittal requirements and procedures.
- B. Shop Drawings and Product Data: Submit detailed Shop Drawings of metal flashing and sheet metalwork, including gutters and downspouts, and installation details. Include manufacturers' product data for materials and manufactured items.

1.04 QUALITY ASSURANCE:

- A. Flashing and sheet metalwork shall be fabricated and installed in accordance with SMACNA Architectural Sheet Metal Manual.
- B. Except where otherwise indicated, comply with minimum thickness or gauge requirements as specified in SMACNA Architectural Sheet Metal Manual.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Galvanized Sheet Metal: Standard galvanized steel sheet, meeting requirements of ASTM A653/A653M and ASTM A924/A924M, as applicable, with minimum zinc coating of 1.25 ounces per square foot and 0.2 percent copper bearing, and mill phosphatized for maximum paint adherence. Where sheet metal gauge is not indicated, provide 24 gauge.

- B. Stainless Steel: Stainless steel sheet for architectural applications, meeting the requirements of ASTM A167, Type 304 or Type 316, with No. 4 finish. Where stainless steel sheet gauge is not indicated, provide 26 gauge.
- C. Aluminum Sheet Metal: ASTM B209, 5005 or 3003-H14 aluminum alloy as appropriate, clear anodized or epoxy coated. Where aluminum sheet thickness is not indicated, provide 0.0201" thickness.
- D. Fasteners and Accessories: Furnish anchors and fasteners, washers, straps, and accessories required for a complete and finished installation. Fasteners and accessories shall conform with the following requirements:
 - 1. Nails shall be stainless steel, hard copper, bronze, or brass. Where sheet metal is built in over roofing materials or other sheet metal, use nails or screws with 1" matching nonferrous washers. Screws shall be standard stainless steel, brass, or bronze wood screws, as required. Sheet metal screws shall be self-drilling, self-tapping stainless steel or tempered non-corrodible steel of proper size and length to suit conditions.
 - 2. Screw heads shall be furnished with neoprene washers.
 - 3. Straps: Straps and miscellaneous fastenings, where required, shall be stainless steel, half-hard copper, or half-hard 70-30 brass of size indicated or required. Where not indicated, provide straps of 1/16" thick by 1" wide size.
- E. Sealant: Caulking or sealing compound shall be a silicone synthetic rubber blastomeric sealant which cures at normal temperature to a flexible firm rubber, tack free, in gun grade consistency. Sealant shall be specially designed for adhesion to the surfaces to which it will be applied, and shall meet or exceed the minimum requirements of FS-TT-S-230 or FS TT-S-1543, as applicable.
- F. Isolating Material: Alkali-resistant bituminous paint or varnish.

2.02 FABRICATION AND SHOP PAINTING:

- A. Form and fabricate sheet metalwork as indicated and in accordance with approved Shop Drawings and SMACNA Architectural Sheet Metal Manual. Properly reinforce sheet metalwork as required for strength and appearance.
- B. Galvanized sheet metal surfaces which will be concealed in the finished work shall be chemically treated or etched to assure maximum paint adherence and then shop painted with one coat of an approved galvanized primer.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Installation Standards: Install flashing and sheet metalwork as indicated and in accordance with the approved Shop Drawings and SMACNA Architectural Sheet Metal Manual.
- B. Flashing and Metal Trim: Provide flashing, counter-flashing, cap flashing, metal trip, and any other fabricated items and miscellaneous sheet metalwork indicated or required to provide a complete and watertight installation.
- C. Gutters and Downspouts: Install gutters and downspouts as indicated and in accordance with the approved Shop Drawings and pertinent provisions of SMACNA Architectural Sheet Metal manual.
- D. Work Quality:
 - 1. Sheet metalwork shall be finished straight and true, with miters and joints accurately fitted. Exposed work shall be free of dents and other defects. Corners shall be reinforced and seams made waterproof. Edges of sheet metal shall be hemmed.
 - 2. Provide for expansion and contraction in sheet metal assembly by means of expansion joints or other appropriate methods of SMACNA Architectural Sheet Metal Manual. Provide reinforcement as required.
 - 3. Isolate and protect dissimilar metals from contact with each other by applying specified isolation material to contact surfaces. Protect surfaces of sheet metal in contact with concrete, treated wood, or aluminum with a heavy coating of bituminous paint.
 - 4. Provide waterproof neoprene washers wherever required fasteners penetrate sheet metal. Exposed fasteners will not be permitted for any potion of this work.
- E. Caulking and Sealing: Caulk or seal joints and laps of sheet metalwork as indicted or required for a waterproof installation. Beads of sealant which will be concealed in the finished work shall be continuous with no voids of material.
- F. Flashing for Roof Penetrations:
 - 1. Flashing of roof penetrations shall be 4 pound lead. Flashing shall be accurately formed to conform with roofing contours and configurations and as required to assure a watertight installation. Flashing shall be
built in as the roofing work progresses. Flash and burn lead against any penetrations through its surface.

2. Except as indicated otherwise, plumbing and mechanical vent flashing shall be of 4 pound lead tubing. Flanges shall be minimum 18" square, and tubing shall be long enough to permit turning lead into the end of vent pipe.

END OF SECTION

SECTION 07900

EXPANSION JOINT SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED: The work shall consist of furnishing and installing waterproof expansion joints in accordance with the details shown on the Drawing and as described herein.

1.02 SUBMITTALS:

- A. General: Submit the following according to Section 01300, Submittals.
- B. Standard Submittal Package: Submit typical expansion joint drawing(s) indicating pertinent dimensions, general construction, expansion joint opening dimensions and product information.
- C. Sample of material is required at time of submittal.
- D. Contractor shall maintain qualified personnel and provide proof of product training by manufacturer's representative or letter from manufacturer stating Contractor is a qualified applicator of product.
- E. Reference Section 01400, Quality Control, and provide written quality control plan for review and approval by JEA and the Engineer.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver products to site in Manufacturer's original, intact, labeled containers. Handle and protect as necessary to prevent damage or deterioration during shipment, handling and storage. Store in accordance with manufacturer's installation instructions.
- B. Store all materials off the ground and protect from rain, freezing, or excessive heat until ready for use

1.04 JOB CONDITIONS:

- A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature 40°F (5°C) and rising.
- B. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified coating.

1.05 QUALITY ASSURANCE:

- A. The Contractor will conduct a pre-construction meeting with all parties and trades involved in the treatment of work at and around expansion joints including, but not limited to, concrete, mechanical, electrical, landscaping, masonry, waterproofing, fire-stopping, caulking, flooring and other finish trade subcontractors. All superintendents and foremen with responsibility for oversight and setting of the joint gap must attend this meeting. The Contractor is responsible to coordinate and schedule all trades and ensure that all Subcontractors understand their responsibilities in relation to expansion joints and that their work cannot impede anticipated structural movement at the expansion joints, or compromise the achievement of watertightness or life safety at expansion joints in any way.
- B. Manufacturing Qualifications: The manufacturer of the specified product shall have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
- C. Contractor Qualifications: Contractor shall be qualified in the field of concrete repair and protection with a successful track record of five (5) years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative.
- D. Install materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state, and federal authorities having jurisdiction Consult Material Safety Data Sheets for complete handling recommendations.
- **1.06 WARRANTY:** Provide a written warranty from the manufacturer against defects of materials for a period of two (2) years, beginning with the date of substantial completion of the project.

PART 2 - PRODUCTS

2.01 JOINT SEALANT:

A. Product and Manufacturer: Sikadur Combiflex SG, as manufactured by Sika Corporation, 1682 Marion Williamsport Road, Marion, OH 43302 is considered to conform to the requirements of this Specification. The Combiflex shall be applied on the internal and external sides of the joint as shown in the Drawings.

- B. Materials:
 - 1. Sikadur 31 Hi-Mod Gel Resin Adhesive:
 - a. Component A shall be a modified epoxy resin of the epichlorohydrin bisphenol A type containing suitable viscosity control agents and pigments. It shall not contain butyl glycidyl ether.
 - b. Component B shall be primarily a reaction product of a selected amine blend with an epoxy resin of the epichlorohydrin bisphenol A type containing suitable viscosity control agents, pigments, and accelerators.
 - c. The ratio of Component A:Component B shall be a 1:1 volume.
 - 2. Combiflex SG Sheeting:
 - a. Sheeting shall be composed of Flexible Polyolefin (FPO) rubber.
 - b. The sheeting shall be supplied in 20 ft rolls or 82 ft rolls. It shall be available in 4, 8, and 12 inch widths at 40 mils in thickness.
 - c. The sheeting shall be supplied with a removable center expansion strip.
- C. Performance Criteria:
 - 1. Properties of the mixed uncured epoxy resin adhesive:
 - a. Pot Life: 30 minutes
 - b. Consistency: Non-sag (¹/₂ inch thick)
 - c. Color: Gray
 - d. Tack-Free Time to Touch: 2-3 hours (73°F)
 - 2. Properties of the Cured Epoxy Resin Adhesive:
 - a. Tensile Properties (ASTM D638) at 14 Days:
 - 1) Tensile Strength: 3,300 psi (22.7 MPa)
 - 2) Elongation at Break: 0.9%
 - b. Compressive Properties (ASTM D695) at 28 Days:
 - 1) Compressive Strength: 16,000 psi (82.8 MPa)
 - 2) Compressive Modulus of Elasticity: 795,000 psi (5,485 MPa)

- c. Flexural Properties (ASTM D790) at 14 Days:
 - 1) Flexural Strength (Modulus of Rupture): 6,100 psi (42 MPa)
 - 2) Tangent Modulus of Elasticity in Bending: 1.67 x 106 psi (11,520 MPa)
- d. Shear Strength (ASTM D732) at 7 Days: 4,600 psi (31.7 MPa)
- e. Water Absorption (ASTM D570), 7 Day (24 Hour Immersion): 0.07%
- f. Bond Strength (ASTM C882 Hardened Concrete to Hardened Concrete:
 - 1) 2 Day (Dry Cure) Bond Strength: 2,200 psi (22.7 MPa)
 - 2) 14 Day (Moist Cure) Bond Strength: 2,900 psi (16.6 MPa)
- g. The epoxy resin shall conform to ASTM C881 and AASHTO M235.
- 3. Properties of the Sheeting:
 - a. Tensile Properties (ASTM D412):
 - 1) Tensile Strength: 1,740 psi (12 MPa)
 - 2) Elongation at Break: >600%
 - b. Tear Resistance (ASTM D624) Die C:
 - 1) Resistance to Tear: 69 lb./inch (12 N/mm)
 - c. Low Temperature of Performance: Maintained to -40°F
 - d. Ozone Resistance (3 Month Exposure):
 - 1) Water/Ozone (3 ppm): No effect
 - 2) Air/Ozone (2-300 ppm): No effect

PART 3 - EXECUTION

3.01 PREPARATION FOR INSTALLATION:

A. Installer's Inspection of Conditions: The Contractor shall require the fabricator and installer to inspect the field conditions under which the work will be performed, and to report (in writing to the Contractor, JEA and the Engineer) any unsatisfactory conditions. If unsatisfactory conditions exist, do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the fabricator and installer.

- B. Comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in the Contract Documents.
- C. The Contractor shall inspect each material item immediately prior to installation and reject damaged and defective items.
- D. The Contractor shall recheck measurements and dimensions of the work as an integral step of starting each installation.
- E. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure best possible results for each unit of work, in coordination with entire work. Isolate each unit of work for noncompatible work as required to prevent deterioration.
- F. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to avoid necessity of uncovering work for that purpose.

3.02 JOINT INSTALLATION:

- A. Preparation of the Work Area:
 - 1. The concrete or steel substrate must be clean, dry, sound, and free of surface contaminants. Remove dust, laitance, grease, oils, curing compounds, form release agents, and foreign particles by mechanical means, i.e., sandblasting, etc., as approved by the Engineer.
 - 2. Repair spalled, irregular, or unsound joint surfaces using accepted industry practices for repair of the substrates in question. Remove protruding roughness to ensure joint sides are smooth.
 - 3. No drilling, or screwing, or fasteners of any type are permitted to anchor the sealant system into the substrate.
 - 4. System to be installed by qualified subcontractors only and according to detailed published installation procedures and/or in accordance with job-specific installation instructions of manufacturer's field technician.
- B. Mixing and Application (Combiflex Sealant):
 - 1. Placement Procedure: If the surface of the Sikadur Combiflex SG Tape is contaminated or dirty, clean with a dry or wet cloth. Use water but do not sure solvent for cleaning. NO ACTIVATION ON SITE REQUIRED. Laps (welds) shall be a minimum 2 inch overlap of each Combiflex SG sheet welded together with a hand welding tool apparatus approved by the Engineer.

- 2. Mixing of the Epoxy Resin Adhesive: Premix each component. Proportion 2 parts of Component A to 1 part Component B by volume into a clean, dry mixing pail. Mix for 3 minutes with a low-speed (400-600 rpm) drill and jiffy paddle until uniform in color. Mix only that quantity that can be used within its potlife (25-45 minutes).
- 3. Joints shall be masked to prevent discoloration or application on unwanted areas as directed by the Engineer. If masking tape is used, it shall be removed before the epoxy resin adhesive has set. Do not apply the masking tape until just prior to the epoxy resin adhesive application.
- 4. Apply the mixed Sikadur 31 Hi-Mod Gel in a 1-1/2 to 2 inch wide band on each side of the joint to a thickness of approximately 1/32 inch to maximum of 1/8 inch. Set the sheeting into the epoxy. Using a hard roller force the sheeting down into the epoxy. Take precautions not to allow the epoxy resin adhesive to enter the joint or crack. Place the sheeting flat over the crack or joint, or drape it into the joint or crack, as directed by the Engineer. Apply a top layer of the epoxy resin adhesive on the same 1-1/2 - 2 inch wide band over the sheeting. The epoxy resin adhesive should extend 1/8 - 1/4 inch beyond the edge of the sheeting. Remove the expansion strip from the sheeting before th epoxy resin adhesive has set.
- 5. Adhere to all limitations and cautions for the epoxy resin adhesive as stated in the manufacturer's printed literatures.

3.03 CLEAN AND PROTECT:

- A. Protect the system and its components during construction. Subsequent damage to the expansion joint system will be repaired at the general contractor's expense. After work is complete, clean exposed surfaces with a suitable cleaner that will not harm or attack the finish.
- B. The uncured epoxy resin adhesive can be cleaned with an approved solvent. The cured epoxy resin adhesive can only be removed mechanically.
- C. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.
- **3.04 TESTING:** The joints shall be visually inspected for any moisture or leaks. Prior to backfilling the existing splitter box structure.

END OF SECTION

SECTION 09200

STUCCO

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. Stucco and accessory products.
- B. Stucco shall be placed for those areas shown on the Drawings.

1.02 RELATED SECTIONS:

- A. Section 03310, Cast-in-Place Concrete.
- B. Section 06100, Rough Carpentry
- C. Section 07600, Flashing and Sheet Metal.
- D. Section 09250, Gypsum Drywall.
- E Section 09910, Painting and Coating.

1.03 REFERENCES:

- A. ACI (American Concrete Institute).
- B. ASTM International (ASTM):
 - 1. ASTM C91 Standard Specification for Masonry Cement.
 - 2. ASTM C109 Standard Specification for Compressive Strength of Hydraulic Cement Mortars.
 - 3. ASTM C144 Standard Specification for Aggregate for Masonry Mortar.
 - 4. www.ASTM.org +C+150" C 150 Standard Specification for Portland Cement.
 - 5. www.ASTM.org +C+207" C 207 Standard Specification for Hydrated Lime for Masonry Purposes.
 - 6. www.ASTM.org +C+270" C 270 Standard Specification for Mortar for Unit Masonry.
 - 7. ASTM C348 Standard Specification for Flexural Strength of Hydraulic Cement Mortar.
 - 8. www.ASTM.org +C+595" C595 Standard Specification for Blended Hydraulic Cements.
 - 9. ASTM C847 Standard Specification for Metal Lath.
 - 10. ASTM C897 Standard Specification for Aggregate for job-mixed Portland Cement Based Plasters.

- 11. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
- 12. ASTM C926 Standard Specification for Application of Portland Cement Based Plaster.
- 13. ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete.
- 14. ASTM C1063 Standard Specification for Installation of Lathing and Furring for Portland Cement Plaster.
- 15. www.ASTM.org +C+1157" C 1157 Standard Performance Specification for Hydraulic Cement.
- 16. www.ASTM.org +C+1329" C 1329 Standard Specification for Mortar Cement.
- 17. www.ASTM.org +C+1384" C 1384 Standard Specification for Admixtures for Masonry Mortars.
- 18. ASTM D 226 Asphalt-Saturated organic Felt Used in Roofing and Waterproofing.
- 19. ICC (International Code Council).
- C. NWCB (Stucco Resource Guide).
- D. PCA (Portland Cement Association).
- E. ICC ESR# 3529 Evaluation Report.
- F. NCMA TR-88 Hot & Cold Weather Masonry Construction Manual.

1.04 SUBMITTALS:

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Mixing and preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Test Reports:
 - 1. Submit certified test reports showing that the cementitious components of the mortar mix comply with the specified requirements.
 - 2. Submit certified test report showing that the mortar complies with the specified requirements.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long representing actual product, in color selected.

1.05 QUALITY ASSURANCE:

- A. Manufacturer Qualifications: Firm specializing in manufacture of masonry materials with minimum 10 years' experience.
- B. Installer Qualifications: Minimum 5 year experience installing similar products.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated on the Drawings.
 - 2. Do not proceed with remaining work until workmanship is approved by Engineer/Owner.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.06 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver stucco mix to site in manufacturer's original unopened sealed bags with labels clearly indicating manufacturer and material.
- B. Store materials indoors in an area protected from freezing, excessive heat and damage. Refer to "Store Materials" ASTM C 926.
- C. Deliver all lath, trim accessories and other specified products in original containers. Any damaged materials must be replaced.

1.07 PROJECT CONDITIONS:

- A. Do not apply when air or substrate temperature is below 40 degrees F (4 degrees C) or above 90 degrees F (32 degrees C) within 48 hours after application.
 - 1. 90 degrees F (32 degrees C) limitation does not apply to AMX 750 see data sheet for application instructions.
- B. Do not apply to frozen substrate or to a substrate containing frost.
- C. Application must comply with referenced standards and manufacturer's published recommendations.

- D. Do not store or apply materials when temperatures are below 40 degrees F (4 degrees C) or above 90 degrees F (32 degrees C).
- E. Protect from uneven and excessive evaporation during dry weather and from strong blasts of dry air.
- **1.08 SEQUENCING:** Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

A. Acceptable Manufacturer: Amerimix, which is located at: 375 Northridge Rd.; Atlanta, GA 30350; Toll Free Tel: 800-334-0784; Tel: 770-804-3363; Email: request info (Joey.peters@oldcastle.com); Web: www.amerimix.com

2.02 MATERIALS:

- A. Stucco: Portland cement stucco by Amerimix Companies comprised of the following base finish coats:
 - 1. Base Coat: Amerimix AMX 700 SBF Scratch, Brown & Finish Stucco.
 - 2. Base Coat: Amerimix AMX 715 PP Premium Plus Stucco.
 - 3. Base Coat: Amerimix AMX 740 FSB Fiber Scratch & Brown Stucco.
 - 4. Base Coat: Amerimix AMX 750 FBC Fiber Base Coat Stucco.
 - 5. Finish Coat: Amerimix AMX 775 C Colored Stucco.
 - 6. Finish Coat: Amerimix AMX 780 STF Stucco Texture Finish.
 - 7. Finish Coat: Amerimix AMX 790 SST Stucco Sand Texture.
- B. Accessory Products:
 - 1. Flashing: Corrosion resistant materials.
 - 2. Moisture Barrier: Asphalt Saturated Felt- ASTM D226.
 - 3. Building Paper: Federal specification UU-B-790a, Grade B, moderate water vapor permeable or Grade D, water vapor permeable.
 - 4. Building Wrap: Tyvek Stucco Wrap.

- C. Plaster Trim Accessories:
 - 1. Properly sized for the specified application.
 - 2. As specified or as indicated on the drawings.
 - 3. With weep holes when used at base of wall.
- D. Lath (conventional stucco systems) Installed per ASTM C1063 / Lath (one coat stucco system) per ICC-ESR #3529:
 - 1. Expanded Metal Lath: ASTM C847, galvanized steel, (2.5 pounds per square yard (1.4 kg/m2) 3.4 pounds per square yard (1.8 kg/m2) self-furring.
 - 2. Woven Wire Lath: ASTM D1032, galvanized steel.
 - 3. Plastic Lath: Submit manufacturer's building code compliance report.
- E. Joint Sealants: ASTM C920, closed cell backer rod compatible with sealants.

2.03 MIXING:

- A. Mixing Procedure: Follow product mixing instructions from technical data sheets
- B. Re-tempering: Use cement plaster within 1 hours of initial mixing.
- C. Hot Weather: Follow National Concrete Masonry Association recommendations for hot weather construction.
- D. Cold Weather: Follow National Concrete Masonry Association recommendations for cold weather construction.

PART 3 EXECUTION

3.01 EXAMINATION:

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation. Corrections of the substrate must be made before proceeding.

3.02 PREPARATION:

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces in accordance with ASTM C 926 and products published information in the technical data sheet.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- **3.03 INSTALLATION:** Install in accordance with manufacturer's instructions and in accordance applicable IBC, IRC, ASTM, ICC, and local requirements

3.04 CURING:

- A. Cure and provide time between coats in accordance with ASTM C926 and manufacturer's instructions.
- B. Provide sufficient moisture in the plaster mix by curing to permit continuous hydration of the cementitious materials.
- C. Allow sufficient time between coats to permit each coat to cure and develop sufficient strength to resist cracking or other physical damage before the next coat is applied.
- D. Where allowed by local jurisdictions, the IBC ' Alternative Method' may be used as the standard for time between coats and curing.

3.05 FIELD QUALITY CONTROL:

- A. Architect or qualified third party will inspect the application at the following stages to confirm the Amerimix Stucco is being applied and cured as specified and as indicated on the Drawings.
 - 1. Completion of substrate installation, preparation, flashing and lathing
 - 2. Completion of base coat application
 - 3. Completion of finish coat application

3.06 CLEANING:

- A. Remove and dispose of all temporary materials used to protect adjacent work and surrounding areas.
- B. Remove and clean from surfaces not intended to receive the Amerimix Stucco.

3.07 PROTECTION:

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09250

GYPSUM DRYWALL

PART 1 - GENERAL

1.01 QUALITY ASSURANCE:

- A. Industry Standard: Comply with applicable requirements of GA-216 "Application and Finishing of Gypsum Board" by the Gypsum Association, except where more detailed or more stringent requirements are indicated including the recommendations of the manufacturer.
- B. Allowable Tolerances: 1/16" offsets between planes of board faces, and 1/8" in 8' 0" for plumb, warp and bow. Where substrates have been installed by other trades tolerances may vary to those specified for that trade.
- **1.02 SUBMITTALS:** Submit manufacturer's product specifications and installation instructions for each gypsum drywall component including other data as may be required to show compliance with these specifications.

PART 2 - PRODUCTS

2.01 GYPSUM BOARD PRODUCTS:

- A. General: Comply with GA-216, as specified and recommended.
- B. Gypsum Board: Regular type with tapered long edges or fire-rated Type X as called for on the Drawings.
 - 1. Sheet Size: 4' wide x maximum length available which will minimize end joints.
 - 2. Thickness: 5/8"
- 2.02 TRIM ACCESSORIES: Manufacturer's standard galvanized steel beaded units with flanges for concealment in joint compound, including corner beads, edge trim and control joints; except provide semi-finishing type (flange not concealed) where specifically indicated.

2.03 JOINT TREATMENT MATERIALS:

A. General: ASTM C475; type recommended by the manufacturer for the application indicated except as otherwise indicated.

- B. Joint Type: Perforated type.
- C. Joint Compound
 - 1. Ready-mixed, vinyl-type for interior use.
 - 2. Grade: Commercial quality, general purpose specifically formulated for bedding tapes, filling depressions and topping and sanding.
 - 3. Conform to ASTM C475 (joint compound and joint tape for finishing gypsum board).
- **2.04 SCREWS:** Self-tapping steel screws.
 - A. For steel framing less than 0.03 inch thick, comply with ASTM C1002 (selfpiercing tapping screws).
 - B. For steel framing 0.033 to 0.112 inch thick, comply with ASTM C954 (steel drill screws for gypsum products).
 - C. Type S or S-12 screws.

PART 3 - EXECUTION

3.01 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS:

- A. General Standards: In addition to compliance with GA-216, comply with manufacturer's instructions.
- B. Space fasteners in gypsum boards in accordance with GA-216 and manufacturer's recommendations.
- C. Ceilings: Apply prior to wall panel installation and at right angles to framing.
- D. Walls: Apply panels vertically and use maximum length to minimize joints.

3.02 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

- A. Install metal corner beads at all external corners of drywall work.
- B. Install metal edge trim or drywall moldings whenever edge of gypsum board would otherwise be exposed or semi-exposed.

3.03 GYPSUM BOARD FINISHINGS:

- A. General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for decoration. Prefill open joints and round or beveled edges using type of compound specified.
 - 1. Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated.
 - 2. Apply joint compound in three coats (not including prefill of openings in base), and sand between last 2 coats and after last coat.

3.04 CLEAN-UP:

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide protection as necessary to ensure product is undamaged at substantial completion.

END OF SECTION

SECTION 09910

PAINTING AND COATINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The work included in this section consists of furnishing all labor, equipment, materials, tools, rigging, lighting, ventilation and other related items necessary for the proper surface preparation, coating application, curing and cleanup of the facilities specified herein and/or indicated on the Drawings.
- B. All work shall be performed by skilled workmen in a safe and workmanlike manner using equipment and procedures as specified herein and consistent with good coating practices.
- **1.02 QUALITY ASSURANCE:** The Contractor is responsible for a satisfactory coating system which will adhere without peeling, flaking, blistering or discoloration. Before application of any painting materials, the Contractor shall submit a Letter of Certification from the manufacturer of materials to be used. The letter shall state that the manufacturer recommends the materials selected for the application proposed. Manufacturers approved in the JEA Water and Wastewater Standards offering products which may be incorporated in the work include:
 - A. PPG Protective and Marine Coating per JEA Section 447
 - B. Corrocoat USA, Inc. per JEA Section 447
 - C. Sherwin-Williams Company per JEA Section 447
 - D. Tnemec per JEA Section 447
 - E. Spectrashield for Interior Manhole and Gravity Sewer Structures (Splitter Box, etc.) Coating Only per JEA Section 446.III
 - F. GML Green Monster for Interior Manhole and Gravity Sewer Structures (Splitter Box, etc.) Coating Only per JEA Section 446.IV
- **1.03 SUBMITTALS:** Contractor shall submit for Engineer's review and/or approval the following items:
 - A. Materials List: Complete list of materials to be furnished including descriptive literature and surface on which they will be utilized.
 - B. Certification Letter: Letter from coating system manufacturer stating that proposed materials are suitable for application proposed.

- C. Color Samples: Manufacturer's color chips or color charts for color selection by Engineer/Owner.
- D. NSF Approval: Certification that all paints which will come in contact with potable water are EPA/NSF approved.
- E. Equipment: A complete list of equipment to be utilized including painting, blasting, lighting, ventilation, heating, welding and inspection equipment.

1.04 DELIVERY AND STORAGE OF MATERIALS:

- A. Delivery: All coating materials shall be delivered to the work site in the original, factory-sealed containers bearing the manufacturer's labels identifying, where applicable, the product number, name, color and instructions for use.
- B. Storage: Prior to use, all coating materials shall be stored in an area as supplied by the Contractor and/or as designated by the Owner or Engineer. This storage area shall be secure and shall provide the coating materials with protection from weather and temperature extremes below 40°F and above 100°F. The area shall be maintained in a safe, neat and clean manner and free from fire, explosion or other hazards.

1.05 WORKING CONDITIONS:

- A. Weather Conditions:
 - 1. No surface preparation or coating application work shall be done under unfavorable weather conditions unless the work is adequately protected from such conditions, and then only with the specific approval of the Engineer.
 - 2. All material temperatures prior to mixing and use shall be between 70°F and 90°F unless specifically permitted by manufacturer or otherwise approved by the Engineer.
 - 3. Surface preparation and coating application shall proceed only when air and surface temperatures are above 50°F and below 125°F, and the surface temperature is at least 5 degrees above the dew point.
 - 4. In the event heating devices are used at any time to create and/or maintain temperature conditions in compliance with the specification requirements, these devices shall be explosion-proof and of the type that does not exhaust sooty or oily residues or any other contaminates into the air. Heating devices shall not be used when, in conjunction with existing temperature and humidity conditions, these devices may create dew point conditions.
 - 5. Painting shall be timed to ensure the area of work is essentially dust free.

- B. Lighting and Ventilation:
 - 1. Adequate explosion-proof lighting shall be provided during surface preparation and coating operations as necessary. This lighting shall be sufficient to illuminate clearly the working area without shadows.
 - 2. Ventilation for Confined Areas: Adequate explosion-proof ventilation shall be continuously maintained during all surface preparation and coating operations during all recoat and curing periods. This ventilation shall be of the suction type and shall be of sufficient capacity to maintain throughout the confined area a clear atmosphere that is well below explosion and toxic limits. The ventilation system, including all fans and temporary duct-work, shall be arranged such that fresh air is drawn into the confined area and permits no still air spaces to exist in any area. Particular attention shall be given to floor level or lower spaces and pocket areas where heavier-than-air solvents and particulate matter are likely to accumulate. All equipment involved shall be OSHA approved. The Contractor shall be solely responsible for supplying, rigging and operating all ventilation equipment in accordance with OSHA requirements.
- C. Safety:
 - 1. General: The Contractor shall make all necessary provisions with regard to materials, equipment, personnel, procedures and practices to assure that the work shall be done in a safe manner and that the working area is maintained free of all health and safety hazards. Contractor shall pay particular attention to OSHA confined space requirements.
 - 2. Employee Education: The Contractor shall direct his personnel's attention to all product warnings and information given on the labels of all components of the coating materials specified herein.
 - 3. Protective Wear: While coating materials are being applied, all application and mixing personnel in the area should wear adequate protective clothing and devices (including respirators).
 - 4. Control of Open Flame: No item which may produce sparks or open flames should be permitted in the immediate working area (including equipment, matches, cigarette lighters, etc.) and no smoking should be permitted in the area.
 - 5. Warning Signs: Appropriate warning signs shall be posted to apprise unsuspecting personnel of the hazards in the area and appropriate barriers shall be erected where required.
 - 6. Partially Used Containers: Partially used coating materials that are to be retained should, at the completion of each work day, be returned

to their original containers. These containers should be tightly resealed, material spills wiped clean and the containers returned to the designated storage area.

- 7. Disposal of Materials: Waste coating material (such as unused catalyzed coating, dirty cleanup solvents, etc.) and contaminated disposable items (such as empty cans, rags, etc.) should be removed from the job site and disposed of at the completion of each work day. Disposal should be in sealed containers, at sanitary landfills and in accordance with local, state and federal regulations.
- 8. Protection of Existing Facilities: The Contractor shall be responsible for taking adequate precautions for protecting against fire and soiling or damage to adjacent equipment, structures, surfaces, processes or products. Floors, paved areas and other adjacent surfaces shall be protected against spatter or spillage. No spray painting shall be performed in areas where welding is in progress or near operations involving open flame, sparks or high heat.
- 9. Special Operations of Owner: The Contractor shall determine any special operations of the Owner which could influence the safe workmanship of personnel with respect to electrical, mechanical, chemical or fire hazard situations.

1.06 EQUIPMENT:

- A. General: All equipment and tools shall be explosion proof and non-sparking, satisfactory for the intended use and shall be maintained in good working order.
- B. Spray Equipment: Spray equipment shall be suitable for the material being sprayed; shall be capable of supplying sufficient air at the required pressures; shall be equipped with air and moisture separators; and shall be thoroughly cleaned before and after each use with the appropriate cleaning solvents.
- C. Inspection Equipment: The inspection equipment to be utilized on the project shall be furnished by the Contractor. Acceptable equipment for the various inspection tests required shall be as follows or equal:
 - 1. Air Temperature and Relative Humidity: Bacharach Sling Psychrometer, Model #12-7012 as supplied by KTA-Tator, Pittsburgh, PA., (412) 788-1300.
 - 2. Surface Temperature: Surface Temperature Thermometer, Model #PTC/312F, 0-250°F as supplied by KTA-Tator, Pittsburgh, PA., (412) 788-1300.

- 3. Material Temperature: Model #6212 Taylor Paint Thermometer, 25°-125°F, 8-inch stem as supplied by KTA-Tator, Pittsburgh, PA., (412) 788-1300.
- 4. Wet Film Thickness: Nordson West Film Gage, Model #790-010, 0-20 mils supplied by KTA-Tator, Pittsburgh, PA., (412) 788-1300.
- 5. Dry Film Thickness: Mikrotest III, Model #FM, Dry Film Thickness Gage as supplied by KTA-Tator, Pittsburgh, PA., (412) 788-1300.
- 6. Anchor Pattern: Keane-Tator Profile Comparator as supplied by KTA-Tator, Pittsburgh, PA., (412) 788-1300.
- 7. Surface Preparation: NACE Visual Surface Preparation Standards as supplied by the National Association of Corrosion Engineers, Katy, Texas.
- 8. Holiday Detection: Model M-1 Holiday Detection as supplied by KTA-Tator, Pittsburgh, PA., (412) 788-1300.
- 9. Visual Surface Inspection: 1 Flash-O-Lens #372/1 as supplied by KTA-Tator, Pittsburgh, PA., (412) 788-1300.

PART 2 - PRODUCTS

- 2.01 GENERAL REQUIREMENTS: The film thickness designated and/or the number of coats to be applied shall not be decreased and shall be increased where required to meet manufacturer's recommendations. Manufacturer's recommendations as to which finish coat should be used with a particular primer shall be observed. In all cases, the painting system shall be from the same manufacturer. All paint shall be mildew resistant.
- **2.02 COATING MATERIALS:** The following coating system is based on a Sherwin-Williams system, but the approved equals listed in Paragraph 1.02 may be utilized as long as their coating system meets or exceeds the specified system.
 - A. Non-Submerged Ferrous Metals (Includes all exposed piping, valves, fittings, and supports which are not aluminum, galvanized or stainless steel).
 - 1. Surface Preparation: Degrease before proceeding. SSPC-SP-10 Near-White Blast Cleaning. Coat all steel before any rust bloom forms. The surface should be dry and free of any contamination. Consult the manufactures application instructions for the recommended Blast profile.
 - 2. Primer: High-build polyamide epoxy primer applied at 6.0 mils DFT. Use Sherwin-Williams Macropoxy 646 Fast Cure Epoxy, or approved equal.

3. Finish: Polyurethane applied at 4.0 mils. Use Sherwin-Williams Acrolon 218 HS Acrylic Polyurethane, or approved equal.

Minimum system dry film thickness 10.0 mils. All colors shall be in accordance with 10 State Standards as approved by the Owner. All piping stenciling in accordance with Paragraph 2.05.

- B. The cleaned and patched concrete areas shall receive the following coating system:
 - 1. Surface Cleaning: Complete in accordance with JEA Water and Wastewater Standards Section 488.V.
 - 2. Patch areas in accordance with hi-strength grout in accordance with Type B Repair (JEA Water and Wastewater Standards Section 488) requirements.
 - 3. Finish: Following completion of patch work with associated required cure time, apply one (1) coat of Sherwin-Williams Dura-Plate 235 Multi-Purpose Epoxy, or approved equal, at 6 mils wet (4 mils DFT).
- C. Exterior Stucco (Building window replacement areas):
 - 1. Surface Cleaning: Complete in accordance with JEA Water and Wastewater Standards Section 488.V.
 - 2. 1st Coat: Apply one (1) coat of Sherwin-Williams SherLastic, or approved equal, at 4.0 to 6.0 mils DFT.
 - 3. 2nd Coat: Apply one (1) coat of Sherwin-Williams SherLastic, or approved equal, at 4.0 to 6.0 mils DFT.

Minimum system dry film thickness 10.0 mils DFT is required. Colors shall be selected by the Owner.

- 2.03 CAULKING MATERIALS: Shall be general purpose, mildew resistant, gun grade, interior/exterior acrylic latex caulk complying with ASTM C-834-76. Caulk shall be compatible with specified coating system, paintable, colorfast, non-staining and non-bleeding.
- **2.04 THINNERS:** Where thinning is necessary, only the products for the particular purpose, and by the manufacturer furnishing the coating system, shall be allowed. All thinning shall be done strictly in accordance with the manufacturer's instructions.
- **2.05 STENCILING:** All piping coated pursuant to Section 2.02 shall be labeled in accordance with the 10 State Standard requirements, and flow arrows shall be provided. Stenciling shall be accomplished through painting or vinyl tape. All lettering shall be two inches high, appear on both sides of pipes, and be spaced on 10-foot intervals.

PART 3 - EXECUTION

3.01 GENERAL PREPARATION:

- A. Protection of Existing Facilities: Remove, mask, or otherwise protect hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items in contact with painted surfaces and not to be coated, prior to surface preparation and coating operations. Reinstall removed items following completion of coating.
- B. Preparation of Welded Surfaces: Prior to beginning surface preparation, the Contractor shall have repaired all ferrous metal surfaces and fabrication imperfections resulting from his metal fabrication/welding operations. All welds shall be continuous, relatively smooth, and free of pinholes, blowholes, depressions, sharp projections, inclusions and other imperfections.

3.02 SURFACE PREPARATION:

- A. Solvent Cleaning: All grease, oil, dirt and other surface contaminants shall be removed from all metal surfaces identified to receive new coating systems by solvent cleaning in accordance with SSPC SP1. It is intended that solvent cleaning be used prior to the surface preparation methods specified herein, for the removal of rust, mill, scale or painting.
- B. Pressure Washing: Exterior concrete block shall be pressure washed to remove all contaminants such as dirt, grease, oil, chemicals, etc., to obtain a clean sound surface. All loose scaling, and poorly bonded coating material and all surface chalk shall be removed.
- C. Caulking: Application of any specified caulking shall be done only after the last coat of paint has been applied and has dried hard. Any caulking material used must be of a type that is compatible with the specific coating system.
- D. Rate of Application: Shall be as recommended by coating manufacturer for the surface involved and/or to provide Dry Film Thickness (DFT) specified.
- E. Time Limits for Coating: All blasted surfaces shall have the first coating applied within eight (8) hours and before rust or contamination can occur, except that there shall remain unpainted a 4" to 6" border of blasted steel at the end of each work day. When blast cleaning resumes the following work day, this border shall be reblasted up to and including 1" to 3" of the previously applied coating.
- F. Protection of Coated Areas: During all blasting operations, extra care shall be taken to prevent damage or abrasive impingement upon previously applied coated area.

3.03 CURING OF COATING SYSTEMS: Contractor shall comply with recommendation of coating manufacturer for drying time between succeeding coats. Before succeeding coats are applied to a surface, the preceding coat shall have been inspected and approved by the Engineer. Additional coats shall not be applied, nor shall units be placed in service, until coatings are thoroughly dry. Longer drying times may be necessary for confined areas and/or "non-normal" weather conditions.

3.04 TESTING AND INSPECTION:

- A. General: The Owner and/or Engineer shall have access to the work in progress at all times and shall reserve the right to inspect this work at any time for compliance with all requirements of the specifications. The Engineer shall also reserve the right to approve each phase of the work before further work may be done, to halt all work deemed to be improper or not in compliance with the specifications and to require that the Contractor promptly correct all improper practices and defective or deficient work.
- B. Testing Requirements: In order to assure compliance with these specifications, the Contractor shall perform the following tests and/or inspections as the work progresses:
 - 1. Humidity and Air Temperature: The relative humidity and surface and air temperature shall be determined in the immediate working area using suitable instruments specified herein each day before work begins and at least one other time in the middle of the work day.
 - 2. Material Temperature: Material temperature shall be similarly measured using a suitable instrument as specified herein prior to mixing and/or application.
 - 3. Anchor Pattern Determination: For each area to be coated, the degree of surface preparation and anchor pattern shall be determined by comparison of work with visual surface preparation standards as specified herein.
 - 4. Wet Film Thickness: As coatings are applied, the wet film thickness shall be periodically and routinely measured using a suitable instrument specified herein for each coat applied.
 - 5. Dry Film Thickness: Dry film thickness of each coat of paint shall be measured with a suitable magnetic gauge as specified herein. Measurements in each area shall be made on no greater than 100 square foot areas and then only on coating that has dried to the point where it can no longer be indented by depression of a finger nail under moderate pressure.
 - 6. Holiday Testing: Following application of the finish coat and when the coating system has dried hard, all coated areas shall be checked for pinholes or other holidays with a suitable low voltage (100 volts or

less) wet sponge holiday detector as specified herein using clean fresh water. All deficient areas shall be clearly marked by circling with a greaseless chalk. These deficient areas shall be touched up by wiping off the chalk with a clean rag and immediately applying a spot coat (preferably by smooth, even brush coat). The surface must be thoroughly dry and free of any surface residues or contamination before any tough-up coat of paint is applied.

- C. Final Inspection: Upon completion of the work, the Owner and/or Engineer shall, in the presence of the Contractor conduct a final inspection and shall either approve the work as satisfactory and in compliance with the specification, or disapprove the work and direct the Contractor to make all necessary corrections of all defects or deficiencies. The Contractor shall provide all necessary inspection equipment, labor, rigging, lighting and other equipment to facilitate this inspection. The final inspection shall include the following:
 - 1. Holiday Detection: Holiday detection with a suitable direct current instrument specified herein.
 - 2. Visual Inspection: Visual surface inspection by the naked eye and/or a suitable magnifying instrument for runs, sags, drips, cracks, alligatoring and blisters.
- **3.05 CORRECTION OF DEFICIENCIES:** The Contractor shall correct all items found to be deficient in an expedient manner. Any expenses incurred for corrective measures required as the result of improper practices and/or defective or deficient work shall be borne by the Contractor and the extent of these corrective measures shall be at the discretion of the Engineer.

END OF SECTION

SECTION 11295

SLIDE GATES

PART 1 - GENERAL

1.01 SCOPE OF WORK: The work to be performed under this Section shall include furnishing all pre-construction coordination with the installing contractor, labor, materials, tools and equipment necessary to install and test all slide gates, consisting of, but not limited to frames, discs, seals, stems, operators, floor stands, stem guides, anchorage, and all other appurtenances, in place and complete, as manufactured by Alfa Laval, Houston, Texas. (800) 362-9041.

The manufacturer will be required to coordinate with the General Contractor to obtain field dimensions and confirm construction/installation approach based on the existing gate characteristics and proposed modifications shown in the Drawings. The existing wetwell and pumping system will only be bypassed one time to remove the existing gates and replace with new units. The replacement gates shall be fabricated with sufficient tolerance to allow for field modifications during the installation process. All replacement gates shall be on-site for install prior to Bypass Sequence 'A' as defined in the Drawings.

1.02 SUBMITTALS:

- A. Materials and Shop Drawings:
 - 1. Copies of all materials required to establish compliance with the specifications shall be submitted to the Engineer. Submittals shall include the following:
 - a. Certified shop and erection drawings and data regarding slide gates.
 - b. Literature on drawings describing the equipment and showing all-important details of construction and dimensions.
 - 2. The Contractor shall coordinate with the Manufacturer to establish existing conditions and measurements to allow fabrication of the replacement units that will seal utilizing the existing wall sleeves and thimbles or construction on opposite sides of existing wall sleeves. Two of the slide gates (SG-1 and SG-2) have special construction needs related to the gate operators with associated support beams that mount to portions of the pump station's wet pit structure. Sufficient field coordination shall occur prior to the shop drawing submittal to allow fabrication of the units for delivery and installation at the site. The pump station will be taken offline one time to complete the gate replacement services.
- B. Operating Instructions: Operating and maintenance instructions ("Installation Plan") for each type of slide gate shall be furnished to the Engineer.

- C. Installation: The manufacturer shall provide installation instructions. The installation and adjustment of gates, operators and all accessories shall be in full accordance with these instructions. The slide gates shall be installed by the best practices and methods. The submittal shall include description and discussion of the following project specific requirements:
 - 1. Stem installation requirements and whether the stem can be installed separately from the gate apparatus to limit concrete decking removal and replacement requirements.
 - 2. Gate interface with existing wall sleeve and thimble. The existing gate seal locations will not be known until bypassing operations are underway. Thus, specific geometry and conditions can not be assessed during pre-construction activities so gates shall be fabricated with sufficient tolerance and field adjustment capabilities. The replacement gates shall be ordered and delivered to the site prior to this bypassing operations to ensure bypassing of the station is minimized to the greatest extent possible. The manufacturer shall illustrate the approach to seal the replacement gates and contingency options should the thimble or wall sleeve have different geometry than anticipated. Drawings from the original design intent are provided at the end of this section for Informational Purposes Only.
 - 3. The Contractor may be required to remove existing concrete and/or drill through existing wall sleeves or thimbles to complete the installation.
 - 4. The gate operators shall be floor or wall mounted as shown in the Drawings. During the preconstruction activities, the Contractor and Manufacturer shall define final mounting requirements.
- **1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING:** All equipment shall be delivered in suitable packaging, cases, or crates and stored or placed in the appropriate manner. Each package shall have an identifying mark and a complete list showing contents.

1.04 APPLICABLE PUBLICATIONS:

The following publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

A. American Society for Testing and Materials (ASTM) Publications. D635-81 Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position D648-82 Test Method for Deflection Temperature of Plastics Under Flexural Load NASA CR-1457, "Manual for Structural Stability Analysis of Sandwiched Plates and Shells" et al.

- B. American Water Works Association (AWWA) C501-87 Standard for Cast Iron Slide Gates.
- **1.05** WARRANTY AND GUARANTEE: The Manufacturer shall guarantee the slide gates, when installed and operated as recommended by the Manufacturer with a documented maintenance program, trouble-free operation for a period of ten (10) years. If the Owner or Engineer is not completely satisfied with the performance of the product, the Manufacturer shall remedy the problem at no cost or refund the materials and installation cost upon the return of the equipment The Manufacturer shall guarantee the following:
 - A. Leakage shall be no more than that allowed by the AWWA C501 Standard during the guarantee period.
 - B. Door (disc) shall be free of sticking or binding as judged by the Engineer (move freely via operator provided) with no exercising required. Gate operators are to be warranted by the operator manufacturer.

1.06 OTHER:

- A. All gates shall be fully assembled in their frames except for operators, guides, stem-extension, and stem covers or concrete-mounted pedestals. Where shipping constraints require it, frame may be partially assembled such that the top may be easily mounted to the bottom containing the disc
- B. Where square-to-circular or bell-lip conversion is required, the Contractor shall provide a bell-end pipe insert of suitable diameter and water stop.
- C. J or P Bulb seals attached to the Disc / mounted to the frame, or any seal that needs replacement in less than 10 years shall not be acceptable. No part of the seal shall protrude into the clear opening.
- D. All slide gates shall be supplied by the same manufacturer, who shall be fully experienced, reputable and qualified in the manufacturing of the equipment furnished and who has been building said equipment for a minimum period of ten (10) years.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS: Slide gates shall be designed for the seating and unseating heads as listed in the gate schedule. Slide gates shall conform to the AWWA C501. Conformance to AWWA C501 applies to discs and frames with a safety factor of five (5) with regard to tensile, compressive and shear strength and with the requirement that all gates will yield no more leakage than shown in Section 6.8 (AWWA) Field Leakage Test. Calculations shall be submitted to show conformance. Materials of construction shall be suitable for the environment in which the slide gates shall be installed and operated.

- A. Reinforced Plastic Slide Gates General: 316 L Stainless Steel Frames with 5/16" minimum thickness, reinforced plastic slide (disc) as specified herein. FRP, GRP, plastic coated steel or externally reinforced slide (disc) shall not be acceptable.
- B. Slide (Disc): Shall be constructed from a reinforced rigid composite plastic material, having a minimum thickness of 1/8-inch. Slide (disc) shall have an internal matrix of carbon steel of suitable strength for the specified service. The slide (disc) outer surface skins shall be a homogeneous plastic material having extremely high tensile and impact strength, be nontoxic and shall be stabilized against ultraviolet light. The plastic material shall be an Aramid fiber from the KEVLAR family of fibers, and shall have the following minimum properties and shall be designed to limit the deflection to a maximum of 1/1000 of the span under design head conditions based upon horizontal support members only. Manufacturer shall submit drawings and comprehensive design criteria to substantiate that the required deflection figure for each door has been achieved. Comprehensive safety factor calculations shall include bending moments, buckling stress, and bonding stress with thermal expansion factors suitable for reference in NASA CR-1457, "Manual for Plates and Shells" et al. Safety factors shall be calculated for the disc under maximum head, and shear at the disc/seal interface. No substitute of fiber type will be acceptable.

Tensile Strength	15,400
Young's Modulus	1,756,000 psi
Flexural Strength	28,000 psi
Flexural Modulus	1,497,000 psi
Compressive Strength	30,200 psi
Impact Strength	9.65 ft-lb/in
Water Absorption	0.09%
Specific Gravity	1.72
Coefficient of Thermal Expansion	1.6 x 10⁻⁵ per C
Heat Distortion Point	80 degrees C ASTM D648
Low Temperature Impact Strength	93% @ -20C
Notch Sensitivity	Not notch sensitive
Weathering Properties	Excellent
Fire Resistance	Class 1 Spread of Flan, Rating BS476: Part 1: 1953 self- extinguishing, ASTM D635-56R
Chemical Resistance	Organics, Alkaline, Ozone (2 to 3 PPM)

PROPERTIES TABLE

Rigid Polyurethane foam shall be used as filler between the steel grid reinforcing system and shall be a min. of 7 LB density/cu. ft.

- C. Seals: The sealing arrangement for the reinforced plastic slide gates shall comprise of sealing faces and side guides constructed of ultra high molecular weight polyolefin having an extremely low coefficient of friction and backing constructed of highly resilient expanded neoprene. Guides and seating of the gate shall be easily adjustable (min. 5/8-inch). All moving contact surfaces shall be compatible to each other there by minimizing sticking / jamming and making the operation easy. Leakage rates shall be one-half (½) that allowed by AWWA C501.
- **2.02 FASTENERS:** Shall be 316 stainless steel. All anchor bolts, assembly bolts, screws, nuts, etc. shall be of ample section to safely withstand the forces created by operation of the gate while subjected to the heads specified.
- 2.03 **STEMS:** All stems shall be the rising types. The entire stem, including extension stem, shall be Type 316 Stainless Steel. The sections of extension stems shall be joined together by solid couplings, threaded and keyed to the stems. All couplings of the same size shall be interchangeable. Stems shall be furnished with adjustable, stem guides, spaced as necessary to maintain a slenderness ratio L/R of less than 200. Stems shall be of ample cross section to prevent distortion and shall have stub acme threads. Stems shall be designed to withstand tensile and compressive loads that occur under maximum operating conditions. Design for compressive loading shall meet AISC code where K=1 with a minimum safety Factor of 2 to 1. These requirements exceed AWWA standards. Stems shall be cold rolled with a double start stub acme thread and a finish of 32 microns or less. Stems shall be fixed to the disc by a threaded and keyed assembly into a lifting nut attached to the disc in a lifting bracket, which is bolted to the disc. The bolts securing the bracket shall be in tension and not shear. Bolts in shear will not be acceptable as they will bind against the outer material causing stress.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Installation of all gates and guides shall be done by the Contractor in a manner acceptable to the Manufacturer and Owner. It shall be the responsibility of the Contractor to handle, store, and install the equipment specified in this Section in strict accordance with the Manufacturer's drawings and recommendations. Frames and guides shall be installed in a true vertical plane with 90-degree corners.

B. See Paragraphs 1.01 and 1.02 that highlight pre-construction coordination that is required between the Contractor and Manufacturer to define installation requirements and develop Installation Plan.

3.02 INSPECTION AND TESTING:

- A. Furnish the services of a factory representative for one (1) day who has complete knowledge of proper operation and maintenance for preconstruction visit.
- B. Furnish the services of a factory representative for one (1) day who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise a test run of the equipment.
- C. Maximum gate leakage shall be as defined in the General Design Criteria of this Specification, herein. If gates, operators, and appurtenances do not meet specified requirements, corrective measures shall be taken by the Contractor, or the equipment shall be removed and replaced with equipment that satisfies the conditions specified.

END OF SECTION



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SECTION 11314

PUMP ROOM SUMP PUMPING SYSTEM

PART 1 - GENERAL

1.01 SCOPE: The work includes the furnishings of all labor, materials, equipment and supervision for the installation of a submersible Sump Pumping System as drawn and specified. The existing pumps and control panel shall be removed and replaced with reconnection of the SCADA system telemetry to notify JEA when the pump "ON" float is activated.

1.02 SUBMITTAL:

- A. Shop Drawings: Submit copies of shop drawings and product data for equipment furnished under this section.
- B. Operating and Maintenance Manual: Furnish Operation and Maintenance Manuals titled "Operation and Maintenance Manuals" in accordance with Section 01300, Submittals.
- C. Equipment Installation Certificate: The manufacturer shall provide a written report, through the Contractor and endorsed in writing by the Contractor, certifying that the equipment has been properly installed, checked and is ready for placement into routine permanent service.
- D. The pumping station equipment components shall be warranted by the Contractor against defects in material or workmanship for a period of not less than one year after the date of final acceptance by the Owner. The warranty shall include responsibility for removal and reinstallation of the equipment, freight to and from the factory for repair, if necessary, and repairs to the equipment including labor and materials.
- **1.03 MANUFACTURER'S START-UP SERVICES:** Furnish services of manufacturer's technical representative to inspect the completed installation, correct or supervise correction of any defects or malfunctions, and instruct operating personnel in proper operating and maintenance procedures as described in Part 3 of this section.
- **1.04 UNITARY RESPONSIBILITY:** In order to unify responsibility for proper equipment operation, it is the intent of these Specifications that all system components shall be furnished by a single supplier (unitary source). The design basis vendor is Xylem-Goulds.

PART 2 - PRODUCTS

2.01 PUMPS:

- A. General: Pumps shall be identical submersible units capable of handling basement sumps, septic tank effluent, and similar fluids. The pumping units shall have stands or feet so they sit on top of the existing concrete sump. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts or other fasteners. The pumps shall be capable of operating in a totally dry condition under full load without damage for extended periods. Pumps shall be equal in design and construction to Goulds Model WS_BHF Model 3887BHF (2 HP).
- B. Operating Characteristics:
 - 1. Drainage Sump No. 1 and No. 2: Each pump motor shall be rated 2 HP, 460 Volts, 3 Phase, 60 Hz, 3,500 rpm. The pump shall be capable of pumping 217 gpm at 20 ft TDH.
- C. Materials of Construction:

Motor Housing	Cast Iron
Pump Casing	Cast Iron ASTM-48
Coolant/Lubricant	Dielectric Oil
Shaft	400 Stainless Steel
Mechanical Shaft Seal	The motor shall be protected by a mechanical shaft seal mounted on the pump shaft. The mechanical seal shall be constructed of silicon carbide vs. silicon carbide sealing faces. The upper mechanical seal shall be, tensioned by an independent spring system constructed of series 300 stainless steel metal components and BUNA-N elastomers.
Impeller	The impeller shall be semi-open with ejector (pump out) vanes on the top of the impeller for protection of the lower mechanical seal and hydraulic balance. Due to design, only single plane spin balancing shall be required for smooth operation.
	The impeller shall be threaded to the solid series 400 stainless steel shaft and is secured by a thread-locking nut which will prevent the impeller from loosening during short periods of reverse rotation as might occur when rotation direction is being verified outside the installation.
Lower Bearing	(Thrust) Single Row-Ball
Fasteners	Stainless Steel

2.02 LIQUID LEVEL CONTROL:

- A. The level control system shall be the mercury switch float type, incorporating weighted floats suspended from the existing pipe hangers. Rising and falling liquid level in the pump room shall cause switches within the floats to open and close, providing start and stop signals for the level control components.
- B. The level control system shall start the lead pump when the liquid level in the pump room rises to the "pump start level". When the liquid is lowered to the "pump stop level", the system shall stop the pump. These actions shall constitute one pumping cycle. The alternator shall change lead pumps at the end of each cycle. A third float shall be provided to start the second pump in the event the level in the wet well rises to the "lag pump on level", both pumps shall then run until the level is dropped to the "stop pump level".
- C. Three float switch assemblies shall be supplied for installation by the Contractor. Each switch assembly shall contain a mercury-type switch and weight sealed in a polypropylene housing, and not less than 30 feet of cable.
- D. The "Pump Start" float switch shall actuate a high water alarm relay to the existing SCADA system. The signal relay shall maintain the alarm signal until the pump room level has been lowered and the circuit has been manually reset.
- E. An alarm silence switch and relay shall be provided to permit maintenance personnel to de-energize the external alarm device while corrective actions are underway. After silencing the alarm device, manual reset of the signal relay shall provide automatic reset of the alarm silence relay.
- F. Float Switches shall be direct acting single pole mercury switch which actuates when the longitudinal axis of the float is horizontal and deactivates when the liquid level falls one inch (1") below the actuation elevation. Entire assembly (cable and float) shall be encapsulated to form a watertight and impact resistant unit. Float switches shall meet the following criteria:
 - 1. Mercury switch rating (non-inductive) shall be ten (10) amps (minimum) at 120 volts, 60-hertz.
 - 2. Float housing construction shall be polypropylene. Cable jacket shall be polyvinyl chloride (PVC).
 - 3. Provide normally open or normally closed contacts as required.
- G. Cable shall be polyvinyl chloride (PVC) type. Conductors shall be No. 18 gage (41 strand) rated 600 volts. Cable shall be continuous with no splices from the float switch to the control cabinet.

2.03 CONTROL PANEL:

- A. Where indicated on the drawings, specified, or required by the functions specified, control panels, including all necessary accessories, shall be provided for control of the associated equipment.
- B. Control panels shall be constructed in accordance with the requirements of Section 433 of the JEA Water & Sewer Standards, and shall be manufactured by a JEA approved manufacturer.
- C. Control panels shall be constructed in accordance with UL 508A requirements for enclosed industrial control panels and shall bear the UL508A serialized label.
- D. All components shall be mounted using stainless steel machine screws. All holes shall be drilled and tapped. The use of self-tapping screws is unacceptable.

PART 3 - EXECUTION

3.01 INSPECTION AND TESTING:

- A. Upon completion of installation, in the presence of the Engineer, a qualified manufacturer's representative shall perform a preliminary test on the system to Ensure the functioning of all component parts to the satisfaction of the Engineer.
- B. Operating personnel shall be trained in operation and maintenance of equipment at start-up. Instruction shall be given in operation, service, adjustments and routine maintenance. Recommended spare parts lists and Operation and Maintenance Manuals shall be provided and reviewed with Owner's operating personnel.

END OF SECTION

SECTION 11500

ODOR CONTROL SYSTEM

PART 1 - GENERAL

1.01 SCOPE:

- A. The work specified shall include furnishing all labor, design, materials, equipment, incidentals and testing of all equipment and materials necessary to provide JEA with a completely operational Odor Control System for removal of hydrogen sulfide (H₂S) and volatile organic compounds (VOCs) from the wastewater collection system identified in the Drawings.
- B. The Biotrickling Filter Odor Control System shall consist of a biotrickling filter vessel, internal structural members, media with support grating, mist eliminator, internal piping, liquid distributors, nutrient feed and storage system, irrigation valves, recirculation pump and piping, air exhaust, fan/blower, process control system control panel, ducting, and any other equipment or accessories required to provide a complete and functioning biotrickling filter odor control system.
- C. All major biotrickling filter system components shall be from the same manufacturer for single source responsibility. The Contractor shall provide an odor control piping/duct system with piping/duct, supports, expansion joints, etc. to deliver the air from the wastewater collection system components to the biotrickling filter system as shown on the Drawings.
- D. All materials, products, or devices shall be new and unused, unless indicated otherwise in proposal.

1.02 PROCESS DESCRIPTION:

- A. The system shall perform in accordance with the design basis. It shall be designed for continuous operation in a highly corrosive environment.
- B. The biotrickling filter odor control system shall utilize a high surface synthetic/inert media to provide an optimal site for growth of microorganisms (aka: biomass). This media has a high surface/high void area for optimal treatment in a small footprint. Microorganisms that attach to the media are capable of removing H₂S and other odorous VOC's when they are contacted by these compounds in the odorous air stream. A blower conveys the odorous air from the odor source to the media at the bottom of the vessel where the air passes upward through the vessel and media. As the odorous air travels upward it comes in contact with the biomass where non-pathogenic sulfur oxidizing bacteria immobilized on the synthetic media

remove H_2S and other odorous VOCs. The biotrickling filter odor control systems counter-current flow of air and water/nutrients enhances the mass transfer to the media where the biological sulfur reduction takes place degrading the odorous compounds to sulfuric acid and other soluble sulfates which are removed in the drain water. If needed, solution containing water and nutrients is conveyed from the sump onto the media via a recycle pump to maintain a healthy biological population. Neutralizing or oxidizing chemicals shall not be utilized to accomplish odor control within the biotrickling filter. If a supplemental nutrient formula is needed for the odor control system to meet the design criteria, the manufacturer shall provide a reservoir and associated dosing system.

1.03 APPROVED MANUFACTURERS:

- A. The biotrickling filter manufacturer shall be experienced in the design, construction and successful operation of biotrickling filter odor control systems for the removal of hydrogen sulfide gas and other odor producing compounds from air ventilated from wastewater treatment systems. All equipment shall be furnished by a single manufacturer with single-source responsibility.
- B. Systems utilizing organic, lava rock, or stone media shall not be accepted.
- C. Below are the approved biological odor control system design and manufacturers for this project:
 - 1. BioAir Solutions, LLC, Voorhees, New Jersey.
 - 2. Evoqua Water Technologies LLC, San Diego, California.
 - 3. Heyward Florida Incorporated, Winter Park, Florida.
 - 4. ECS Environmental Solutions, Belton, Texas.
 - 5. Daniel Company, Upland, California.
- D. If a biotrickling filter manufacturer is not a pre-approved manufacturer and would like to be included in the above list, at a minimum the manufacturer shall:
 - 1. Provide manufacturer literature on biotrickling filter equipment, components, and materials. A specification on the material and structural integrity of the vessel must be provided.
 - 2. Provide a letter documenting compliance with this specification and, if necessary, state any exceptions.
 - 3. Provide at least five (5) examples of satisfactory installations treating an average influent hydrogen sulfide concentration of greater than 600 ppm and a peak concentration greater than > 1,000 ppm.

- 4. Provide design criteria for each of the examples including, but not limited to: air flow (cfm), hydrogen sulfide inlet design concentration (ppm), hydrogen sulfide removal (%), water usage (gpd), vessel diameter and height (feet).
- 5. Provide a list of references for each of the example installations with contact information including, but not limited to: accurate contact information of owner (name, job title, location, phone number, email address), placed in service date, design conditions including air flow rate, and hydrogen sulfide loading.
- 6. JEA reserves the right to request additional information.

1.04 SUBMITTALS:

- A. Shop drawings and literature describing the equipment shall be submitted to the Engineer and JEA for evaluation and approval. Fabrication of odor control system shall not begin until written approval is provided. If the selected manufacturer's equipment layout, configuration, and/or piping requires changes from the bid documents, it is the responsibility of the manufacturer to clearly submit all proposed changes in the submittals at no additional cost to JEA.
- B. The following items may be requested prior to approval:
 - 1. Submittals shall include details of construction, model numbers, dimensions, manway locations, media material, media total depth, number of media sections, depth of media per section, vessel exterior color selection charts (if applicable), nutrient storage and feed system (if needed), recirculation pump (if needed), integral carbon polisher (if specified), shipping and operating weights, operating parameters, blower performance curves, blower motor (manufacturer, model, bearing type, horsepower, weight, load, efficiency, current and dimensions), process and instrumentation diagrams (wiring and interconnection diagram), electrical schematics, system layout drawings/schematics, recommended methods for handling (unloading, storing, lifting, etc.), mounting and installation instructions, and any other pertinent information that may be required for a successful odor controls system.
 - 2. In addition to the control requirements specified herein and the Manufacturer's standard control apparatus, the Odor Control Pump Station Control Panel shall:
 - a. Power the Air Flow Meter (FE/FIT 600) and provide contact closure circuit to the Holiday Road Master Pump Station SCADA System to confirm the odor control blower is running; and

- b. Provide a contact closure circuit to the Holiday Road Master Pump Station to confirm when the HOA switch is in the AUTO position.
- 3. Manufacturer shall submit description of the laminate and the type of reinforcing to be used and a letter from the manufacturer stating the laminate reinforcing material used will provide chemical resistance at least equal to the published chemical resistance for the resin for the intended application, and the resin will meet the performance requirements stated and is suitable for the service conditions specified herein and the fabrication technique proposed. Manufacturer shall also submit certification of applicable wind load design in accordance with current edition of the Florida Building Code.
- 4. Manufacturer shall furnish a list of recommended spare parts for each piece of equipment in the scope of supply.
- 5. Manufacturer shall submit calculations indicating the basis of design for the system. These must demonstrate that the equipment is structurally sound and that the system will perform as specified. Manufacturer shall submit complete design calculations for the media support system. The design calculations shall be sealed by a Registered Professional Engineer in the State of Florida.
- 6. Anchor and tie-down system design calculations signed and sealed by a Registered Professional Engineer in the State of Florida. Shall include, but not limited to, anchor calculations for design of fastening system to concrete pad to withstand applicable wind load criteria and other loadings discussed herein. Shall include size, embedment, and installation design criteria for anchor bolts and tie downs.
- C. Manufacturer is required to submit the following items:
 - 1. Submit certification indicating the quality control, testing, and inspection has been completed and standards specified herein have been met prior to shipment to the job site.
 - 2. Manufacturer shall furnish two (2) bound copies and an electronic copy of the Operation and Maintenance instructions. The information shall be sufficient to instruct personnel who are unfamiliar with such equipment in the operation and maintenance of the system. It shall include diagnostic procedures to be used in the event of system shutdown or malfunction.
 - 3. Submit the performance guarantee and warranty for the system.
 - 4. Submit results of all performance testing procedures and results.

- D. All exceptions and/or deviations shall be fully identified and described.
- **1.05 DESIGN BASIS:** The complete biotrickling filter odor control system shall be sized for the following characteristics:
 - A. Air Flow: 600 cfm
 - B. H_2 S Inlet: 100 ppm (min) | 500 ppm (max) | 250 ppm (avg) C. H_2 S Removal: 99% (min) | >99% (max) | >99% (avg)
 - C. H_2 S Removal: 99% (min) D. EBRT @ Max. Air: 20 sec (min)

PART 2 - PRODUCTS

2.01 GENERAL:

- A. The biotrickling filter shall be cylindrically shaped with upflow air passage and countercurrent liquid flow. The biotrickling filter shall include an engineered baffle to ensure 0% bypass of the air stream around any of the media bed.
- B. The system shall include the equipment and controls necessary to automatically and effectively remove contaminant gases and to minimize the possibility of breakthrough due to fluctuations in gas flow or concentration.
- C. The system shall be able to operate in a constant liquid recirculation mode, intermittent freshwater mode, and the ability to do both.
- D. All parts for the odor control system shall be installed in strict accordance with the manufacturer's instructions and under the guidance of the manufacturer's field representative. All components shall be designed for operation in a highly corrosive environment. All exposed parts shall be suitable for direct sunlight.
- E. All materials of construction including miscellaneous hardware shall be resistant to attack by the corrosive compounds present in the air stream, as well as those present in the recirculating liquid, including biodegradation byproducts. Nuts, bolts, and washers shall be 316 stainless steel.
- F. All special tools required for normal operation and maintenance of the equipment shall be furnished with the equipment by the manufacturer. The Operation and Maintenance Manual shall identify each such tool and where it is used.
- G. Manufacturer is responsible for the duct from the blower to the biotrickling filter vessel and, if applicable, from the biotrickling filter vessel to the carbon polishing system. Duct shall include required transition pieces, valves, and expansion joints to connect to fan outlet and odor control equipment. Ducts shall be of sufficient diameter and design to move air without undue pressure loss. The pressure loss of the combined odor control system and duct work

shall not exceed the maximum pressure available from the blower at the specified air flow rate operating at non-overload conditions. <u>The Contractor</u> is responsible for duct from the <u>Splitter Box, as shown on the Drawings</u>, to the suction side of the blower, as well as Sch. 80 PVC piping for the water supply, nutrients, and drain.

- H. Products shall comply with National Fire Protection Association 820: Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
- 2.02 **PERFORMANCE REQUIREMENTS:** In addition to the system requirements identified in Section 1.05, the biotrickling filter system shall be designed for the following operating conditions and criteria. <u>Systems not meeting minimum EBRT</u> (Empty Bed Residence Time) will not be accepted.

Minimum H ₂ S Removal Efficiency / 24 hr Avg.	> 99% or less than 0.1 ppm, whichever is greater
Max. Pressure Loss Across Reactor (Biological only)	< 3.0" water column
Max. Pressure Loss Across Reactor (Biological and Carbon)	< 6.0" water column

2.03 BIOTRICKLING FILTER VESSEL, MEDIA, AND COMPONENTS:

- A. The entire biotrickling filter vessel shall be made of fiberglass reinforced plastic (FRP) material. The FRP shall be premium vinyl ester fiberglass resin. Resins used in laminate shall be premium corrosion-resistant, suitable for the intended service. Selected resin shall be used for fabrication throughout the entire vessel. Use of more than one resin during fabrication is not acceptable. The resin shall not contain fillers or thixotropic agents unless otherwise specified. Vessels shall be cured in accordance with the recommendations of the resin manufacturer, including post cure temperatures and times.
- B. Vessels shall be resistant to chemical attack compounds present in the application. Vessels shall also be UV resistant. Ultraviolet absorbers shall be added to the surfacing resin to improve weather/UV resistance of the vessel.
- C. Vessel components shall be preassembled at the point of fabrication. Preassembly will not require all joints to be factory assembled, but all joints shall be prepared for field fabrication and square. All cut edges shall be sealed with a resin coating of the same resin as used in the fabrication. Vessel walls shall be reinforced around all openings and connections.

- D. Exterior coating shall not be applied until after inspection of the laminate has been completed. No dyes, pigments, or colorants shall be used except in the exterior coat. JEA reserves the right to select the biotrickling filter vessel exterior color (if applicable). If not specified, the manufacturer shall supply their standard equipment color (white, grey or black).
- E. At a minimum, four (4) manways (sump, top, and bottom of packing, and top of mist eliminator) shall be provided. Manways at the top and bottom of the packing shall be at least 24" in diameter for access to facilitate both removal and replacement of the media. They should be located away from any obstructions such as piping and ductwork. If the vessel is 6-foot in diameter or smaller, the 24" manways are not required as long as adequate access to the media is provided for removal and replacement.
- F. The bottom or reservoir section shall include air inlet connection, makeup water connection, nutrient feed connection (if needed), inoculant injection connection, recirculation pump suction connection (if needed), drain, and overflow. The drain shall be positioned as close to the bottom as possible so the reservoir section can drain completely.
- G. Equipment shall be furnished with concrete anchors and hold down lugs, complete with 316 stainless steel plates, bolts, nuts and washers for proper anchoring of the tank as required by the manufacturer, anticipated loads, and compliance with local code requirements.
- H. Lifting lugs shall be capable of withstanding weight of the empty vessel with a minimum safety factor of 5 to 1. A minimum of three lugs shall be furnished per vessel. Lifting lugs shall be Type 316 stainless steel of FRP and attached to the vessel wall with hand lay-up laminate equal to or greater than the vessel wall thickness.
- I. The structure shall comply with the current edition of the Florida Building Code including design for applicable wind loads. If necessary, hurricane straps and accessories shall be provided to securely anchor the unit to the slab.
- J. Biotrickling filter shall have air inlet and outlet flanges. Flanges shall be 3/8" thick and widths will be commensurate with the scrubber dimensions. Maximum flange width will be 3".
- K. Air inlet duct between the blower and vessel shall have a 1" diameter tap and 1" ball valve for inlet air sampling. Also provide a 1" diameter tap and 1" PVC ball valve in the bottom of the duct to remove condensate in air duct at low elevations including before the blower and between the blower and vessel (if applicable). If a separate carbon polishing unit is provided a 1" diameter tap and 1" ball valve for inlet air sampling and 1" diameter tap and 1" PVC ball valve for condensate shall be provided on the transition duct.

- L. Vessel shall be furnished with a vertical exhaust stack with a bolted flanged connection to the outlet. Vertical exhaust stack shall be provided with a down turned 2" diameter internal outlet air collection, transitioning to 1" diameter outside the vessel, routed down to approximately 4' above the finished grade with a 1" ball valve for outlet air sampling. Outlet sample shall have either a ½" hole in the pipe downstream of the sample location to facilitate airflow, or shall be routed to the suction side of the blower to allow for positive flow to the sample location.
- M. The Supplier shall be responsible for providing the proper media to ensure the system meets the specified performance requirements. The chemically resistant synthetic/inert media shall have a high surface area to provide an optimal site for growth of microorganisms while allowing for even airflow and water recirculation without possibility of media compaction. Media and media support system shall be suitable for continuous exposure to a dilute sulfuric acid solution with pH ranging from 1 to 3. Media should not shrink or swell with varying moisture content. The media shall be made from chemically resistant material. The system must be constructed in a manner to minimize the potential for short circuiting of the air being treated and to enhance contact between the gas and liquid solutions. Manufacturer shall design biotrickling filter unit with engineered baffle to ensure 0% bypass of the airstream around any of the media bed.
- N. Media shall be supported by media support plates, packing support plates and mid span supports suitable for supporting a bed of media plus entrained water/solution and any deposits on the media under all conditions of operation, including a flooded bed condition. Media support system shall be constructed of corrosion-resistant materials. Apply vinyl ester resin to any field cut edges of FRP media support beams or grating to prevent corrosion and degradation. Opening size shall not allow for passage of packing media in any random orientation. Manufacturer shall provide instructions for placement and removal of packing support in and out of the vessel.
- O. The vessel shall be configured with at least one fluid injection spray nozzle designed to be clog resistant. The spray nozzle shall be located to disburse the fluid evenly over the entire media surface area. Internal spray piping shall have flanged connection for easy removal without entering the vessel.
- P. The operation of the spray nozzles shall be via a recirculation pump (recirculation mode) or a motor controlled actuator valve (fresh water intermittent mode) and shall be capable of continuous, intermittent, and dual mode operation with either recirculated sump water or fresh water.
- Q. All irrigation system piping shall be constructed of Scheduled 80 PVC. All fittings shall be true union, solvent welded, or threaded, US standard sizes. All flange gaskets, union seals, valve seals, and other piping seals shall be fully compatible with the chemicals to be used in the regular operation, maintenance, and cleaning of the odor control system.

- R. Mist eliminator shall be provided to prevent excess mist from being discharged from the tower exhaust. Mist eliminator shall be designed to remove 99% of all mist particles 40 microns and larger and 90% of all mist particles 10 microns and larger.
- S. Recirculation pump shall be a magnetic drive pump, dynamically balanced and be capable of mounting directly to standard NEMA motors. The pump shall be totally enclosed and suitable for exposure to the elements. Motors shall be TEFC. Vertically mounted motors shall include rain guard for protection. If necessary, the recycle line shall include motorized ball valves to alternate between multiple spray headers.
- T. Supply either an external tank or integral tank built into the odor control system vessel to mix and store supplemental nutrients. Nutrients will be automatically added to the injection fluid on a periodic or continuous basis to meet performance requirements.
 - 1. To maintain a fresh nutrient supply, nutrient storage tanks shall be sized for a minimum 7-day supply and a maximum of 14-day supply.
 - 2. Nutrients shall be available locally, non-hazardous, and non-proprietary. Manufacturer is responsible for providing chemical composition of recommended nutrients along with non-proprietary supplier information.
 - 3. The nutrient dosing system shall be provided by a dedicated metering pump for the delivery of nutrient to the media bed compartment. The metering pump shall be manually adjusted for output by the operator. Nutrient system tank shall include fill, outlet, low level indicator and vent.
- U. Vessel shall be provided with a permanently attached, stainless steel equipment identification plate. The label shall state the following in die-stamped lettering for the plate:
 - Equipment identification (tag) number shown on submittals and vessel name.
 - Manufacturers name and address.
 - Model number and serial number.
 - Date of manufacture.
 - Material of construction.
 - Design pressure (vacuum).
 - Vessel dimensions.
 - Operating weight.

2.04 CENTRIFUGAL BLOWERS:

- A. Blowers shall be corrosion resistant cast aluminum, welded aluminum or FRP direct drive.
- B. All internal and external blower hardware shall be 316 stainless steel.
- C. Motors shall be high-efficiency, 1.15 service factor, 3phase/60hz/208V. Motors shall be stainless steel washdown/inverter duty induction type motors with sealed, lubricated bearings mounted on a corrosion resistant aluminum or stainless steel motor pedestal. No painted carbon steel bases shall be allowed. Bearings shall be heavy duty, self-aligning grease lubricated ball or roller type with a minimum 100,000 hour B-10 life. OSHA approved shaft guard shall be provided when fan wheel is not direct coupled to the motor. For motor frame sizes larger than 3HP, use Severe Duty TEFC Motors.
- D. Blower impeller shall be dynamically balanced prior to assembly.
- E. Blower motor shall be operated by a variable frequency drive (VFD) motor controller for precise air flow control to the biotrickling filter.
- F. Blower inlet/outlet shall be provided with a flex connector. The blower shall be shipped loose from the system and anchored to the concrete pad without the need for vibration isolators.
- G. The pressure loss of the combined odor control system and duct work shall not exceed the maximum pressure available from the blower at the specified air flow rate operating at non-overload conditions.
- H. Each fan shall be furnished with a 316 stainless steel nameplate with manufacturer's name, model number, and serial number.
- I. See Section 1.05 for air flow requirements.

2.05 PROCESS CONTROL SYSTEM PANEL AND ACCESSORIES:

- A. Process control system panel(s) shall be provided to operate the blower, nutrient pump, actuator valve, recirculation pump(s), instrumentation and all other system components.
- B. The process control system panel(s) shall be manufactured of marine grade aluminum, FRP or stainless steel with all stainless steel mounting hardware where necessary and rated NEMA 4X. The biotrickling filter control panel shall be provided to operate the nutrient feed pump, pressure gauge(s), actuator valve, valves, timer relays, flow meter, recirculation pump, instrumentation and all other system components in a complete packaged system for operation of the odor control system. The control system(s) shall

include an Eaton Cutler Hammer SVX9000 VFD blower motor controller. Start/stop control shall be provided for each recycle pump, and hand-off timer control shall be provided for the nutrient pump.

- C. Portable pressure gauge(s) shall be provided in lieu of installed gauge(s) and differential pressure indicator as long as connections are provided to allow for measurement.
- D. Circuit breaker protection for all motor circuits shall be provided. A main disconnect and control transformer to 120 VAC control power shall be included. A separate 120 VAC circuit with breaker shall be provided for the air flow detector (FE/FIT 600) device shown on the DRAWINGS and specified in Section 2.05(J).
- E. Labels shall be fixed to the face of the panel in such a manner that the function of each component shall be easily ascertained. Labeled terminal strips shall be provided in order to facilitate wiring of external devices such as switches, sensors, meters, and controllers. No more than two conductors shall be located in each termination point.
- F. Wiring practices shall meet standards set by the latest editions of the National Electric Code (NEC).
- G. All conductors shall be labeled with wire numbers and those numbers shall correspond with those provided in a wiring and panel layout diagram. All components shall be labeled with the same symbol reference shown in the electrical wiring and instrument list.
- H. System supplier shall provide any and all necessary start-up or acclimation kits required to place the system into successful operation.
- I. Equipment metal frame work shall include a ground wire #2 cu thinned to the grounded grid. It shall be exothermically welded to the grounding grid and mechanically attached to the frame with a compression terminal on the wire and bolted to the frame. Consult JEA standard grounding drawings on jea.com for additional information.
- J. The Manufacturer shall integrate an air flow switch into the Blower's suction duct to confirm the blower is operating when the control panel is energized. The Manufacturer's control panel shall provide contact closures to provide: (1) confirmation the panel has power and is in AUTO position; and (2) confirmation air is flowing in the duct as measured by the air flow switch. The Contractor shall also integrate the control panel's power and air flow switch (FE/FIT 600) confirmations into the Pump Station Control Panel's SCADA system. The SCADA system shall receive contact closures that the station is powered AND the blower is operating based on air flow from the

suction duct. The air flow switch (FE/FIT 600) shall be the SERIES AVFS Air Flow Switch as Manufactured by Dwyer having the following characteristics:

- Air Velocity Range: 197-1969 FPM (1-10 m/s)
- Temperature Limits: 5 to 122°F (-10 to 50°C)
- Humidity Limits: 0-90% RH
- Wetted Materials: PBT body, titanium sensor
- Maximum Pressure: 14.7 psig (1 bar)
- Housing: PBT
- Repeatability: 5%
- Contact Rating: 3 A (30 VDC/250 VAC)
- Response Time: 3-60 seconds. Varies with flow and set point.
- Power Requirement: AVFS-01: 80...250 AC/DC (47...63 Hz AC); AVFS-02: 24 VDC ±25%
- Power Consumption: 3 VA
- Electrical Connection: As required for facility connection
- Enclosure Rating: NEMA 4X (IP65)
- Display: 1 red LED/1 green LED
- Agency Approvals: CE

PART 3 - EXECUTION

3.01 SHIPPING, STORAGE, AND HANDLING:

- A. Equipment shall be inspected for damage prior to unloading. Manufacturer shall be notified immediately upon notice of damage. Any damaged equipment shall be promptly replaced at no cost to JEA.
- B. Product delivery, storage, and handling shall comply with Manufacturer's instructions and as follows:
 - 1. All media shall be delivered in bags for ease of install.
 - 2. Long term media storage is not acceptable.
 - 3. All electrical and ancillary equipment shall be stored in a climate controlled building greater than 50 degrees F.
 - 4. All parts shall be properly protected so that no damage or deterioration will occur in transit or during prolonged storage at the site.
 - 5. All openings in equipment shall be protected against entry of foreign objects.

- 6. Each box, crate, and package shall be properly marked to show its contents and net weight.
- C. Equipment shall be shipped on an open flat-bed trailer to facilitate offloading. A covered trailer may be utilized with prior approval providing that equipment is at or near the open end. Contact Katie Templeton (904) 665-8784 to coordinate specific delivery time and location to ensure that someone is available to assist with offloading equipment prior to delivery.
- **3.02 INSTALLATION:** Installation shall be in strict accordance with the respective manufacturer's instructions and recommendations. Type 316 stainless steel anchor bolts shall be furnished by the equipment supplier and set in accordance with the manufacturer's recommendations.

3.03 MANUFACTURER SERVICES:

- A. The manufacturer shall provide the services of a qualified service technician who shall adequately supervise the installation and testing of all equipment furnished under this contract and instruct JEA operating personnel in its proper maintenance and operation. The manufacturer shall provide service technician for at least four (4) trips no less than eight (8) days total for installation assistance, start-up, and post start-up inspection of the equipment. Within the first year of operation a direct employee of the manufacturer (not local representative) shall make quarterly visits for one year after installation to insure proper operation of the system. Emergency response for first year is 24 hour call back and five (5) business days on site at no cost to JEA.
- B. The biotrickling filter system with other associated equipment such as the blower, piping and controls shall be field-tested.
- C. The Contractor shall furnish water, power, and nutrients required for startup and testing.
- D. The startup and testing shall meet the performance guarantees described under performance requirements listed herein. All equipment shall show evidence of mechanical soundness, no evidence of liquid or gas leaks, no undue vibration, and generally be structurally rigid when being tested.
- E. The manufacturer representative witnessing the biotrickling filter system startup and field test shall furnish the Owner a written report certifying that the unit is operating according to specifications.
- F. Coordinate startup services with the blower and VFD. The manufacturer representative of the biotrickling filter system shall provide all speed and protection settings necessary for this device.

3.04 PERFORMANCE TEST

- A. The manufacturer shall provide for a direct employee (not local representative) to conduct performance testing to ensure hydrogen sulfide removal efficiency.
- B. The performance test shall be conducted after sufficient acclimation time and at such time as all anticipated odorous air streams are present in the scrubber inlet.
- C. The odor control system shall be tested under actual operating conditions in order to demonstrate that it will perform as required. During the test, air flow rates, recirculation rates and other controllable parameters must remain constant and be recorded.
- D. The test shall last at least twenty-four (24) consecutive hours and samples shall be taken from the inlet and outlet of the scrubber system using an OdaLog portable gas detection instrument. <u>Performance testing will also be required on quarterly visits as described above</u>. If the equipment includes a carbon polishing unit the outlet of the system shall also be recorded during performance testing using an OdaLog. It shall be noted that performing testing is based on the biotrickling filter only. The outlet conditions of the carbon polisher shall be tested but will not be included to meet the performance testing requirements specified herein.
- E. <u>Should the system performance not meet any of the above requirements,</u> that system shall have failed the performance test. The manufacturer shall make any additions or modifications to the system as may be necessary, at no additional cost to JEA, and the performance tests for that system shall be repeated in its entirety. In the event of three (3) failed performance tests, the system will be rejected and the manufacturer shall remove equipment within 30-days and refund JEA the entire bid price.
- F. Manufacturer shall certify the results of the test and submit a written test certification report of the test to JEA. The conditions tested shall be documented and the parameters recorded including air flow rates, recirculation rates and pH.
- G. Any additional time required to achieve successful installation and operation shall be at the expense of the manufacturer and not JEA.
- H. Each performance test shall be witnessed by JEA and results submitted for review and acceptance.

3.05 WARRANTY: The complete biological odor control system and all components shall carry a 3-year "Full Replacement Warranty" against defects in workmanship and materials that shall begin once the unit has been started and is meeting all performance requirements. Manufacturer shall modify or replace any equipment that fails to perform as specified, at no additional cost to JEA. The synthetic/inert biological media and support grating shall carry a 10-year <u>non</u> pro-rated full replacement warranty. Labor cost of removal and replacement of media shall be by JEA.

END OF SECTION

SECTION 15060

PIPE WORK - TREATMENT PLANT SITES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: The extent of work as specified under this section shall generally include, but not be limited to, the furnishing of all labor and materials required to provide all piping, fittings, sleeves and seals required for the new construction and tying-in to existing construction under this contract.

All pipe work shall be furnished and installed in accordance with JEA's Water and Wastewater Standards Manual, January 1, 2020 Edition, Section 429 - Wastewater Force Mains.

1.02 SUBMITTALS:

- A. Submit manufacturer's certification of materials' conformance to specifications.
- B. Submit manufacturer's literature, catalog data and installation instructions.
- C. Submit certified pressure test reports.
- D. Certified shop and erection drawings. Contractor shall submit electronic files of the piping layout including the following.
 - 1. Pipe layouts in full detail.
 - 2. Location of hangers and supports.
 - 3. Location and type of anchors.
 - 4. Location of couplings and expansion joints.
 - 5. 1/2-inch = 1 foot-0 inches (25) scale details of all wall penetrations and fabricated fittings or special fittings.
 - 6. Schedules of pipe, fittings, expansion joints and other appurtenances.
- E. Job Conditions: Coordinate dimensions and drillings of flanges with flanges for valves, pumps and equipment to be installed in the piping systems.

PART 2 - PRODUCT

See JEA's Water and Wastewater Standards, Specification Section 429.II.

PART 3 - EXECUTION

See JEA's Water and Wastewater Standards, Specification Section 429.III.

END OF SECTION

SECTION 15101

VALVES AND ACCESSORIES

PART 1 - GENERAL

Valves and accessories shall be furnished and installed in accordance with JEA's Water and Wastewater Standards Manual. Applicable sections as follows:

• Wastewater Valves & Appurtenances, Section 430.

PART 2 - PRODUCTS

See JEA's Water and Wastewater Standards, Specification Section 430.II., 430.IV., and 430.VI.

PART 3 - EXECUTION

3.01 PREPARATION AND INSPECTION:

- A. Examine area to receive valve and accessories for defects that adversely affect execution of work or cause deviation beyond allowable tolerances for clearances.
- B. Carefully examine each section of pipe and valve before installation. Do not use defective or damaged pipe or valves. Remove such pipe or materials from project site immediately.
- C. Provide proper facilities for lowering materials into trench.
- D. Thoroughly clean inside of pipe of all foreign matter.

3.02 INSTALLATION:

A. General: Location of lines shall be generally as indicated. Adjust line location to avoid conflicts as required and as approved by the Engineer. At locations shown or as directed by Engineer. Install connections to meet conditions encountered. Use standard fittings as indicated and/or as directed by Engineer. Schedule operations to cause minimum interruption in flow of line. Provide all required fittings, accessories and operating equipment on site prior to starting work on connection.

- B. Valves shall be set with stems set vertically above centerline of pipe unless indicated otherwise. Keep valves tightly closed during installation and take care to prevent dirt from damaging seating surfaces.
- C. Operate valve to verify that all parts are in working condition prior to installation.
 - 1. Buried Valves:
 - a. Set valve box plumb and place directly over valve operating nut.
 - b. Tamp earth fill completely around valve box for a distance of one foot.
 - c. Provide valve box extensions where required for depth of cover.

3.03 FIELD QUALITY CONTROL:

- A. Inspection:
 - 1. Visually inspect all pipe, fittings, and valves for faults or defects.
 - 2. Correct all deviations or omissions from the plans and specifications immediately.
 - 3. Remove defective pipe, fittings, or valves and replace with sound materials.
- B. Tests: Operate all valves in presence of maintenance personnel.

END OF SECTION

SECTION 15200

BYPASS PUMPING SYSTEMS

<u> PART 1 - GENERAL</u>

- **1.01 SCOPE:** Work covered by this section of the specifications shall consist of furnishing all labor, equipment, supplies, design services, and materials necessary for performing all operations in connection with the temporary bypass pumping and appurtenant facilities shown in the Drawings, and/or modifications thereto required to meet the bypass flow requirements defined herein. It shall be the Contractor's responsibility to supply a Temporary Bypass pumping system to bypass/divert flows as follows:
 - <u>Holiday Road Master Pump Station Influent Collection System Flows</u>: 3.6 MGD (2,500 gpm) average daily flow or less 5.8 MGD (4,000 gpm) peak hourly flow
 - Operating pressures as required to transmit flows.
 - Bypass Sequence 'A': Force main head condition 30 to 40 psig (TDH) at 1,000 to 2,000 gpm from current dry-pit pumps. 3,000 gpm and greater head conditions have force main pressures that exceed 50 psig. During this sequence, the Contractor shall pump to the existing 18" force main utilizing Pump Connection No. 1 and No. 2 as shown on the Drawings. Pump Connection No. 1 shall be modified prior to bypass activities, and Pump Connection No. 2 shall be constructed prior to bypass activities.
 - Bypass Sequence 'B': Low-head condition from collection system manhole to proposed Manhole No. 2 as shown in the Drawings.

The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The Contractor shall employ the services of a vendor who can demonstrate to the Engineer/JEA that they specialize in the design and operation of temporary bypass pumping systems. The bypass system shall meet the requirements of this Specification, all codes, and regulatory agencies having jurisdiction.

The Contractor will be responsible for restraining all temporary piping and providing appropriate anchors, pipe supports, flanges, mechanical joints, bell restraints, etc. to maintain pressure and flow to the designated portions of the project. The Contractor shall provide restraint and support designs for the proposed piping systems as part of the shop drawing process.

The Contractor shall review the Drawings and configuration of the existing collection system to determine approach to isolate portions of the system for

storage and allow for the sequenced improvements required to complete the Work. The Contractor shall confirm their approach within the bypass submittal. During Bypass Sequence A, Pump Connection No. 1 and No. 2 shall be utilized at all times.

1.02 QUALITY ASSURANCE: Bypass system manufacturer/supplier shall have been in business for a minimum of 15 years and have a Professional Engineer registered in the State of Florida to sign and seal Contractor designed bypass pumping plans for the project as defined herein. Manufacturer shall have a major service center within 150 miles of the project site. Bypass system representative shall provide a system with sufficient redundancy/firm capacity to meet the bypass requirements even if mechanical failures occur.

In order to unify responsibility for proper operation and service of the bypass units, it is the intent of these Specifications that all system components shall be furnished by a single manufacturer (unitary source).

The bypass system manufacturer/supplier shall provide references for three (3) or more successful bypass projects of similar complexity and size as this project.

1.03 GENERAL REQUIREMENTS:

- A. Applicable Codes, Standards, and Specifications: The Work shall be in strict accordance with the following codes and standards:
 - 1. FDEP Requirements.
 - 2. American Society for Testing and Materials (ASTM).
 - 3. National Electrical Code.
 - 4. Occupational Safety and Health Standards (OSHA).
- B. Existing Facility Operations: The existing master pump station shall remain in service at all times during construction of the project except during Bypass Pumping Sequence 'A'.
 - 1. During Bypass Pumping Sequence 'A', the Contractor will be required to provide a bypass pumping plan to isolate the existing master pump station from the collection system, and pump domestic wastewater from the existing collection system piping to the existing 18" force main via two 12" pump connections (Pump Connection No. 1 and No. 2). During Bypass Pumping Sequence 'A', the master pump station will be offline to allow for wet-pit rehab, slide gate removal/replacement, wall cores, PLC modifications, wet-pit cleaning, etc. The duration of Bypass Sequence 'A' shall be minimized to the least amount of time possible to complete the improvements.

- 2. During Bypass Pumping Sequence 'B', the Contractor will be required to provide a bypass pumping plan to pump domestic wastewater from the existing collection system piping to the project's 30" gravity bypass system completed during Bypass Sequence 'A'. The bypass pumping system shall allow JEA to operate the Holiday Road Master Pump Station in normal operations and ensure no sanitary sewer overflows occur while the bypass pumping system is online.
- 3. The Contractor shall coordinate the work with JEA so that the construction will not restrain or hinder the operation to the existing master pump station during Bypass Pumping Sequence 'B'.
- 4. After coordinating the work with JEA, the Contractor shall prepare a submittal in accordance with the enclosed requirements. The Contractor shall obtain JEA and Engineer's approval before any work is undertaken.
- 5. Before any roadway or facilities are blocked off, JEA's approval shall be obtained to coordinate operations for the pump station facility. Temporary ramps shall be provided, as required, to protect bypass piping and allow access to the station during the project's completion.
- C. Bypass System Description:
 - 1. Bypass pumping necessary for the construction of the Project is considered specialty work and shall be performed by subcontractors specializing in this type of work. The design, installation and operation of the temporary pumping system shall be solely the Contractor's responsibility. The proposed bypass design shall be sealed by a Professional Engineer registered in the State of Florida. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
 - 2. The Contractor shall provide for continuous transmission of wastewater by providing a temporary bypass pumping system. The Contractor shall have adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. The Contractor shall indicate in their submittal sufficient firm capacity to meet the peak hourly flow demands with one pump out of service. A minimum of three pumps will be required for service, with design approach to keep one pump in lag condition at all times. If actual operations require service of all mobilized pumps, then the Contractor shall modify and replace pump selections or add an additional standby pump.

- 3. Temporary bypass pumping shall include, as a minimum:
 - a. All pumps, hoses, fittings, adapters, pipe supports, and incidentals for a complete turnkey bypass pumping station.
 - b. Temporary pump system shall be capable of pumping flows defined in the Drawings and specified in Section 1.01 on a real-time basis.
 - c. Each pumping system shall operate on a variable frequency drive (VFD) system to maintain a constant water level within the collection system piping.
 - d. Power required for operating the system. Fuel shall be arranged, delivered and installed by the Contractor.
 - e. Automatic controls to adjust the flow rate of the pumping system to match the influent flows.
 - f. Pumping system shall be periodically inspected and maintained by a qualified operator when in operation.
 - g. Bypass pumping shall not hamper or impair the operations of the pump station facilities during Bypass Sequence 'B'.
 - h. High water level alarm with signal to the Contractor and JEA Operation Building.
 - i. Automatic dialers shall be installed to notify emergency contacts.
- 4. The Contractor shall not be liable for FDEP/EPA fines due to sewage spills caused solely by incoming flows exceeding 5.8 MGD, provided the specified amount of bypass pumping is maintained.
- 5. Submit Work Plan detailing overall sequence of work to install the materials. Work Plan shall detail the project schedule, required shutdowns, required temporary structures, bypass pumping plan, contingency plans for weather and bypass pumping equipment downtime and safety plan.

1.05 SUBMITTAL:

A. Shop Drawings: The Contractor shall submit to the Engineer/JEA detailed plans and descriptions signed, sealed, and dated by a Florida Professional Engineer outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing wastewater flows. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials and all other incidental items necessary and/or required to insure proper protection of the facilities, including protection of the access and bypass pumping locations from damage due to discharge flows, and compliance with the requirements and permit conditions specified in these Contract Documents. No construction shall begin until all provisions and requirements have been reviewed and approved by the Engineer/JEA.

Submit copies of shop drawings and product data for equipment furnished under this section. Submittal shall include the following minimum information:

- 1. Qualifications of Pump Contractor.
- 2. Signed, Sealed, and Dated Bypass Installation Plan including, but not limited to:
 - a. Staging area for pumps;
 - b. Number, size, material, location and method of installation of suction piping;
 - c. Number, size, material, method of installation and location of installation of discharge piping;
 - d. Bypass pump sizes, capacity, number of each size to be on site and power requirements (minimum of 3 pumps required, with one standby pump);
 - e. Standby power generator size, location (if applicable);
 - f. Thrust and restraint block sizes and locations;
 - g. Method of noise control for each pump and/or generator;
 - h. Any temporary pipe supports and anchoring required;
 - i. Design plans for access to bypass pumping locations indicated on the drawings;
 - j. Schedule for installation of and maintenance of bypass pumping lines;
 - k. Plan indicating selection location of bypass pumping line locations.

- 3. Automatic Level Control and Pump Control System, reviewed and approved by the Contractor's Engineer.
- 4. Emergency Response Plan, reviewed and approved by the Contractor's Engineer.
- 5. Signed, sealed, and dated Hydraulic Calculation & System Curves including, but not limited to:
 - a. Calculations of static lift, friction losses, and flow velocity (pump curves showing pump operating range shall be submitted);
 - b. Calculations for selection of bypass pumping pipe size.
- 6. Overall Site Plan with Pump and Suction Placement, reviewed and approved by the Contractor's Engineer.

PART 2 – PRODUCTS

2.01 EQUIPMENT:

- A. General: The bypass pumps shall be capable of handling raw, unscreened, sanitary sewage containing heavy sludge and fibrous materials without injurious damage during normal operation. Pumps shall be non-clog and shall be capable of passing a 3" solid.
- B. Pump Operating Conditions: The Contractor shall provide hydraulic calculations defining the system's head requirements and associated pump and motor capacities.
- C. All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves in the priming system. All pumps used must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows. The pumping equipment shall be sound attenuated (72 dBA @ 23') and be mounted on a skid. Each pump and fuel tank shall be placed in environmental containment pans for secondary containment of spills.
- D. The Contractor shall provide the necessary stop/start controls for each pump. The stop/start control shall be an integral part of the engine control panel.
- E. The Contractor shall include one stand-by pump of each size to be maintained on site. Back-up pumps shall be on-line, isolated from the primary system by a valve.

- F. All temporary bypass piping shall be the appropriate size and rating to meet pressure/flow requirements as determined by the pump contractor's engineer. All temporary bypass piping shall be pressure rated with a minimum 1.5 safety factor for the proposed system use. HDPE, PVC, flex hose, ductile iron, etc. may be utilized. The Contractor shall indicate the type of pipe within their shop drawing submittal and provide all necessary information related to joint restraint, pressure rating, piping supports, pipeline wall thickness, pipeline internal diameter, etc. All pipeline sizes and material types shown in the Drawings provide the design basis for the bypassing system.
- G. Pumps used must be manufactured by a company that is ISO 9001 registered with a RAB (registration accreditation board) accredited third party registrar. The pump manufacturer is to also be ISO 9001 certified for Engineering Design Services and After Market Service. A copy of the ISO 9001 certificate is to be included with the bypass pump submittal to the engineer. All pumps shall be Quiet Flow® sound attenuated, automatic self-priming pumps as supplied by Sunbelt Rentals Inc. Pump and Power Services, (800) 736-6672, or approved equal.
- **2.02 LIQUID LEVEL CONTROLS:** The Contractor shall specify the means of controlling the bypass pumping system and ensuring liquid levels within the influent structure remain below elevations prescribed in the Drawings. Pump controls shall automatically activate and deactivate pumps based on water levels.
- **2.03 EMERGENCY RESPONSE PLAN:** The Emergency Response Plan shall have the following minimum components:
 - 24-hour a day electronic monitoring of the pumping system
 - A call path or sequence for an emergency
 - Requirements of on-site tools and parts
 - Record keeping requirements

The Contractor shall provide technician(s) capable of maintaining and troubleshooting the by-ass system on-call in case of an emergency on a 24-hour basis to maintain or re-establish pump sets and level of the water. Technician shall submit incident reports and turn them into the JEA within 24 hours of any incident.

The Contractor, JEA, & JEA Pump Station Operator(s) shall be linked by cell phone 24-hours a day during the course of bypass operations. Any alarms shall initiate a call to the Contractor and JEA. JEA and Contractor shall each have a minimum of three (3) individuals listed within the 'calling tree'. If the first contact does not confirm receipt of the alarm call, then the next contact shall be called until the alarm is either confirmed and/or all three (3) contacts are called. JEA's link into the alarm status is only for informational purposes. The Contractor shall
be responsible for all bypass alarm conditions and shall be required to resolve the condition that is causing the alarm to occur.

The Contractor shall be solely responsible for re-cleaning of effluent channel (work area) if overflows occur based on bypass pumping failures.

PART 3 - EXECUTION

3.01 INSPECTION AND TESTING:

- A. Contractor is responsible for locating any existing utilities in the area the Contractor selects to locate their bypass pipelines. The Contractor shall locate his bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from the JEA. All costs associated with relocating utilities and obtaining all approvals shall be paid by the Contractor.
- B. Upon completion of installation, in the presence of the Engineer/JEA, the Contractor shall perform a preliminary test on the system to ensure the functioning of all component parts to the satisfaction of the Engineer/JEA. Bypass Systems 'A' and 'B' shall run without failure or alarms for a minimum period of 48 consecutive hours before any system modifications work can begin.
- C. Bypass pumping pipelines to the 30" bypass system via Manhole No. 2 shall be coordinated with the Contractor and bypass vendor to ensure work areas are available to excavate and perform the necessary earthwork activities to complete construction of Manhole No. 1 and associated gravity sewer extensions. See Drawings for additional information.
- D. During all bypass operations, the Contractor shall protect all temporary work, existing utilities, and proposed work from damage inflicted by any equipment. The Contractor shall be responsible for all physical damage to the pumping station and main and all local sewer lines caused by human or mechanical failure.

3.02 OPERATIONS:

- A. The Contractor shall furnish all labor, materials and equipment required to correct any deficiencies noted, by repairing or replacing the defective component and retesting, as required, until the equipment meets the satisfaction of the Engineer/JEA.
- B. Operating personnel shall be trained in operation and maintenance of the equipment. The Contractor shall provide dialers and temporary flow level

alarms for the complete duration of the project. The Contractor shall ensure appropriate equipment and materials are available on-site so the bypass system can be maintained despite mechanical failures.

- C. The Contractor is to provide all maintenance and operation including power cost, oil, lubricant, labor for services, etc. to maintain bypass pumping operation during the duration of the project.
- D. The Contractor shall have designated personnel for on-call maintenance and operation of the bypass pumping facility 24 hours a day, 7 days a week during bypass operations. The bypass pumping subcontracting firm must provide an emergency contact list as well.
- E. Following completion and acceptance of the channel rehabilitation work, the Contractor shall remove all temporary bypass system components and restore the treatment plant to normal operations. Any damaged facilities resulting from the Contractor's work shall be repaired to pre-construction or better condition.

END OF SECTION

SECTION 16000

ELECTRICAL WORK - GENERAL

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. In general, the work specified in this division of the specifications includes the furnishing of all labor, material, auxiliaries, and services necessary to install a complete and properly operating electrical systems, including all fees, charges, and permits necessary.
- B. The Contractor shall furnish and install all wire, cables, conduits, wiring, wiring devices, lighting fixtures, motor controllers, safety switches, relays, control equipment, and all other apparatus and accessories indicated, specified, or required for complete lighting, power, control and instrumentation systems for the project facilities.
- C. The Contractor shall refer to every section of these specifications for installation and coordination requirements applicable to the work specified in this division. The Contractor shall furnish and install all wiring and connections to all electrical equipment furnished under other sections of these specifications, except where specified or indicated otherwise.
- D. The Contractor shall coordinate all electrical work with other project construction trades, installation requirements, sequence of construction schedule, etc., including coordination and installation of required conduit sleeves and supporting devices.
- E. The Contractor shall be required to coordinate all electrical system connections with each appropriate utility company and shall furnish and install all equipment or material necessary to provide complete electrical and telephone service in accordance with all utility company requirements.

1.02 GENERAL REQUIREMENTS:

- A. Design drawings are diagrammatic and intended to show approximate installation and equipment locations. All dimensions shall be verified in the field and coordinated with shop drawings issued. Equipment schedules are intended to serve as a guide only and does not relieve the Contractor of the responsibility for the complete furnishing and installation of all wiring, cable, conduits, or additional apparatus required.
- B. The Contractor shall furnish, install, maintain, and remove upon completion of the project, all temporary service required for construction and testing. The service shall be for general power and lighting and shall include distribution system, panelboards, grounding, branch circuits, general lighting, and receptacles as required.

- C. The Contractor shall furnish a covered, weather-protected facility, providing a clean, dry, non-corrosive environment for storage of all electrical and instrumentation equipment incorporated into this project in accordance with the provisions of the General Conditions.
- D. The Contractor shall furnish and install a system of engraved, laminated nameplates (black lettering on a white background), designed to identify each major piece of equipment. Nameplates shall be attached with stainless steel removable fasteners.
- E. Motors will be furnished with the equipment they drive unless indicated otherwise. Motors shall be high efficiency design. Motors located outdoors or within corrosive environments shall be severe duty construction.
- F. The Contractor shall remove all existing electrical equipment within areas to be demolished and shall return all reusable material to the Owner. Equipment feeder conductors shall be removed up to the first remaining circuit disconnect.

1.03 SUBMITTALS:

- A. For each individual section of this division, there shall be submitted for approval a single, complete shop drawing submission. All elementary and schematic diagrams shall be provided with indication of system coordination and complete description of sequence of operation. Deviations from the contract documents shall be clearly identified.
- B. Complete operation and maintenance instruction manuals, including system schematics which reflect "as-built" modifications, shall be provided. All wire terminations shall be numbered and identified on as-built drawings included as part of the operations and maintenance manuals. All drawings included within the operation and maintenance manuals shall be reduced to a maximum dimension of 17 inches x 11 inches, and shall be legible and reproducible. Special maintenance requirements particular to the system shall be clearly defined along with special calibration and test procedures.
- C. One complete set of design drawings shall be neatly marked daily as a record of job progression and "as-built" installation. The drawings shall reflect the actual installed locations of all equipment and indicate the exact routing and elevations of all concealed conduits. Upon completion of the project, the drawings shall be coordinated with the as-built drawings and submitted to the Engineer.
- D. The Contractor shall maintain a record of all construction documentation including construction survey data, inspection reports, test reports, startup logs, etc. Upon completion of the project, copies of all construction documentation shall be submitted to the engineer.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. All material shall be new and shall conform with the standards of the Underwriter's Laboratories, Inc., American National Standards Institute, National Electrical Manufacturers' Association, Insulated Power Cable Engineers Association, and Institute of Electrical and Electronic Engineers in every case where such a standard has been established for the particular type of materials in question.
- B. The use of a manufacturer's tradename and catalog number is not intended to indicate preference but only the type and quality of the product desired. Products of reputable manufacturers of equal quality and functional type will be acceptable. Substitutes which tend to lower the quality of the work will not be permitted.
- C. Acceptance of alternate equipment does not relieve the Contractor of the responsibility of compliance with the performance and accuracy requirements of these specifications. Where such substitutions alter the design or space requirements indicated on the Contract Drawings, detailed drawings shall be prepared and submitted by the Contractor delineating any changes in or additions to the work shown on the Contract Drawings, and such drawings and changes or additions to the work shall be made by the Contractor at no additional expense to the Owner. In all cases, the burden of proof that the material or equipment offered for substitution is equal in construction, efficiency, and service to that named on the Contractor and, unless the proof is satisfactory to the Engineer, the substitution will not be approved.
- D. Wherever possible, equipment items having the same or similar rated capacity or function shall be identical.
- E. All equipment and apparatus shall be the manufacturer's latest proven design, neither presently scheduled for obsolescence nor developmental prototype.

2.02 RACEWAYS:

- A. Metallic Conduit (Aluminum): All conduit shall be heavy wall rigid aluminum of standard pipe weight unless noted otherwise.
 - 1. Couplings, conduit unions, conduit fittings, etc., shall be aluminum, shall have conventional trade dimensions, and shall be internally threaded with a tapered thread at each end to fit the tapered thread specified for the corresponding size conduit. Conduit outlet body covers shall be cast construction.

- 2. All conduits, couplings, and fittings, and all aluminum conduit elbows and risers located within the classified areas, or within concrete encasement, shall have a gray or black factory-applied PVC coating of not less than 20 mils thickness. Damaged PVC coatings shall be repaired with an approved compound. Conduit supports, channels, and mounting apparatus shall be aluminum or 316 stainless steel.
- B. Flexible Conduit: All flexible conduit shall be Type UA liquid-tight flexible metal conduit made with aluminum flexible conduit covered with an extruded PVC jacket, unless noted otherwise. Fittings shall be the type specifically designed for flexible conduit use and shall form watertight connections. Flexible conduit fittings shall be aluminum construction.
 - 1. Flexible conduit shall only be used for connections from conduits, junction boxes, or motor controllers to mechanical equipment or where the location of the connection is such that it is impractical to make a rigid conduit connection, where vibration isolation is required, or where specifically called for on the drawings. Flexible conduit shall be used for connection to all motors.
- C. Non-Metallic Conduit: Non-metallic conduit, couplings, and fittings shall be Schedule 40 PVC unless noted otherwise. All PVC conduit joints shall be solvent-welded in accordance with the manufacturer's recommendations.
 - 1. Underground conduits and conduit embedded within slabs on grade shall be non-metallic; however, conversion shall be made to rigid aluminum before conduit runs exit encasement. Conversion elbows, fittings and risers within the concrete encasement shall be PVC coated rigid aluminum conduit.
 - 2. Underground conduits shall be installed not less than 24 inches below grade.
 - 3. Underground conduits below driveways, and the underground segments of service entrance conduits, shall be encased in a minimum of 3 inches of concrete.
 - 4. Underground pull boxes shall be provided for all miscellaneous underground conduit runs over 200 feet long.
 - 5. A minimum 3-inch wide polyethylene warning tape, yellow for electrical and orange for telephone, with imprinted legend, shall be installed in the backfill above all underground conduits. Warning Tape shall be Allen Terra Tape, or equal and shall be guaranteed not to discolor. Unless indicated otherwise, the tape shall be 12 inches below the finished ground grade.

- **2.03 WIREWAYS:** Wireways, as indicated on the drawings or approved for installation, shall be NEMA 12 construction with gasketed screw covers and gray baked enamel over a rust-inhibiting primer finish. Wireways installed outdoors on in corrosive atmospheres shall be NEMA 4X aluminum or 316 stainless steel.
 - A. Wireways shall be furnished and installed with required conduit knockouts only.

2.04 WIRES AND CABLE:

- A. Low Voltage Wire: Low voltage wire and cable shall be 600 volt, singleconductor copper, rated 90 degrees C dry and 75 degrees C wet. Unless indicated otherwise, low voltage building wire No. 3 AWG and smaller shall be Type THWN; larger conductors shall have XHHW-2 insulation.
- B. Instrumentation Cable: Instrumentation cable shall be single twisted pair, 600 volt, stranded, tinned copper conductors with cross-linked polyethylene primary insulation, aluminum-mylar foil and braided shield with copper drain wire, and chlorinated polyethylene jacket.
- C. Inner Panel Wiring: Wiring for instrumentation and control panels shall be single conductor, 600 volt, 125 °C rated UL Type AWM stranded tinned copper conductors with cross-linked polyethylene insulation, Belden 356 series.

2.05 TERMINAL BLOCKS AND WIRE MARKING:

- A. Terminal blocks for power conductors shall be 600 volt, three pole unit construction type with high pressure solderless connectors, headless socket screws, and ampere rating equal to or greater than the ampacity of the maximum conductor size to be terminated; Square D Type LBC, or equal.
- B. Terminal blocks for control and instrumentation conductors shall be 600 volt, sectional rail mounted terminal blocks with plastic pre-printed terminal numbering markers on both the inside and outside tracks, and provisions for center terminal bridge jumper cross connections with no loss of space on terminal or rail; Siemens 8WA1 011-1DF11, or equal. Terminal blocks for general control connections shall be feed-through terminal blocks; terminal blocks for instrumentation signal circuits shall be knife type test/disconnect terminal blocks; and terminal blocks for cable shield termination and grounding shall be ground blocks.
- C. Cable and conductor markers shall be heat shrinkable sleeve markers with permanent legible machine printed markings.

2.06 BOXES:

- A. General: Boxes shall be installed at all locations necessary to facilitate proper installation and equipment connection, including each conduit/cable transition.
 - 1. Minimum dimensions of boxes shall not be less than NEC requirements and shall be increased if necessary for practical reasons or where required to suit job condition.
 - 2. Boxes shall have only the holes necessary to accommodate the conduits at point of installation. All boxes shall have lugs or ears to secure covers.
 - 3. All boxes shall be rigidly secured in position. All boxes, except on unfinished ceilings and walls, and where conduit is run exposed, shall be so set that the front edge of box shall be flush with or recessed not more than 1/4-inch behind the finished wall or ceiling line.
- B. Outlet Boxes: The location of outlets as shown on the drawings will be considered as approximate only. It shall be the work of this section to study all plans with relation to spaces surrounding each outlet in order that the work may fit and that when fixtures or other fittings are installed they shall be symmetrically located to best suit each condition. All outlets shall be coordinated with the work of other sections of these specifications to prevent outlets or fixtures from being covered by pipe, duct, etc.
 - 1. Outlet boxes shall be cast one piece hub type standard gang boxes with rubber gaskets.
 - a. Wiring device boxes shall be equipped with cast screw-type covers; Crouse-Hinds Series FS or equal.
 - b. Fixture boxes shall be of sufficient diameter to provide a seat for the fixture canopy; Crouse-Hinds Series GRF or equal.
 - 2. Unless indicated otherwise, receptacle boxes shall be centered 1 foot 6 inches; wall switch boxes shall be centered 4 feet; and wall fixture boxes shall be centered 7 feet 6 inches above finished floor.
 - a. Where shown at door locations, wall switch boxes shall be installed on lock side of door.
 - b. Where shown on columns or over doors, wall fixture boxes shall be installed symmetrically.
- C. Pull Boxes: Pull boxes, including junction boxes and terminal boxes, shall be installed at all necessary points, whether indicated or not, to prevent

injury to the insulation or other damage that might result from pulling resistance or other reasons during installation.

- 1. Unless indicated otherwise, pull boxes shall be NEMA 12 construction with gasketed screw covers and gray baked enamel over a rust-inhibiting primer finish. Pull boxes installed outdoors on in corrosive atmospheres shall be NEMA 4X aluminum or 316 stainless.
- 2. Pull boxes in excess of 36 inches x 36 inches x 12 inches shall be fabricated from code gauge aluminum or 316 stainless steel, suitably reinforced to provide a rigid, self-supporting construction. Each large pull box shall be equipped with a gasketed hinged cover fastened with screws on three sides. Dimension and installation details, for each large pull box, shall be approved prior to fabrication.
- 3. Pull boxes in hazardous areas shall be explosion proof, cast aluminum construction with hinged, threaded, screw-on covers. Explosion proof pull boxes shall be equipped with threaded conduit openings as required for the initial installation, all identified future connections, and a minimum of one spare conduit opening sized to match the largest otherwise required conduit opening.
- 4. Branch circuit pull boxes shall be appropriate outlet boxes with blank covers.
- D. Underground Pull Boxes: Underground pull boxes shall be minimum 24inch x 14-inch x 18-inch deep composolite service boxes constructed of reinforced polymer concrete suitable for light traffic loading, with locking cover and molded logo; Quazite Composolite, or equal.
 - 1. Unless otherwise indicated underground pull boxes shall have solid bottoms. Where open bottom pull boxes are indicated or approved for installation, a bed of gravel, minimum 12" thick and exceeding the pull box footprint by 6" on all sides, shall be placed beneath each open bottom pull box.

2.07 WIRING DEVICES:

- A. Wall Switches: Wall switches shall be specification grade, totallyenclosed, toggle switches rated 20 ampere, 120/277 volt. Switches shall be single pole, double-pole, 3-way, or 4-way as indicated; GE-5951 through 5954, Hubbell 1221 through 1224, Leviton 1221 through 1224, or equal.
 - 1. Wall switches shall be furnished with suitable plates. The material, colors, and finishes of switch plates shall be as directed to harmonize with the surroundings. In general, standard switches

shall be brown with Sierra S-1N, Hubbell S-1N, or equal, 302 stainless steel plates.

- Unless specified otherwise, wall switches installed outdoors or in corrosive atmospheres shall be weatherproof and vapor-tight. Weatherproof and vapor-tight switches shall consist of standard wall switches as previously specified, enclosed in Series FS condulets equipped with vapor-tight gasketed covers; Crouse-Hinds Series DS128, Appleton Series FSK-1VTS, or equal.
- B. Receptacles: Receptacles shall be specification grade, grounding type, totally-enclosed, duplex receptacles rated 20 ampere, 125 volt; GE 8300-9, Hubbell 5362-GRY, Leviton 5362-GY, or equal.
 - 1. Each receptacle shall be provided with a single gang plate for flush mounting. The materials, colors, and finishes of the plates shall be as directed to harmonize with the surroundings. In general, receptacles shall be gray with Hubbell
 - 2. S-8N, Sierra S-8N, or equal, 302 stainless steel plates.
 - 3. Unless specified otherwise, receptacles installed outdoors or in corrosive atmospheres shall be weatherproof. Weatherproof receptacles shall each consist of standard duplex receptacles as previously specified, enclosed in Series FS condulet equipped with a weatherproof cover; Crouse-Hinds WLRD or equal. Outdoor receptacles installed on circuits without ground fault protection shall be type GFCI.
 - 4. Special purpose outlets shall be black melamine locking receptacles with voltage, phase, and current ratings in accordance with the connected service and intended duty. Special purpose outlets shall be grounding type with permanent rating identification following installation; GE NEMA-Line, Hubbell Twist-Lock, Leviton Spec-Master, or equal, equipped with plates, boxes, etc., as indicated for standard receptacles.
 - 5. The Contractor shall connect the grounding terminal in each receptacle to the inside of the metal enclosure.

2.08 CIRCUIT BREAKERS:

A. Circuit breakers shall be 600 volt thermal magnetic, quick-make, quickbreak molded case air circuit breakers, with trip-free operation, incorporating an internal trip bar and a single external handle. Breaker ratings shall be coordinated with the installed service and loads supplied. Unless indicated otherwise, breakers shall be rated not less than 65,000 amperes RMS symmetrical.

- 1. Unless indicated otherwise, circuit breakers shall have NEMA 12 enclosures with gray baked enamel over a rust-inhibiting primer finish. Breakers located outdoors or in corrosive atmospheres shall have NEMA 4X aluminum or 316 stainless steel enclosures.
- 2. Circuit Breakers used as a service disconnecting device shall be 100% rated and UL service entrance rated; shall be equipped with long time, short-time, instantaneous and ground fault adjustments for system selectivity; and shall be fully rated for the maximum fault current, without the use of current limiters.

2.09 SUPPORT SYSTEMS:

- A. Groups of two or more conduits, and all boxes and equipment, shall be mounted on a system of minimum 1-5/8-inch x 1-5/8-inch heavy wall aluminum or 316 stainless steel channel with a minimum of 25% unused capacity.
- B. Overhead conduits shall be supported on trapeze hangers from approved concrete inserts and shall be grouped with pipes wherever possible.
- C. Support system hardware, including hanger rods, shall be aluminum or stainless steel.
- **2.10 LIGHTING FIXTURES:** Lighting fixtures shall be as indicated or called for on the drawings or specified. The fixtures shall be wired and suitable for lamps of the sizes called for on the drawings and shall be controlled by switches as indicated. Where tradenames are used, the intent is to indicate the general type and quality required.

PART 3 - EXECUTION

3.01 CODES, PERMITS, AND INSPECTIONS:

- A. The installations shall be in accordance with the regulations of the latest editions of the National Electrical Code, National Electrical Safety Code, applicable city, state, and local codes and regulations and other applicable codes, including utility company codes.
- B. All permits required by state or local ordinances shall be obtained and after completion of the work, a certificate of final inspection and approval from the electrical inspector shall be furnished to the Owner. All permits for installation, inspections, connections, etc., shall be taken out and paid for as part of the work under this section.

3.02 CONDUIT:

A. Conduit Installation: All conduits shall be run in such a manner as to cause the least interference with other trades. Conduits shall be joined by

means of couplings or 3-piece coupling type conduit unions. Joints shall be set up tight. Runs shall be straight and true; elbows, offsets, and bends shall be uniform and symmetrical. Installation workmanship shall be of the best quality and skill.

- B. Conduits shall be of sizes required to accommodate the number of conductors in accordance with the tables given in the current edition of National Electrical Code or as noted on the drawings. The minimum size of conduit shall be 3/4-inch.
- C. Conduit runs shall terminate below the particular section of the motor control center or equipment to which their respective circuits run. Concealed conduits shall be run in as direct a line as possible. Exposed conduits shall be run parallel to or at right angles with the lines of the building. All bends shall be made with standard conduit ells, conduit bent to not less than the same radius, or malleable iron conduit outlet bodies with gasketed cast iron covers. Adjacent conduit runs shall be installed with concentric bends. All bends shall be free from dents or flattenings. Not more than the equivalent of four quarter bends shall be used in any one run between terminals at cabinets, outlets, and junction or pull boxes. Boxes shall be located in accessible locations.
- D. Conduit shall be continuous from outlet to outlet and from outlets to cabinets, junctions, or pull boxes and shall enter and be secured to all boxes in such a manner that each system shall be electrically continuous from point of service to all outlets. Insulated grounding bushings shall be used on all metallic conduit. Terminals of all conduits shall be plugged with an approved cap to prevent the entrance of foreign materials when exposed during construction.
- E. As far as practicable, all exposed conduits shall be run without traps. Where dips are unavoidable, a pull box or approved conduit outlet body shall be placed at each low point. Conduit systems shall be completed before conductors are drawn in. Where conduits must be run exposed, except as indicated in the drawings, locations of the runs shall be subject to approval.
- F. Where exposed conduit needs clamping to the structures, clamps shall consist of galvanized malleable iron 1-hole pipe straps and pipe spacers, galvanized steel bolts of appropriate size to fill the holes in the straps and spacers, and approved expansion shields. Clamps used with aluminum conduit, and clamps located outdoors or in "corrosive atmospheres", shall be PVC coated, aluminum or 316 stainless steel. Clamps shall be bolted to the structure or where necessary to intermediate galvanized steel brackets. Spacing between conduit supports shall not exceed the recommendations published by the National Electrical Code. No deformed, split, or otherwise defective conduit or fitting shall be installed. Conduit shall be installed with a minimum number of joints.

- G. Where conduit has been cut in the field, it shall be cut square using a hand or power hacksaw or approved pipe cutter using cutting knives. The use of pipe cutters with cutterwheels will not be permitted. The cut ends of the field-cut conduit shall be reamed to remove burrs and sharp edges. Where threads have to be cut on conduit, the threads shall have the same effective length and shall have the same thread dimensions and taper as specified for factory-cut threads on conduit. Conduits installed in the work with threads not complying with these requirements shall be removed and replaced.
- H. Where conduit installed in concrete or masonry extends across building joints, expansion joints with approved type grounding straps and clamps shall be installed. Expansion joints shall be Type XJ as manufactured by Crouse-Hinds, Appleton, or equal. Where conduit enters a building through the concrete foundation, below final grade, approved type FSK entrance seals shall be used.
- I. All conduit shall be cleaned, prior to pulling in wire and cable, by pulling a stiff wire brush of the size of the conduit through it. This cleaning shall remove all foreign matter, including water, from the conduit. All boxes in which the conduit terminates shall be cleaned of all concrete, mortar, or other foreign matter and all threads in boxes shall be left clean and true upon completion of the work.
- J. All spare, future, or telephone conduits shall be equipped with a pull wire prior to capping.
- K. All conduits, fittings, and electrical equipment used within hazardous areas shall comply with requirements of the National Electrical Code for the type of hazardous location encountered, and shall be furnished as specified for "corrosive atmospheres".
 - 1. In such hazardous locations, conduits terminating at boxes enclosing electric switching, or circuit opening equipment, shall be sealed at the entrance to the enclosure with approved, compoundfilled, sealing fittings to prevent passage of explosive or combustible gases through the conduits.
 - 2. All conduits exiting from such hazardous locations or entering said locations shall be similarly sealed at point of exit or entrance.

3.03 WIRE AND CABLE INSTALLATION:

A. The installation of wires and cables includes all splicing of these wires and cables to each other and connecting them to receptacles, switches, control boxes, lighting fixtures, motors, and all other electrical apparatus installed under this Contract. All cable installation methods shall correspond to manufacturer's recommendations.

- B. Wire and cable shall be suitably protected from weather or damage during storage and handling and it shall be first-class condition when installed.
- C. The minimum size of wire or cable conductor shall be No. 12, unless indicated otherwise on the drawings. Wire sizes No. 8 and larger, and all wire sizes utilized for control or instrumentation, shall be stranded. All sizes called for in the specifications or shown on the drawings are American Wire Gauge sizes.
 - 1. No wire smaller than No. 12 shall be used for any branch circuit unless noted otherwise on the drawings. Larger sizes shall be used where required or indicated on the drawings. If the single distance from the panelboard to the first device exceeds 50 feet, the minimum size for this run shall be No. 10 AWG with the minimum between devices as No. 12 AWG.
- D. All sizes of wire and cable furnished and installed under these specifications shall be color-coded with a separate color for each phase and neutral used consistently throughout. Each conductor shall have factory color-coded insulation. As an alternative, wire sizes No.8 and larger shall have black insulation and shall be color-coded with waterproof phasing tape at each termination, junction box, pull box, etc. All 277/480 volt wiring shall be color-coded yellow, brown, and orange for hot legs (Phase A, B, and C, respectively). All 120/208-240 volt wiring shall be color-coded neutral conductor of each circuit shall be color-coded white. Grounding conductors shall be color-coded green.
- E. All wires and cables shall, as far as practicable in the judgment of the Engineer, be continuous from origin to destination without running splices in intermediate pull boxes, junction boxes, or wireways. At the ends of these wires and cables, only sufficient slack shall be left as may be required for making proper connections. There shall be no unnecessary slack.
- F. In connecting wires and cables to apparatus, various methods shall be used depending upon the local conditions as detailed on the drawings. In general, solderless pressure connectors shall be used for terminals, taps, and splices for all wires and cables. Solderless pressure connectors or vinyl-covered steel spring-type connectors shall be securely fastened and shall not loosen under vibration or normal strain. All connections shall be in accordance with manufacturer's recommendations and shall be with connectors approved for the particular connection conditions.
- G. Where wires and cables are connected to metallic surfaces, the coated surfaces of the metal shall be polished before installing the mechanical connector. The lacquer coating of the conduits shall be removed where a ground clamp is to be installed.

- H. All soldered joints shall be made mechanically strong before soldering and shall be carefully soldered without the use of acid and shall be taped with insulating tape to a thickness equal to that of the insulation.
- I. The installation of wires and cables shall include the furnishing and installing of all hangers, racks, cable cleats, and supports that may be necessary to make a neat and substantial wiring installation in all pull boxes, wireways, cable channels, and in such other locations as may be required. Plastic ties shall be used to hold the wires and cables together and to the racks or supports.
- J. Each junction box, terminal box, control cabinet, or other terminal location containing a total of 4 or more conductor terminations or splices, shall be equipped with 1 or more terminal boards, as required, for connecting each wire including the spare wires. Each wire terminal shall be permanently marked throughout the entire system using, wherever possible, the notation of the wires given on the manufacturer's wiring diagrams. Sufficient terminal blocks shall be provided to terminate all wires routed to the enclosure including all spare conductors. In addition, the greater of 20 percent or four unused spare terminals shall be provided. All connections for future functions shall be wired to numbered terminal blocks shall be grouped to isolate power conductors from control conductors and to separate AC circuits from DC circuits.
- K. Each control, instrumentation, and power cable and conductor shall be marked with the proper feeder symbol or termination number in each manhole, handhole, pull box, wireway, terminal cabinet, panelboard, switchboard and all additional locations required to provide positive identification. Each conductor shall be marked at each point of termination following final installation.
- L. The electrical installation shall maintain suitable isolation between power, control and instrumentation conductors. Approved isolation barriers shall be provided within each pull box, terminal box, wireway, cable tray, handhole, manhole, etc.

3.04 TESTING:

A. Upon completion, the Contractor shall provide all necessary instruments and special apparatus to thoroughly test the complete installation and shall conduct all tests that may be required to insure system is free of all improper grounds and short circuits, and that all the feeders are properly balanced. All electrical equipment shall be tested to determine proper polarity, phasing, relay settings, and operation. System shall be checked for quality and completeness in accordance with the provisions of the General Conditions. Any objectionable noise, heating, voltage drop, or excessive current draw, after in operation, shall be identified and corrected.

- B. Prior to energization, the electrical system ground resistance shall be tested. Additionally, the insulation resistance of all electrical gear, power feeders, and electric motors shall be measured. Upon completion of all corrective measures required, certified acceptance reports, including tabulations of all initial and final resistance measurements, shall be submitted for approval in accordance with the provisions of the General Conditions.
- C. Each motor starter overload element, and each motor circuit protector, shall be selected and adjusted to coordinate with the nameplate full-load current and service factor of the actual motors installed. Improper units shall be replaced. Upon completion of all corrective measures required, certified compliance reports, including tabulation of the actual full load current and voltage measurements for each phase of each motor, together with the nameplate current rating, overload element rating, and motor circuit protector setting, shall be submitted for approval in accordance with the provisions of the General Conditions.
- D. System testing shall include complete thermal surveys of all electrical apparatus. Upon completion of all corrective measures required, certified acceptance reports, including satisfactory infrared photographs, shall be submitted for approval.
- **3.05 SPARE PARTS:** The Contractor shall furnish, upon completion of the project, one year's supply of all consumable parts utilized within the electrical system, including pilot lights (minimum 12 of each type), fuses (minimum 12 of each type below 100 amps and 6 of each type 100 amps and above), recorder charts, ink tips, etc.

3.06 GUARANTEES:

- A. All materials and workmanship shall be guaranteed to be free from defects. Any part of the system considered defective by the Engineer within the guarantee period shall be immediately replaced or corrected to the Engineer's satisfaction without further expense to the Owner.
- B. Upon final completion, the Contractor shall furnish certification from each equipment manufacturer that all equipment has been installed in accordance with the requirements of these specifications, is ready for permanent operation, and that nothing in the installation shall render the warranty null and void.

END OF SECTION

SECTION 16600

GROUNDING AND SURGE PROTECTION

PART 1 - GENERAL

- **1.01 DESCRIPTION OF WORK:** In general, the work specified in this section of the specifications includes the furnishing of all labor, material, and services necessary to install the following materials, including all fees, charges and permits necessary.
- **1.02 GENERAL REQUIREMENTS:** The project's grounding system shall consist of a grounding electrode system in accordance with NEC specifications, bonded to a main ground bus interconnecting all power distribution equipment. Ground rods shall be located at each service connection, transformer pad, generator pad, outdoor electrical equipment pad, and as indicated or required, and shall be bonded to the main ground bus. Ground rod sections shall be coupled and driven to establish a maximum resistance to ground of 5 ohms throughout the grounding system.

1.03 SURGE PROTECTION:

- A. The Contractor shall furnish and install UL 1449 (latest edition) listed surge protection devices (SPD) for the protection of all AC electrical circuits from the effects of lightning-induced currents, substation switching transients, and internally-generated transients from inductive and/or capacitive load switching.
- B. Each SPD unit shall be marked with a short circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of that rating.
- C. Complete UL 1449 performance ratings, including the fault current rating and VPR rating, shall be posted on the UL label of each SPD.
- D. Submit copies of the UL Standard 1449 Listing documentation for each proposed SPD.

PART 2 - PRODUCTS

2.01 GROUNDING:

- A. Ground rods shall be minimum 10 feet long, 3/4-inch diameter, copperclad steel sections.
- B. Main ground bus cable shall be minimum No. 4/0. Bonding jumpers shall be minimum No. 2. Unless noted otherwise, all grounding conductors shall be insulated and shall have green colored insulation.

C. All grounding hardware such as clamps, connectors, couplings, lugs, bolts, nuts, and washers shall be of silicone bronze.

2.02 SURGE PROTECTION:

- A. AC power surge protection devices (SPD), formally transient voltage surge suppressors (TVSS), shall utilize heavy duty 'large block' MOVs, each exceeding 30mm diameter, with redundant modules per phase. SPD equipment shall provide suppression elements between all phases and each phase conductor and the system neutral. AC power surge protection equipment shall be APT, or equal.
- B. SPD shall be UL labeled as Type 1, intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.
- C. SPD shall be UL labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.
- D. SPD shall be UL labeled with 20kA Inominal (I-n) for compliance to UL 96A Lightning Protection Master Label and NFPA 780.
- E. Minimum surge current capability (single pulse rated) per phase shall be:

Service Entrance Equipment:	300kA
Power Distribution Equipment:	200kA
Panelboards & Control Panels:	100kA

- F. SPD shall provide surge current paths for all modes of protection: L-N, L-G, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.
- G. UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

System Voltage	L-N	L-G	L-L	N-G
208Y/120	700V	700V	1200V	700V
480Y/277	1200V	1200V	1800V	1200V

Numerically lower is allowed/preferred; old-style Suppressed Voltage Ratings (SVRs) shall not be submitted, nor evaluated due to outdated less-strenuous testing).

H. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV):

System Voltage	Allowable Voltage Fluct	tuation (%)MCOV
208Y/120	25%	150V
480Y/277	15%	320V

- I. SPD shall have UL 1283 EMI/RFI filtering with minimum attenuation of -50dB at 100kHz.
- J. SPD shall include visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED. SPD shall include an audible alarm with on/off silence function and diagnostic test function (excluding branch).
- K. Warranty: Each SPD shall have a warranty period of not less than 10 years, incorporating unlimited replacements of suppressor parts if they are destroyed by transients during the warranty period.

PART 3 - EXECUTION

3.01 GROUNDING:

- A. The concrete-encased steel reinforcement within the foundation of each structure shall be grounded, with a minimum of one 20-foot ground rod, at each corner column and at intermediate columns at distances not to exceed 60 feet. The main ground bus shall be interconnected to each ground rod throughout the structural grounding system with a continuous bare copper cable loop, minimum No. 4/0, buried 30 inches below grade and 24 inches outside the structural footing.
- B. A minimum of one 20-foot ground rod shall be located within each manhole and handhole. The main ground bus shall be interconnected to each ground rod throughout the underground ductbank system with a continuous bare copper cable, minimum No. 4/0, encased within the ductbank concrete envelope.
- C. All grounding connections shall be made in the same manner as current carrying connections are made with bolted clamps and solderless connectors. All underground grounding system connections, cable-to-cable, cable-to-ground rod, etc., shall be made with exothermic-fused connections. Contact surfaces shall be equal in area to those of current carrying connectors. All contact surfaces shall be thoroughly cleaned before connections are made.
- D. All ground connections shall be made with connectors or lugs approved for the specific type of connection.

- E. Insulated-type grounding bushings shall be used for all metallic conduit terminations.
- F. Permanent and effective ground connections shall be provided for transformer secondary neutrals.
- G. The metallic frame of each motor, generator, transformer, panelboard, lighting fixture, outlet box, control equipment enclosure, etc. shall be grounded to the ground bus of the power distribution equipment with an insulated grounding conductor included in the feeder or branch circuit conduit.
- H. The base of each street or area lighting standard shall be grounded to a ground rod driven into the ground near the base of the standard and to a separate ground wire run with the feeder. Ground rods shall be driven so that the top is 6 inches below finished ground grade. When the foundation is placed, a suitable ground wire shall be embedded in the concrete to facilitate connection to the base on the inside.
- I. Installed ground cables shall be protected from subsequent mechanical damage. Sleeves shall be provided in foundation walls and in floors to facilitate installation of ground cables. Where ground cables enter buildings through sleeves, the sleeves shall be sealed with jute packing and approved sealing compound.

3.02 SURGE PROTECTION:

- A. Service Entrance: Each SPD installed on service entrance equipment shall be replaceable modular construction. A UL approved disconnect switch shall be provided as a means of servicing disconnect if a 60A breaker is not available.
- B. Power Distribution: Each SPD installed on switchboards or motor control centers shall be replaceable modular construction. Each SPD shall have an independent means of servicing disconnect such that the protected power distribution equipment remains energized. A 30A breaker (or larger) may serve this function.
- C. Sub Panels: Each SPD installed on power distribution panelboards, lighting panelboards, control panels, unit equipment, etc. shall be encapsulated construction.
- D. SPD equipment shall be installed per manufacturer's installation instructions with lead lengths as short (less than 24") and straight as possible. Gently twist conductors together.
- E. Installer may reasonably rearrange breaker locations to ensure short & straightest possible leads to SPDs.
- F. SPD shall be installed on the load side of the main service disconnect.

- G. Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers per NEC.
- H. Status indication pilot lights for each SPD shall be remote mounted and shall be visible from the front of the protected equipment enclosure.

END OF SECTION

SECTION 16900

INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.01 **DESCRIPTION OF WORK:**

- In general, the work specified in this section of the specifications includes Α. the furnishing of all labor, material, and services necessary to install the instrumentation, control and monitoring systems, including all fees, charges, and permits necessary. JEA has pre-purchased PLC components to replace the existing system located within the existing Pump Station Control Panel. The Integrator shall install these components into the existing control panel as described further herein and integrate the PLC replacement components into the existing SCADA system. The work includes incorporation of new field instruments as well as an Odor Control System. The integrator will also be required to confirm existing input/output wiring functions prior to the PLC replacement to ensure the replacement programming is accurately modified to control existing field configurations.
- B. As specified in the section of these specifications entitled 16000 ELECTRICAL WORK - GENERAL, the Contractor shall furnish and install conduit, wiring, and connections for equipment and devices furnished under other sections of the specifications or under other contracts. The Contractor shall also install motor starters, switches, and other electrical equipment furnished under other sections or under other contracts.
- C. The Contractor shall refer to the mechanical specifications and drawings for locations of pressure-operated control switches, float switches, solenoid-operated valves, limit switches, alarm actuating contacts, and other devices requiring wiring.
- D. The Contractor shall make all interconnections required between transmitters, receivers, control panels, and miscellaneous devices, and shall provide for electrical supply to metering and signal systems.
- E. All conduit and wiring between electrical and instrumentation panels, all field-mounted devices, and power sources shall be furnished and installed as required for a complete operable system.
- F. Unless otherwise indicated, all electrical equipment and installation shall be in accordance with Section 16000 of these Specifications entitled Electric Work General.

1.02 SYSTEM RESPONSIBILITY:

- A. To ensure coordinated control systems, to properly achieve the indicated functions, and to provide a maximum interchangeability of equipment items and parts, the complete instrument and control system shall be furnished by a single instrumentation system contractor/supplier who shall be responsible for the satisfactory operation of the system.
- B. The system contractor/supplier shall maintain permanent in-house system engineering and fabrication facilities including a quality assurance organization with the capability to perform complete system checkout and simulation in the shop prior to shipment.
- C. The system contractor/supplier shall maintain a permanent field service engineer for maintenance service.
- D. The system contractor/supplier shall perform all system engineering, prepare all necessary internal and external wiring and piping drawings, and assume full responsibility with the performance requirements of these specifications, and as required for a complete and operable facility.
- E. The instrumentation equipment locations and conduit drawings are diagrammatic to show the general scope and route of instrumentation system conduit. The instrumentation system contractor/supplier shall provide all conduit and wiring necessary for his specific requirements, in accordance with these specifications, and without additional cost to the JEA.

1.03 SUBMITTALS:

- A. The Contractor's attention is directed to the provisions of the GENERAL REQUIREMENTS with regard to submissions for approval. In order to facilitate review and approval of the proposed system, shop drawing submittals shall be made in two steps. The first submittal shall include all in-line devices such as flow meters, control valves, etc., to be supplied or coordinated with the instrumentation system. The second submittal shall include shall include complete details of the instrumentation system.
- B. Shop drawing submittals shall include the following:
 - 1. Complete Bill of Materials, front panel view with component locations, subpanel view with component locations, and electrical schematics.
 - 2. Functional description of the entire system including individual loop diagram descriptions.
 - 3. Detail loop diagrams showing both piping and wiring requirements for each analog instrument loop in the system.

- 4. Component drawing for each component showing dimensions, mounting, and external connection details.
- 5. Detail layout, dimensions, fabrication, piping, and wiring schematic, connection, and interconnection drawings for each instrumentation panel, graphic display, termination cabinet, etc.
- 6. Component manufacturing data sheet for each component indicating pertinent data and identifying each component by item number and nomenclature as indicated on the drawings and in these specifications.
- 7. Testing plan description, sample test reports, and proposed testing schedule.
- 8. Training plan description, listing of training materials to be provided, and proposed training schedule.
- C. Shop drawings shall conform to JEA standard drawing/schematics. References to the Bill of Materials shall be located for each component.
- D. Operation and maintenance manuals, in accordance with the provisions of Section 01700, shall also be supplied. Operating instructions shall incorporate an updated functional description of the entire system including the system schematics that reflect as-built modifications. Special maintenance requirements particular to the system shall be clearly defined along with special calibration and test procedures.
 - 1. A complete set of "as-built" wiring, fabrication, and interconnection drawings shall be included with the manuals. In addition, an electronic copy of all drawings shall be submitted to JEA.
 - a. Electronic drawing files shall be AutoCad 2016 format.
- **1.04 APPROVED INTEGRATORS:** The following Integrators are approved JEA vendors:
 - A. Infamation Technologies Group, (ITG) | James Ruiz (904) 425-4760 jruiz@itgtec.com
 - B. DSI Innovations LLC. | Sean Patterson (336)893.8385 spatterson@dsiinnovations.com
 - C. Southern Flow | Rod Strub (770)-667-5169x203 <u>rstrub@southernflowinc.com</u>
 - D. Tesco Controls | Kyle Hady 916-395-8800 khady@tescocontrols.com

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS:

- A. All of the equipment shall be the manufacturer's latest and proven design. Specifications and drawings call attention to certain features but do not purport to cover all details entering into the design of the instrumentation and control system. The completed system shall be compatible with the functions required and the equipment furnished by the Contractor and shall include all necessary control relays, contacts, and additional devices required for a complete, coordinated, operable facility.
- B. Electrical control equipment, starters, contactors, etc., shall be full NEMA rated.
- C. All contacts for control of electrically-operated equipment shall be rated not less than 10 amperes on 120 volts.
- D. All electrical components of the instrumentation and control system shall operate on 120 volt, single phase, 60 hertz power, except as noted otherwise in the specifications. Control circuits for components which are located in hazardous areas shall be 24 volt intrinsically safe.
- E. Where control equipment is not within sight of the motor, a safety lockout station with position indication, which shall prevent application of current to the motor, shall be located near the motor. Where the driven equipment is located on a different level than their driving motors, a safety lockout station shall be provided on each level.
- F. Programmable controllers shall be utilized for standard relay and control functions within motor control centers, control panels, etc., only where specifically approved. In general, conventional control equipment shall be provided.
- G. All controls for remote electrically-operated or motor-driven equipment shall be complete, including all necessary auxiliary relays so as to require only wiring and connections to the equipment control circuit. All contacts for control of remote motor-operated or electrically-operated equipment shall be rated not less than 10 amperes on 120 volts unless specified otherwise herein.
- H. All remote motor-operated or electrically-operated equipment shall have a separate 120 volt control circuit, except as indicated otherwise.
- I. All necessary fuses or switches required by the instrumentation manufacturer for his equipment shall be provided with the equipment. All instruments requiring an internal power supply shall have an internal ON-OFF switch.

- J. The drawings and specifications indicate the energy sources that will be provided. Any other devices (isolation transformers, power supplies, lightning arresters, etc.) necessary to obtain proper operation and protection of the instrumentation system shall be furnished with the instrumentation system.
- K. Individually adjustable alarm modules shall be provided to generate all required alarm or interlocking contacts from analog signals.
- L. Signal isolators shall be provided for all analog signals to auxiliary equipment remote from instrumentation panels.
- M. Signal isolators and analog alarm modules shall be individual selfcontained units. Where multiple units are to be installed in the same location, a plug-in motherboard with minimum 25% spare capacity, master power supply, and individual plug-in function modules shall be provided.
- N. All printed circuit boards throughout the instrumentation system shall have a protective coating to prevent corrosion.
- O. All components shall be tagged with the item number and nomenclature given in the specifications and component tabulation lists.
- P. Each field mounted transmitter shall be installed within a NEMA 12/3R aluminum or stainless steel enclosure for weather protection. Enclosures shall exceed the dimensions of the enclosed transmitter by a minimum of six inches on all sides and shall permit full unobstructed access to the enclosed transmitter. Enclosures shall be equipped with a continuous hinged access door with 3-point latching handle. Ventilation louvers shall be provided at top and bottom of both sides to promote convection cooling.
- Q. Power supply to the Generator I/O Panel shown in the Drawings and specified in Section 16901 shall be powered by the Pump Station Control Panel via a separate 24 DC circuit with service breaker. The Integrator shall modify the existing panel wiring and provide sufficient back-up power to service the loads.

2.02 CONTROL DEVICES:

- A. Control Stations: Control stations shall be heavy-duty, oil-tight, complete with NEMA 13 cast aluminum enclosures; Cutler-Hammer Type T, General Electric, or equal.
 - 1. Safety lockout stations (SAFE-OFF) shall be equipped with 316 stainless steel padlock devices for padlocking in the de-energized position.

- 2. Unless specified otherwise, control stations installed outdoors, or in corrosive atmospheres, shall have watertight, NEMA 4X cast aluminum enclosures.
- 3. Control stations within hazardous locations shall be explosion-proof and shall have galvanized cast iron enclosures; Crouse-Hinds Type EFS, Appleton, or equal.

2.03 CONTROL COMPONENTS:

- A. General: Where indicated on the drawings, or required by the functions specified, control components shall be furnished and installed with-in control panels, motor control center, or other approved locations. Suitable nameplates shall be provided for all panel door or surface-mounted control devices. Nameplates shall be attached with stainless steel removable fasteners. All component terminals, including auxiliary contacts, shall be wired to master terminal boards.
- B. Pilot Devices: Selector switches, pushbuttons, indicating pilot lights, and additional pilot devices as required, shall be 600 volt rated heavy-duty, oil-tight, 30mm pilot devices as manufactured by General Electric, Cutler-Hammer, or equal.
 - 1. Pushbuttons shall be standard type with anodized aluminum rings and colored buttons.
 - 2. Selector switches shall be standard handle type with anodized aluminum rings and handles.
 - 3. Pilot lights shall be LED type: Dialight Series 556.
 - 4. All pilot devices shall have appropriate nameplates and locking means for locking in the de-energized mode, and shall be color coded (red start, on, open, up; green stop, off, close, down; black test, silence, miscellaneous).
- C. Control Relays: See Section 2.04 for control relay requirements within the Pump Station Control Panel. Where required for control system operation, control relays shall be 3P3T, 11 pin octal type, with 10 amp contacts, internal LED, test button, and large ice cube style case; Cutler-Hammer D3PF3AA, D3PF3AT1, or equal.
 - 1. Time delay relays shall be potentiometer adjustable time setting, 1.0% repeatability, 2PDT plug-in type time delay relays with, 10 amp contacts, 8-pin square sockets and hold-down springs. Delay on de-energize mode shall not require input power during the timing; Potter & Brumfield CK Series.

2.04 CONTROL PANELS:

- A. Where indicated on the drawings, specified, or required by the functions specified, control panels, including all necessary accessories, shall be provided for control of the associated equipment.
- B. Control panels shall be constructed in accordance with the requirements of Section 433 of the JEA Water & Sewer Standards, and shall be manufactured by a JEA approved manufacturer.
- C. Control panels shall be constructed in accordance with UL 508A requirements for enclosed industrial control panels and shall bear the UL508A serialized label.
- D. All components shall be mounted using stainless steel machine screws. All holes shall be drilled and tapped. The use of self-tapping screws is unacceptable.

2.05 SUPERVISORY CONTROL SYSTEM:

- A. General: The Contractor shall coordinate with JEA on scheduling and details on replacement of the existing PLC within the Pump Station Control Panel. The replacement PLC and components shall be furnished and configured by the Instrumentation system contractor/supplier (see Section 1.04 for approved vendors) who shall be responsible for the satisfactory operation of the entire system. The Supervising Control System (SCS) shall consist of a programmable logic controller and communications network.
 - 1. JEA has purchased the materials listed within the enclosed bill of sale, which will be provided to the Contractor for installation and integration. As noted in the Drawings, the existing Pump Station Control Panel's PLC Backplate will be removed and replaced with these components.
 - 2. For all components furnished by the Instrumentation system contractor/supplier, the Instrumentation system contractor/supplier shall provide JEA with all component data, calibration data, wiring diagrams, software copy of program with comments, etc. that may be required to facilitate the proper development of the SCS.
 - 3. System startup and testing shall be provided by the contractor, and shall be witnessed and approved by JEA.
 - 4. JEA will issue their standard pump station program for review and use by the Contractor. The following additional functions shall be incorporated into the program:
 - Vibration monitoring from each pump that is currently on

JEA's wireless monitoring gateway;

- Raw wastewater quality (pH and conductivity) monitoring; and
- Odor Control system monitoring (blower flow monitoring and HOA position status).
- B. Programmable Logic Controller (PLC): The PLC shall be fully equipped to monitor all equipment status, alarm, and instrumentation system analog signals; control selected equipment operations; and seamlessly connect to the SCADA system network. To ensure coordination, compatibility, and maximum interchangeability with the JEA's existing systems, JEA is furnishing the PLC components defined in Section 2.05(A) for the Contractor's use. In addition, the following information is provided for the Contractor's use:
 - 1. The Contract Drawings indicate current wiring findings to date. Additional field investigations will be required to confirm existing I/O termination points.
 - 2. Enclosed at the end of this specification section are the following materials for the Contractor's review and use:
 - 'As-Built' Suncoast Panel Drawings for the Holiday Road Master Pump Station VFD Panels and Pump Station Control Panel
 - PLC Rack Layout & BOM Drawings for PLC Replacement
- C. During replacement of the PLC Backplate, the Contractor shall complete the following modifications to the Pump Station Control Panel:
 - 1. Replace all DPDT 8 Pin basic relays with EATON D 3RF2A (120 V) Units, or Approved Equal, with test flag and light.
 - 2. Replace EDCO analog surge arrestors with CITEL Model DLAW-24D3 surge arrestors.
- D. Upon final acceptance, electronic copies of the final programming shall be included within the O&M manuals.
- E. Unless indicated otherwise, prior to shipment, each PLC shall be loaded and tested at the Instrumentation system contractor/supplier manufacturing facility, and shall be witnessed and approved by JEA.
- **2.06 COMMUNICATION NETWORKS:** All communication modifications shall be confirmed with JEA during the shop drawing review of the facility improvements.
 - A. All Profibus installations shall comply with the Profibus User Organization. More information can be found at "www.Profibus.com".

- 1. Reference "Profibus Design Guideline" order number 8.012.
- 2. Reference "Profibus Assembling Guideline" order number 8.022.
- 3. ALL recommendations from the Profibus User Organization must be followed, such as using fiber optic cable instead of copper when leaving a building.
- 4. Profibus cable shall be type FC (Fast Connect) 2 wire shielded cable specifically designed for rapid installation; Siemens 6XV1830.
- 5. Profibus connectors shall be made with metal housing and have Power, Transmit, Termination and Error indicating LED's. Connectors shall be Brad Harrison MA9D00-42 and MA9D01-42 type or equal.
- 6. Only Diagnostic Repeaters shall be used where repeaters are required. Standard repeaters shall not be accepted. Repeaters shall be Siemens Diagnostic repeater 6ES7 972-0AB01-0XA0.
- 7. Provide an active termination resistor on the last device in the segment. Termination resistor shall be Procentec 101-00211A.
- 8. For fiber optic communications use the Siemens OLM G12 Part # 6GK1503-3CB00.
- B. All Ethernet installations shall 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 cable when leaving a building.
 - 3. Ethernet connectors shall be made with metal housing. Connectors shall be Siemens 6GK1901-1BB10-2AA0 type or equal.
 - 4. All switches shall have the capability to be managed. Switches shall be of type Siemens Scalance X212-2 at minimum.

PART 3 - EXECUTION

3.01 SYSTEM DESCRIPTIONS:

- A. General: The general arrangement of the analog instrument and control system is shown on the drawings.
 - 1. No attempt has been made to detail on the drawings all accessories and devices required for the complete system. The system contractor/supplier shall be responsible for the preparation

of all detail installation drawings showing wiring, piping, mounting, etc.

- 2. The system contractor/supplier shall be responsible for furnishing all devices required for a complete functioning system.
- 3. All PLC operator "adjustable" or "selectable" settings shall be accessible from the PLC operator interface panel.
- 4. The integrator shall field confirm all existing input/output wiring and associated programming controls. Confirmation of existing programming configurations and wiring shall be provided in the shop drawing review and utilized to complete the programming enhancements. JEA will provide a copy of the existing pump station programming for the integrator's use in confirming existing system configuration.

3.02 CONTROL PANELS:

- A. Where indicated on the drawings, specified, or required by the functions specified, control panels, including all necessary accessories, shall be provided for control of the associated equipment.
- B. Control panels shall be constructed in accordance with the requirements of Section 433 of the JEA Water & Sewer Standards, and shall be manufactured by a JEA approved manufacturer.
- C. Control panels shall be constructed in accordance with UL 508A requirements for enclosed industrial control panels and shall bear the UL508A serialized label.
- D. All components shall be mounted using stainless steel machine screws. All holes shall be drilled and tapped. The use of self-tapping screws is unacceptable.

3.03 WIRING:

- A. Identification: All wiring shall be color-coded as follows:
 - 1. 120 VAC (Unswitched Hot)
 - 2. 120 Volt Dry Contacts
 - 3. 120 VAC (Neutral)
 - 4. 120 VAC (Switched Hot)
 - 5. 24 VDC+
 - 6. 24 VDC-
 - 7. Ground

- #12 AWG Black
 - #16 AWG Red #12 AWG White
 - #14 AWG Red
 - #18 AWG Blue
 - #18 AWG Blue with White Tracer
 - #12 AWG Green
- B. Conductors #12 AWG and smaller shall be tinned copper hook-up/lead wire: Belden 35612 UL AWM Style 3173-XL-DUR, or equal.

- C. All control cabinet wiring to the PLC and control devices shall be 18 AWG.
- D. Control wiring shall be numbered/lettered at each end. Wire numbers/letters shall be flattened polyolefin heat shrink markers for permanent wire and cable identification or JEA pre-approved equal.
- E. Wire Duct: All wiring shall be routed through a wiring duct system to provide wire protection and an organized appearance. Wire duct shall be permanently attached using screws into the back panel.
- F. Terminals: Terminals shall be provided for interface with field installed equipment. The terminal blocks shall be mounted on a 30 degree angle for ease of field connection. Terminals shall be Siemens Model #8WA1011-1DF11 or current Siemens equivalent.

3.04 NAMEPLATES:

- A. Nameplates shall be a laminated two-part system using black letters on a yellow background providing protection against fading, pealing or warping. The labeling system shall be computer controlled to provide logos, post-script type or custom designs. The uses of embossed plastic type tags are not acceptable.
- B. As a minimum, the following components shall be labeled using a laser-screened Mylar nameplate:
 - 1. Relays
 - 2. Fuses
 - 3. Circuit breakers
- **3.05 MOUNTING HARDWARE:** All components shall be mounted using stainless steel machine screws. All holes shall be drilled and tapped. The uses of self-tapping screws are unacceptable.

3.06 ELECTRICAL TRANSIENT AND SURGE PROTECTION:

- A. All components of the instrumentation system shall be equipped with suitable surge arresting devices to protect the equipment from damage due to electrical transients, including lightning induced electrical power surges.
- B. All power and signal circuits of each field instrument shall be protected with surge and transient protectors installed at both the source and destination ends of each circuit.
 - 1. Protectors for 120 volt power circuits shall be DS41S-120.
 - 2. Protectors for analog signal circuits shall be Citel DLAW-24D3.

- C. Surge and transient protectors shall be connected to the electrical system ground. Supplemental grounding shall be provided in accordance with the protection equipment manufacturer's recommendations.
- **3.07 UL LABELS:** Each control panel shall bear a UL 508 serialized label "Enclosed Industrial Control Panel". The use of the UL label "Industrial Control Panel Enclosure" without the UL 508 serialized label is not acceptable. The entire control system shall bear a UL 913 serialized label "Industrial Panels Relating to Hazardous Locations".

3.08 FIELD CALIBRATION AND TRAINING:

- A. Prior to initiation of preliminary instrumentation system startup, the Contractor must submit a certified statement from his installation subcontractor confirming that all field wiring is complete, has been terminated and marked in accordance with the latest set of approved shop drawings, and has been tested for improper grounds, short circuits, and continuity.
- B. Prior to energizing any part of the instrumentation system, the Contractor must submit a certified statement from his system contractor/supplier authorizing energization.
 - 1. With the exception of in-line devices, field instruments shall not be installed until provisions have been completed for rapid energization. Any instrument, which remains de-energized in an uncontrolled environment in excess of 7 days, shall be removed from the project and replaced.
- C. The instrumentation system contractor/supplier shall systematically perform preliminary startup and calibration of each instrumentation system component.
 - 1. Each component must remain in service continuously following preliminary startup. Any component, which must be taken out of service due to construction conditions, malfunction, etc., must be re-calibrated prior to complete system startup.
 - 2. The system contractor/supplier shall provide to the Contractor a periodic written report detailing the progress of preliminary system startup. These reports shall include specific tabulations of devices on which startup has been completed.
 - 3. Following completion of preliminary startup of the complete instrumentation system, the Contractor shall submit copies of all system contractor/supplier progress reports together with proposed schedule for complete system startup (minimum 14 days in advance).

- D. The complete instrumentation system shall be systematically recalibrated and proper performance demonstrated in the presence of the JEA Representative and Engineer.
 - 1. Process calibration, such as volumetric drawdown tests on flow and level measurements, shall be conducted on all measuring systems as required by the JEA Representative.
 - 2. Performance demonstrations shall be provided individually for each complete instrumentation loop. Successful performance shall depend on proper performance of each and every component associated with the loop.
 - 3. The Contractor shall submit certified calibration and performance reports from his system contractor/supplier confirming that the entire instrumentation system is complete and operating properly.
- E. Instrumentation system contractor/supplier shall test all SCS functionality and provide documentation of test results. Copy of documentation shall remain inside of the PLC cabinet door pocket.
- F. Following acceptance of the complete instrumentation system startup, the system contractor/supplier shall conduct a complete training program (minimum 1 day's duration) at the job site for a minimum of 4 JEA-selected operating personnel. The training program shall include operation, preventive maintenance, and troubleshooting instructions relative to all components of the system provided, and shall include calibration demonstrations for each type of instrument provided.
 - 1. The training program shall be scheduled a minimum of 14 days in advance. Proposed dates shall be submitted in writing for approval. The JEA may exercise the option to audio- or video-tape the entire training program without restriction.
- G. All calibration, testing, demonstrations, training, etc., shall be at no additional cost to the JEA.

END OF SECTION



Jacksonville, FL 32224

Bill To JEA UTILITIES -----PO ACCOUNT ACCOUNTS PAYABLE DIVISION P.O. BOX 4910 JACKSONVILLE, FL 32201-4910

Ship To

JEA UTILITIES 102 KERNAN BLVD.

JACKSONVILLE, FL 32225

Confirming

Please Reference AWC, Inc. S.O. #1682784 on all correspondence.

Please Reference AWC, Inc. S.O. #1682784 on all correspondence.

Material subject to a minimum 15% restocking charge if returned.

Sales Order #: 1682784

P.O. #: 180707 Entered: March 05, 2019 Ship Via: Buyer;Will Call; FA Account: 7J0253 Attention: Pamela LaForge From: Michael Lanier Phone: (813) 386-1023 x2988 FAX: (813) 347-4506

Page 1 of 3

LI #	Ord	Q/S	B/O	Part Number / Description	Unit Price	Ext. Price
001	1	0	1	SC 6AV21240QC020AX1 SIMATIC HMI TP1500 COMFORT. COMFORT PANEL. TOUCH OPERATION. 15 WIDESCREEN-TFT-DISPLAY. 16 MIL. COLORS. PROFINET INTERFACE. MPI/PROFIBUS DP INTERFACE. 24 MB US MEMORY. WEC 2013. CONFIGURABLE FROM WINCC COMFORT SP1 WITH HSP	SER V14	
				On Dock Date: 03/31/2019		
002	1	0	1	SC 6AV21818XP000AX0 SIMATIC HMI MEMORY CARD SD CARD 2 GB FOR SIMATIC HMI COMFORT PANEL		
				On Dock Date: 03/31/2019		
003	1	0	1	SC 6EP4134-3AB00-0AY0 SITOP UPS1600 10A UNINTERRUPTIBLE POWER SUPPLY INPUT 2 DC OUTPUT 24 V/10 A DC	24 V	
				On Dock Date: 03/31/2019		
004	1	0	1	SC 6ES75901AE800AA0 SIMATIC S7-1500, MOUNTING RAIL 482 MM (APPR. 19 INCH) INC GROUNDING ELEMENT, INTEGRATED DIN RAIL FOR MOUNTIN SMALL COMPONENTS SUCH AS CLAMPS, FUSES OR RELAYS	'L. G OF	

Acknowledgment

Unless otherwise agreed to in writing by both parties, all sales are subject to AWC's "Standard Terms and Conditions of Sale", which are available at http://www.awc-inc.com/AWCTermsAndConditions.pdf, and also available upon request.

WC, Inc. PO	#:180707			SO #:	1682784		March 20, 2019 Page 2 of 3
LI#	Ord	Q/S	B/O	Part Number / Descrip	tion	Unit Price	Ext. Price
				On Dock Date:	03/31/2019		
005	1	0	1	SC 6ES75163AN010	AB0		
	SIMATIC S7-1500, CPU 1516-3 PN/DP, CENTRAL PROCESSING UNIT WITH WORKING MEMORY 1 MB FOR PROGRAM AND 5 MB FOR DATA, 1. INTERFACE PROFINET IRT WITH 2 PORT SWITCH, 2. INTERFACE ETHERNET, 3. INTERFACE PROFIBUS, 10 NS BIT-PERFORMANCE, SIMATIC MEMORY CARD NE			IIT S			
				On Dock Date:	03/31/2019		
006	1	0	1	SC 6ES79548LF0304	AA0		
				SIMATIC S7. MEMC FLASH. 24 MBYTE	DRY CARD FOR S7-1X00 CPU/SINAMICS. 3.3 V		
				On Dock Date:	03/31/2019		
007	1	0	1	SC 6ES75317NF100	AB0		
		SIMATIC S7-1500, A RESOLUTION, ACC COMMON MODE V 8 CHANNELS IN 0,1	NALOG INPUT MODULE AI 8 X U/I HS, 16 BIT URACY 0.3 % 8 CHANNELS IN GROUPS OF 8 OLTAGE APPR. 10V DIAGNOSIS, PROCESSAL 25 MS	TS OF ARMS			
				On Dock Date:	03/31/2019		
008	1	0	1	SC 6ES75921BM000)XB0		
				SIMATIC S7-1500, F 35MM WIDE MODU	RONTCONNECTOR PUSH-IN TYPE, 40PIN, FO JLES INCL. 4 JUMPERS AND CABLE STRAP	R	
				On Dock Date:	03/31/2019		
009	5	0	5	SC 6ES75211BH100	AA0		
				SIMATIC S7-1500, D CHANNELS IN GRC (IEC 61131) INCL. F	NGITAL INPUT MODULE, DI16 X DC24V, 16 DUPS OF 16 INPUT DELAY TYP. 3.2MS INPUT RONT CONNECTOR PUSH-IN	ГҮРЕ З	
				On Dock Date:	03/31/2019		
010	2	0	2	SC 6ES7522-1BH10-	-0AA0		
				SIMATIC S7-1500, D CHANNELS IN GRC CONNECTOR PUSH	DIGITAL OUTPUT MODULE, DQ 16 X 24VDC/0. DUPS OF 8, 4 A PER GROUP INCL. FRONT I-IN	5A 16	
					Acknowledg	ament	

1

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AWC, I	nc. PO #:180707			SO ‡	#:1682784	March 20, 2019 Page 3 of 3
LI #	Ord	Q/S	B/O	Part Number / Descri	ption	Unit Price Ext. Price
				On Dock Date:	03/31/2019	
011	1	0	1	SC 6ES75325HD00 SIMATIC S7-1500,	00AB0 ANALOG OUTPUT MODULE AQ 4 X 1	U/I ST 16 BITS
				OF RESOLUTION, DIAGNOSIS, SUBS	ACCURACY 0.3 % 4 CHANNELS IN G STITUTE VALUE	ROUPS OF 4
				On Dock Date:	03/31/2019	
012	1	0	1	SC 6GK75431AX0	00XE0	
				COMMUNICATION S7-1500 TO INDUS COMMUNICATION (HARDWARE- IDE DIAGNOSIS SNMF	N PROCESSOR CP 1543-1 FOR CONNE STRIAL ETHERNET TCP/IP, ISO, UDP, N, IP-BROADCAST/ MULTICAST, SEC ENTIFICATION, IP/MAC ACCESS LIST PV1/V3, DHCP, FTP CLIE	ECTING SIMATIC S7- URITY , FIREWALL),
				On Dock Date:	03/31/2019	
013	1	0	1	SC 6GK51080BA00	02AC2	
				SCALANCE XC108 PORTS. LED-DIAG BUTTON. REDUNI DOWNLOAD	8. UNMANAGED IE SWITCH. 8 X 10/1 SNOSIS. FAULT SIGNAL CONTACT W DANT POWER SUPPLY MANUAL AVA	00MBIT/S RJ45 ITH SET IILABLE AS
				On Dock Date:	03/31/2019	
014	1	0	1	SC 6EP13342BA20		
				SITOP PSU100S 24 V AC OUTPUT 24 V DATECODE = (OC	V/10 A STABILIZED POWER SUPPLY V/10 A DC WARRANTY PERIOD 24 M(TOBER 2014)	INPUT 120/230 ONTHS FROM
				On Dock Date:	03/31/2019	

*** Order Sub-Total: ***

Acknowledgment

Unless otherwise agreed to in writing by both parties, all sales are subject to AWC's "Standard Terms and Conditions of Sale", which are available at http://www.awc-inc.com/AWCTermsAndConditions.pdf, and also available upon request.



HYDRAULIC ELECTRIC MANUFACTURING 136 N. Ellis Road Jacksonville, FL 32254 904-693-3318 904 693-3203 (fax)

CALE

N.T.S.

3/14/05

DRAWING STA

UNIVERSAL HARMONIC FILTER

BILL OF MATERIALS (TYP. OF 3 PANELS)

DESCRIPTION	MFR.	QTY.
ENCLOSURE, NEMA 12, PAINTED	SCHAEFER	1
CONTROL CB, 1 POLE, 10A	CUTLER-HAMMER	1
PUMP MCP, 3 POLE, 400A	CUTLER-HAMMER	1
HANDLE KIT	CUTLER-HAMMER	. 1
IEC CONTACTOR, 300A	CUTLER-HAMMER	1
CONTROL TRANSFORMER, 500VA	SIEMENS	1
MOM. PUSHBUTTON, 120VAC, BLK	SIEMENS	4
3 POS. SEL. SW, MAINT, 120VAC	SIEMENS	1
POTENTIOMETER, 10kOHM	CUTLER-HAMMER	. 1
RELAY 3PDT, 120VAC	CUTLER-HAMMER	13
ON-DELAY TIMER, 120VAC	AUTONICS	1
MOISTURE RELAY, 120VAC	SSAC	1
FUSE, TIME-DELAY, 500V, 2A / 8A	BUSSMAN	2/1
SIGNAL SURGE SUPPRESSOR	EDCO	1
THERMOSTAT, N.O.	PFANNENBERG	1
10 " COOLING FAN	PFANNENBERG	2
10" FILTER ASSEMBLY	PFANNENBERG	2
UPPLIED ITEMS KB VARIABLE FREQUENCY DRIVE VED REMOTE KEYPAD KIT	TOSHIBA	1 1
		1
HOLIDAY ROAD VFD PANEL	TITLE SEE	
JOB #104030	Building Comm	aunit
TUS AS BUILT $(C)^{D}$	WG NUMBER SHEET: C CP-05-0894 1)F: 3





			· · · · · · · · · · · · · · · · · · ·					
REV#	DATE	INITIAL	DESCRIPTION					
A	6/8/05	D.B.L.	REVISED TO MEET NEW SCADA STANDARDS	DRAWN BY	CHIBCKED BY		VFD PANEL	
				D.B.L.	K.A.C.	A LA CAL		
				DATE CREATED	SCALR		JOB #104030	Building Community
				3/14/05	N.T.S.	HYDRAULIC ELECTRIC MANUFACTURING		
						180 H. Cills Read Jacksonills, FL 22254 804-689-3398 004 688-4509 (km)	DRAWING STATUS AS BUILT	$\left(C \left \begin{array}{c} DWG NUMBER \\ CP-05-0894 \end{array} \right \left \begin{array}{c} SHEET: OF: \\ 2 & 3 \end{array} \right \right)$
				3/14/05	N.T.S.	10 K Risk Antonia, R. 2020 10 K Risk Antonia, R. 2020 20 K Risk Antonia, R. 2020	DRAWING STATUS	AS BUILT



		_						
REV#	DATE	INITIAL	DESCRIPTION					
A	6/8/05	D.B.L.	REVISED TO MEET NEW SCADA STANDARDS	DRAWN BY	CHIBCIKED BY		VFD PANEL	
				D.B.L.	К.А.С.	a N		
				DATE CREATED	SCALE	SUN MAS I	JOB #104030	Building Community
		_		3/14/05	N.T.S.	HYDRAULIC ELECTRIC MANUFACTURING		
		_				100 H. Bills Road Jacksonills, Pf, 22224 804-809-33 88 804 689-3259 (km)	DRAWING STATUS AS BUILT	$\left(C \left \begin{array}{c} CP-05-0894 \\ CP-05-0894 \\ \end{array} \right \begin{array}{c} S \\ S \\ 3 \\ \end{array} \right $

CBs 24VDC RELAYS O O <	
TERMINAL BLOCKS	
CPU PLC CPU 226 CP 243-1 IT EM 223 EM235 EM23	F SI DC
TERMINAL BLOCKS	
SURGE SUPPRESSORS & ISOLATORS GROUNDING BAR	
	LIGHT SWITC DUPLEX REC MOUNTED IN LEFT WALL
OPEN BOTTOM	



REV#	DATE	INITIAL	DESCRIPTION
А	6/8/05	D.B.L.	REVISED TO MEET NEW SCADA STANDARDS



E904820FSDD

DIGITAL LEVEL INDICATOR: "FUEL TANK LEVEL" DIGITAL LEVEL INDICATOR: "WET WELL #1 LEVEL" DIGITAL LEVEL INDICATOR: "WET WELL #2 LEVEL" SELECTOR SWITCH: "BACKUP CONTROLS ENABLED" PLOT LIGHT: "BACKUP CONTROLS ENABLED" USHBUTTON: "LAMP TEST" PUSHBUTTON: "ALARM SILENCE"

PAR 1 E 90482 _____ 2 SCFDLS 3 BQ1B01 4 PFC-500 5 A-20258 6 52PX8A 7 52SX2A 8 52PX4E 9 D3PR33 10 D3PR33 11 AT8N-1 12 PD690-3 13 HSP121 14 PC642-0 15 G408-0 16 Q404-4 17 6AV654 18 EA2912 19 6ES7 2 20 W790 8 21 6GK7 2 22 6ES7 22 23 6ES7 23 24 6GK5 20 25 6ES7 30

DP AWN BY	CHECKED BY		
D.B.L.	K.A.C.	SUN CAST	
date created 3/14/05	SCALE N.T.S.	HYDRAULIC ELECTRIC MANUFACTURING 136 N. Ellis Road Jacksonville, FL 32254 904-693-3318 904 693-3203 (fax)	DRAWING S

BI	LL OF MATERIALS		
		MED	
T NO.			
20FS	ENCLOSURE, NEMA 12, PAINTED	ELECTROMATE	1
SAL	FOLDING LAP TOP SHELF	SUNCOAST	1
015L	CONTROL CB, 1 POLE, 15A	SIEMENS	6
00/24 (28)	BATTERY CHARGER	DURACOMM	1
i8-1	BATTERY, 24VDC	POWER SONIC	1
A1	MOM. PUSHBUTTON, 120VAC, BLK	SIEMENS	2
AAB	2 POS. SEL. SW, MAINT, 120VAC	SIEMENS	1
E2Y	LED PILOT LIGHT, RED	SIEMENS	1
3A	RELAY, 3PDT, 120VAC	CUTLER-HAMMER	8 6
3T1	RELAY, 3PDT, 24VDC	CUTLER-HAMMER	R 17
120	ON-DELAY TIMER, 120VAC	AUTONICS	3
-3-N	DIGITAL PANEL METER, 120VAC	PREC. DIGITAL	3
1BT1	120VAC SURGE SUPPRESSOR	EDCO	3
-036X	ANALOG SURGE ARRESTOR	EDCO	6
0001	SIGNAL ISOLATOR	ACTION	3
ŀ	SIGNAL ISOLATOR/SPLITTER	ACTION	3
420CA100AX0	TOUCH SCREEN	SIEMENS	1
2-325	TOUCH SCREEN ETHERNET CARD	SIEMENS	1
216-2AD23-0XB0	CPU S7-200 24D I / 16 DO	SIEMENS	1
34E10-01B2	CPU S7-200 LITHIUM BATTERY	SIEMENS	1
243-1GX00-0XE0	ETHERNET COMM MODULE	SIEMENS	1
23-1BL22-0XA0	24VDC I/O MODULE, 16 D I / 16 DO	SIEMENS	1
235-0KD22-0XA0	ANALOG I/O MODULE, 4 A I / 4 DO	SIEMENS	3
208-0BA00-2AA3	8 PORT ETHERNET SWITCH	SIEMENS	1
07-1KA00-0AA0	24VDC POWER SUPPLY, 10A	SIEMENS	1













	BILL of MATERIAL							
ITEM	QTY.	MANUFACTURER	PART No.	DESCRIPTION				
Α	1	SIEMENS	6AV2 124-0QC02-0AX1	TP1500 TOUCH SCREEN OPERATOR INTERFACE (HMI)				
В	1	SIEMENS	6AV2 181-8XP00-0AX0	HMI MEMORY CARD, 2GB				
С	1	SIEMENS	6EP1 334-2BA20	SITOP PSU100S 24VDC POWER SUPPLY, 10A OUTPUT				
D	1	SIEMENS	6EP4 134-3AB00-0AY0	SITOP UPS1600 24VDC UNINTERRUPTIBLE POWER SUPPLY, 10A OUTPUT				
E	1	SIEMENS	6ES7 590-1AE80-0AA0	SIMATIC S7-1500 MOUNTING RAIL, 482mm (19") WITH GROUNDING ELEMENT				
F	1	SIEMENS	6ES7 516-3AN01-0AB0	SIMATIC S7-1500 CPU 1516-3 PN/DP				
G	1	SIEMENS	6ES7 954-8LF03-0AA0	CPU MEMORY CARD, 24MB				
Н	5	SIEMENS	6ES7 521-1BH10-0AA0	SIMATIC S7-1500 DIGITAL INPUT MODULE, DI16 x 24VDC, 16 CHANNEL				
I	2	SIEMENS	6ES7 522-1BH10-0AA0	SIMATIC S7-1500 DIGITAL OUTPUT MODULE, DQ16 x 24VDC/0.5A, 16 CHANNEL				
J	2	SIEMENS	6ES7 531-7NF10-0AB0	SIMATIC S7-1500 ANALOG INPUT MODULE, AI8 x U/I HS, 16-BIT, 8 CHANNEL				
K	1	SIEMENS	6ES7 532-5HD00-0AB0	SIMATIC S7-1500 ANALOG OUTPUT MODULE, AQ4 x U/I ST, 16-BIT, 4 CHANNEL				
L	3	SIEMENS	6ES7 592-1BM00-0XB0	SIMATIC S7-1500 FRONT CONNECTOR, PUSH-IN TYPE, 40-PIN				
Μ	1	SIEMENS	6GK7 543-1AX00-0XE0	CP 1543-1 COMMUNICATION PROCESSOR FOR INDUSTRIAL ETHERNET				
Ν	1	SIEMENS	6GK5 108-0BA00-2AC2	SCALENCE XC108 UNMANAGED ETHERNET SWITCH, 8 x 10/100MBITS/S				



1 ITEM NOT SHOWN. NEW PARTS SHALL REPLACE EXISTING PARTS IN KIND.

NOTES:

1 REVISIONS PER ENGINEER'S REVIEW COMMENTS

2 RE-ORDER AI/O MODULES AS REQUESTED

PROJECT:	JEA HOLIDAY ROAD PUM	P STATION PLO	C UPGF	RADE			
TITLE:	PLC RACK LAYOUT & BOM						
CREATED BY:	DS	APPROVED BY:			SB		
SCALE:	NTS	REVISION:			2		
DATE:	05/15/20	SHEET:	1	of:	11		



 6ES7 321-7BH01-0AB0 6ES 16 Digital Inputs 1 L+ = 24VDC 2 INPUT 32.0 3 INPUT 32.1 4 INPUT 32.2 5 6 INPUT 32.3 6 INPUT 32.4 7 8 INPUT 32.6 9 INPUT 32.7 10 1Vs = 24VDC 11 2Vs = 24VDC 11 12 INPUT 33.0 12 13 INPUT 33.1 14 INPUT 33.2 14 INPUT 33.3 15 16 INPUT 33.4 17 INPUT 33.5 17 18 INPUT 33.7 20 M = DC COM 21 22 23 24 25 26 	7 521-1BH10-0AA0 6 Digital Inputs INPUT 32.0 INPUT 32.1 INPUT 32.2 INPUT 32.3 INPUT 32.4 INPUT 32.5 INPUT 32.6 INPUT 32.7 INPUT 33.0 INPUT 33.1 INPUT 33.2 INPUT 33.3 INPUT 33.4 INPUT 33.5 INPUT 33.6 INPUT 33.7
16 Digital Inputs 1 1 L+ = 24VDC 2 INPUT 32.0 3 INPUT 32.1 4 INPUT 32.2 5 INPUT 32.3 6 INPUT 32.4 7 INPUT 32.5 8 INPUT 32.6 9 INPUT 32.7 10 1Vs = 24VDC 11 2Vs = 24VDC 12 INPUT 33.0 13 INPUT 33.1 14 INPUT 33.3 16 INPUT 33.3 16 INPUT 33.5 17 INPUT 33.7 20 M = DC COM 21 22 23 24 25 26	6 Digital Inputs INPUT 32.0 INPUT 32.1 INPUT 32.2 INPUT 32.3 INPUT 32.4 INPUT 32.5 INPUT 32.6 INPUT 32.7 INPUT 33.0 INPUT 33.1 INPUT 33.2 INPUT 33.3 INPUT 33.4 INPUT 33.5 INPUT 33.7
1 L+ = 24VDC 1 2 INPUT 32.0 3 4 INPUT 32.1 4 5 INPUT 32.2 4 5 INPUT 32.3 6 7 INPUT 32.4 7 8 INPUT 32.5 8 9 INPUT 32.7 9 10 IVs = 24VDC 10 11 2Vs = 24VDC 11 12 INPUT 33.0 12 13 INPUT 33.1 13 14 INPUT 33.2 14 15 INPUT 33.3 16 16 INPUT 33.5 17 18 INPUT 33.6 19 19 INPUT 33.7 20 20 M = DC COM 20 21 22 23 24 25 26	INPUT 32.0 INPUT 32.1 INPUT 32.2 INPUT 32.3 INPUT 32.4 INPUT 32.5 INPUT 32.6 INPUT 32.7 INPUT 33.0 INPUT 33.1 INPUT 33.2 INPUT 33.3 INPUT 33.4 INPUT 33.5 INPUT 33.6 INPUT 33.7
2 INPUT 32.0 2 3 INPUT 32.1 4 4 INPUT 32.2 5 6 INPUT 32.3 6 7 INPUT 32.5 7 8 INPUT 32.6 8 9 INPUT 32.7 9 10 1Vs = 24VDC 10 11 2Vs = 24VDC 11 12 INPUT 33.0 12 13 INPUT 33.1 13 14 INPUT 33.2 15 16 INPUT 33.3 15 16 INPUT 33.6 18 19 INPUT 33.7 19 20 M = DC COM 20 21 22 23 24 25 26	INPUT 32.1 INPUT 32.2 INPUT 32.3 INPUT 32.4 INPUT 32.5 INPUT 32.6 INPUT 32.7 INPUT 33.0 INPUT 33.1 INPUT 33.2 INPUT 33.3 INPUT 33.4 INPUT 33.5 INPUT 33.6 INPUT 33.7
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1 10 1Vs = 24VDC 10 11 2Vs = 24VDC 11 12 INPUT 33.0 12 13 INPUT 33.1 13 14 INPUT 33.2 14 15 INPUT 33.3 15 16 INPUT 33.4 16 17 INPUT 33.5 17 18 INPUT 33.7 19 20 M = DC COM 20 21 22 23 24 25 26	INPUT 33.0 INPUT 33.1 INPUT 33.2 INPUT 33.3 INPUT 33.4 INPUT 33.5 INPUT 33.6 INPUT 33.7
11 2Vs = 24VDC 11 12 INPUT 33.0 12 13 INPUT 33.1 13 14 INPUT 33.2 14 15 INPUT 33.3 15 16 INPUT 33.4 16 17 INPUT 33.5 17 18 INPUT 33.7 19 20 M = DC COM 20 21 22 23 24 25 26	INPUT 33.0 INPUT 33.1 INPUT 33.2 INPUT 33.3 INPUT 33.4 INPUT 33.5 INPUT 33.6 INPUT 33.7
12 INPUT 33.0 12 13 INPUT 33.1 13 14 INPUT 33.2 14 15 INPUT 33.3 15 16 INPUT 33.4 16 17 INPUT 33.5 17 18 INPUT 33.7 19 20 M = DC COM 20 21 22 23 24 25 26	INPUT 33.1 INPUT 33.2 INPUT 33.3 INPUT 33.4 INPUT 33.5 INPUT 33.6 INPUT 33.7
13 INPUT 33.1 13 14 INPUT 33.2 14 15 INPUT 33.3 15 16 INPUT 33.4 16 17 INPUT 33.5 17 18 INPUT 33.6 18 19 INPUT 33.7 19 20 M = DC COM 20 21 22 23 24 25 26	INPUT 33.2 INPUT 33.3 INPUT 33.4 INPUT 33.5 INPUT 33.6 INPUT 33.7
14 INPUT 33.2 14 15 INPUT 33.3 15 16 INPUT 33.4 16 17 INPUT 33.5 17 18 INPUT 33.6 18 19 INPUT 33.7 19 20 M = DC COM 20 21 22 23 24 25 26	INPUT 33.3 INPUT 33.4 INPUT 33.5 INPUT 33.6 INPUT 33.7
15 INPUT 33.3 15 16 INPUT 33.4 16 17 INPUT 33.5 17 18 INPUT 33.6 18 19 INPUT 33.7 19 20 M = DC COM 20 21 22 23 24 25 26	INPUT 33.4 INPUT 33.5 INPUT 33.6 INPUT 33.7
16 INPUT 33.4 16 Not Used 17 INPUT 33.5 17 18 INPUT 33.6 18 19 INPUT 33.7 19 20 M = DC COM 20 21 22 23 24 25 26	INPUT 33.5 INPUT 33.6 INPUT 33.7
Not Used 17 INPUT 33.5 17 18 INPUT 33.6 18 19 19 INPUT 33.7 19 20 20 M = DC COM 20 21 22 23 24 25 26 26 26 26	INPUT 33.6 INPUT 33.7
18 INPUT 33.6 18 19 INPUT 33.7 19 20 M = DC COM 20 21 22 23 24 25 26	INPUT 33.7
19 INPUT 33.7 19 20 M = DC COM 20 21 22 23 24 25 26	
20 M = DC COM 20 21 22 23 24 25 26	
21 22 23 24 25 26	M = DC COM
22 23 24 25 26	
23 24 25 26	
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PROJECT:	JEA HOLIDAY ROAD PUM	P STATION PLC	UPGRADE			
TITLE: DIGITAL INPUT MODULE 1						
CREATED BY:	DS	APPROVED BY:		SB		
SCALE:	NTS	REVISION:		2		
DATE:	05/15/20	SHEET: 2	of:	11		



	EXISTING (20-Pin Connector)	NEW (40-Pin Connector)
	6ES7 321-7BH01-0AB0	6ES7 521-1BH10-0AA0
	16 Digital Inputs	16 Digital Inputs
	1 L+ = 24VDC 2 INPUT 36.0 3 INPUT 36.1	1 INPUT 36.0 2 INPUT 36.1 3 INPUT 36.2
	4 INPUT 36.25 INPUT 36.36 INPUT 36.4	4 INPUT 36.3 5 INPUT 36.4 6 INPUT 36.5
	7 INPUT 36.5 8 INPUT 36.6	7 INPUT 36.6 8 INPUT 36.7
	9 INPUT 36.7 10 1Vs = 24VDC 11 2Vs = 24VDC	9 10 11 INPUT 37.0
	12 INPUT 37.0 13 INPUT 37.1 14 INPUT 37.2	12 INPUT 37.1 13 INPUT 37.2 14 INPUT 37.3
- Not Llead	 15 INPUT 37.3 16 INPUT 37.4 17 INPUT 37.5 	15 INPUT 37.4 16 INPUT 37.5 17 INPUT 37.6
Not Used	18 INPUT 37.6 19 INPUT 37.7 20 M – DC COM	18 INPUT 37.7 19
		21 22
		23 24 25
		26 27 28
		29 30
		31 32 33
		34 35 36
		37 38 39
		40

PROJECT:	PROJECT: JEA HOLIDAY ROAD PUMP STATION PLC UPGRADE				
TITLE:	DIGITAL INPU	JT MODULE 2			
CREATED BY:	DS	APPROVED BY:		SB	
SCALE:	NTS	REVISION:		2	
DATE:	05/15/20	SHEET: 3	of:	11	



		(20-Pin Connector)	(4	IO-Pin Connector)
	6E	S7 321-7BH01-0AB0	6ES	7 521-1BH10-0AA0
		16 Digital Inputs		16 Digital Inputs
	1	L+ = 24VDC	1	INPUT 40.0
	2	INPUT 40.0	2	INPUT 40.1
	3	INPUT 40.1	3	INPUT 40.2
	4	INPUT 40.2	4	INPUT 40.3
	5	INPUT 40.3	5	INPUT 40.4
	6	INPUT 40.4	6	INPUT 40.5
	7	INPUT 40.5	7	INPUT 40.6
	8	INPUT 40.6	8	INPUT 40.7
	9	INPUT 40.7	9	
Z	10	1Vs = 24VDC	10	
Z	1	2Vs = 24VDC	11	INPUT 41.0
	12	INPUT 41.0	12	INPUT 41.1
	13	INPUT 41.1	13	INPUT 41.2
	14	INPUT 41.2	14	INPUT 41.3
	15	INPUT 41.3	15	INPUT 41.4
	16	INPUT 41.4	16	INPUT 41.5
Not Used	1/	INPUT 41.5	1/	INPUT 41.6
	18	INPUT 41.6	18	INPUT 41.7
	19	INPUT 41.7	19	
	20	M = DC COM	20	M = DC COM
			21	
			22	
			23	
			24	
			20	
			20	
			28	
			29	
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	PROJECT:	JEA HOLIDAY ROAD PUM	P STATION PLC U	PGRADE	
TITLE: DIGITAL INPUT MODULE 3					
	CREATED BY:	DS	APPROVED BY:		SB
	SCALE:	NTS	REVISION:		2
	DATE:	05/15/20	SHEET: 4	of:	11



	EXISTING (20-Pin Connector)	NEW (40-Pin Connector)
	6ES7 321-7BH01-0AB0	6ES7 521-1BH10-0AA
	16 Digital Inputs	16 Digital Inputs
	1 L+ = 24VDC	1 INPUT 44.0
	2 INPUT 44.0	2 INPUT 44.1
	3 INPUT 44.1	3 INPUT 44.2
	4 INPUT 44.2	4 INPUT 44.3
	5 INPUT 44.3	5 INPUT 44.4
	6 INPUT 44.4	6 INPUT 44.5
	7 INPUT 44.5	7 INPUT 44.6
	8 INPUT 44.6	8 INPUT 44.7
	9 INPUT 44.7	9
1	10 1Vs = 24VDC	10
1	11 2Vs = 24VDC	11 INPUT 45.0
	12 INPUT 45.0	12 INPUT 45.1
	13 INPUT 45.1	13 INPUT 45.2
	14 INPUT 45.2	14 INPUT 45.3
	15 INPUT 45.3	15 INPUT 45.4
	16 INPUT 45.4	16 INPUT 45.5
Not Used	17 INPUT 45.5	17 INPUT 45.6
	18 INPUT 45.6	18 INPUT 45.7
	19 INPUT 45.7	19
	20 M = DC COM	20 M = DC COM
		21
		22
		23
		24
		25
		26
		27
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PROJECT:	JEA HOLIDAY ROAD PUMP STATION PLC UPGRADE				
TITLE:	DIGITAL INPUT MODULE 4				
CREATED BY:	DS	APPROVED BY:		SB	
SCALE:	NTS	REVISION:		2	
DATE:	05/15/20	SHEET: 5	of:	11	



	EXISTING (20-Pin Connector)	(4	NEW I0-Pin Connector)
	6ES7 321-7BH01-0AB0	6ES	7 521-1BH10-0AA0
	16 Digital Inputs		16 Digital Inputs
	1 L+ = 24VDC	1	INPUT 48.0
	2 INPUT 48.0	2	INPUT 48.1
	3 INPUT 48.1	3	INPUT 48.2
	4 INPUT 48.2	4	INPUT 48.3
	5 INPUT 48.3	5	INPUT 48.4
	6 INPUT 48.4	6	INPUT 48.5
	7 INPUT 48.5	7	INPUT 48.6
	8 INPUT 48.6	8	INPUT 48.7
	9 INPUT 48.7	9	
1	10 1Vs = 24VDC	10	
1	11 2Vs = 24VDC	11	INPUT 49.0
	12 INPUT 49.0	12	INPUT 49.1
	13 INPUT 49.1	13	INPUT 49.2
	14 INPUT 49.2	14	INPUT 49.3
	15 INPUT 49.3	15	INPUT 49.4
	16 INPUT 49.4	16	INPUT 49.5
Not Used	17 INPUT 49.5	17	INPUT 49.6
	18 INPUT 49.6	18	INPUT 49.7
	19 INPUT 49.7	19	
	20 M = DC COM	20	M = DC COM
		21	
		22	
		23	
		24	
		25	
		26	
		27	
		28	
		29	
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PROJECT:	JEA HOLIDAY ROAD PUM	P STATION PLC	UPGRA	ADE	
TITLE:	DIGITAL INPUT MODULE 5				
CREATED BY:	DS	APPROVED BY:			SB
SCALE:	NTS	REVISION:			2
DATE:	05/15/20	SHEET: (6	of:	11



	EXISTING (20-Pin Connector)	NEW (40-Pin Connector)
	6ES7 322-1BH01-0AA0	6ES7 522-1BH10-0AA
	16 Digital Outputs	16 Digital Outputs
	1 1L+ = 24VDC	1 OUTPUT 52.0
	2 OUTPUT 52.0	2 OUTPUT 52.1
	3 OUTPUT 52.1	3 OUTPUT 52.2
	4 OUTPUT 52.2	4 OUTPUT 52.3
	5 OUTPUT 52.3	5 OUTPUT 52.4
	6 OUTPUT 52.4	6 OUTPUT 52.5
	7 OUTPUT 52.5	7 OUTPUT 52.6
	8 OUTPUT 52.6	8 OUTPUT 52.7
	9 OUTPUT 52.7	9 1L+ = 24VDC
	10 1M = DC COM	10 1M = DC COM
	11 2L+ = 24VDC	11 OUTUT 53.0
	12 OUTUT 53.0	12 OUTUT 53.1
	13 OUTUT 53.1	13 OUTUT 53.2
	14 OUTUT 53.2	14 OUTUT 53.3
	15 OUTUT 53.3	15 OUTUT 53.4
	16 OUTUT 53.4	16 OUTUT 53.5
Not Used	17 OUTUT 53.5	17 OUTUT 53.6
	18 OUTUT 53.6	18 00101 53.7
	19 00101 53.7	$19 \ 2L + = 24 \ VDC$
	20 211 = 00 0011	20 2101 = DC COIVI
		22
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	TITLE:	E 1					
	CREATED BY:	DS	APPROVED	BY:		SB	
	SCALE:	NTS	REVISION:			2	
	DATE:	05/15/20	SHEET:	7	of:	11	



	EXISTING (20-Pin Connector)	(4	NEW I0-Pin Connector)
	6ES7 322-1BH01-0AA0	6ES	7 522-1BH10-0AA0
	16 Digital Outputs	1	6 Digital Outputs
	1 1L+ = 24VDC	1	OUTPUT 56.0
	2 OUTPUT 56.0	2	OUTPUT 56.1
	3 OUTPUT 56.1	3	OUTPUT 56.2
	4 OUTPUT 56.2	4	OUTPUT 56.3
	5 OUTPUT 56.3	5	OUTPUT 56.4
	6 OUTPUT 56.4	6	OUTPUT 56.5
	7 OUTPUT 56.5	7	OUTPUT 56.6
	8 OUTPUT 56.6	8	OUTPUT 56.7
	9 OUTPUT 56.7	9	1L+ = 24VDC
	10 1M = DC COM	10	1M = DC COM
	11 2L+ = 24VDC	11	OUTUT 57.0
	12 OUTUT 57.0	12	OUTUT 57.1
	13 OUTUT 57.1	13	OUTUT 57.2
	14 OUTUT 57.2	14	OUTUT 57.3
	15 OUTUT 57.3	15	OUTUT 57.4
	16 OUTUT 57.4	16	OUTUT 57.5
Not Used	17 OUTUT 57.5	17	OUTUT 57.6
	18 OUTUT 57.6	18	OUTUT 57.7
	19 OUTUT 57.7	19	2L+ = 24VDC
	20 2M = DC COM	20	2M = DC COM
		21	
		22	
		23	
		24	
		25	
		26	
		27	
		20	
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TITLE:	DIGITAL OUTPUT MODULE 2						
CREATED BY:	DS	APPROVED BY:		SB			
SCALE:	NTS	REVISION:		2			
DATE:	05/15/20	SHEET: 8	of:	11			



3 NEW AI MODULE 1 SUPPLIES POWER TO NEW AO MODULE 1, SHEET 10.

2 RE-ORDER AI/O MODULES AS REQUESTED

/		EXISTING (40-Pin Connector)	(4	NEW 40-Pin Connector)
© 22	6E	S7 331-7NF10-0AB	0 6ES	S7 531-7NF10-0AB0
		8 Analog Inputs		8 Analog Inputs
	1		1	Uv0
24	2		2	I0+ (PIW288)
	3	M0+ (PIW288)	3	
	4		4	10-
	5		5	Uv1
© 26 –	6	M0-	6	I1+ (PIW290)
	/ 7	M1+ (PIW290)	7	
	8		8	11-
	9		9	Uv2
© 28	10	M1-	10	I2+ (PIW292)
	11	M2+ (PIW292)	11	
	12		12	12-
	13		13	Uv3
© 30	14	M2-	14	I3+ (PIW294)
	/ 15	M3+ (PIW294)	15	
	16		16	13-
	17	,	17	
© 32	18	M3-	18	Mana
	19		19	
	20		20	
	21	L+=24VDC	21	Uv4
∅ 34	22		22	I4+ (PIW296)
	23	M4+ (PIW296)	23	
	24		24	4-
	25		25	Uv5
◎ 36	26	M4-	26	I5+ (PIW298)
	27	M5+ (PIW298)	27	
	28		28	15-
	29		29	Uv6
∅ 38	30	M5-	30	I6+ (PIW300)
	31	M6+ (PIW300)	31	
	32		32	I6-
	33		33	Uv7
◎ 40	34	M6-	34	I7+ (PIW302)
	35	M7+ (PIW302)	35	
3 44	36		36	17-
	37	,	37	
	38	M7-	38	
	39		39	
↓ <u>/3</u>	40	M = DC COM	40	

_								
	PROJECT:	JEA HOLIDAY ROAD PUMP STATION PLC UPGRADE						
	TITLE:	ANALOG INPU	JT MODULE 1					
	CREATED BY:	DS	APPROVED BY:			SB		
	SCALE:	NTS	REVISION:			2		
	DATE:	05/15/20	SHEET:	9	of:	11		



	(4	EXISTING 20-Pin Connector)	(4	NEW 10-Pin Connector)
	6ES	67 332-7ND02-0AB0	6ES	7 532-5HD00-0AB0
	2	4 Analog Outputs	4	Analog Outputs
	1	L+ = 24VDC	1	QI0 (PIW320)
	2		2	
	3	QI0 (PIW320)	3	
	4		4	Mana
	5		5	QI1 (PIW322)
	6	Mana 0	6	
	7	QI1 (PIW322)	7	
	8		8	Mana
	9		9	QI2 (PIW324)
	10	Mana 1	10	
	11	QI2 (PIW324)	11	Maria
	12		12	Mana
	13	Mana 2	13	Q13 (P1W326)
	14		14	
- Not Used	16	QI3 (F10020)	10	Mana
	17		17	Ivialia
	18	Mana 3	18	
	19	Ivialia 0	19	
	20	M = DC COM	20	
			21	
			22	
			23	
			24	
			25	
			26	
			27	
			28	
			29	
			30	
			31	
			32	
			33	
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			3/	
			38	
			39	
			40	

PROJECT:	JEA HOLIDAY ROAD PUMP STATION PLC UPGRADE					
TITLE:	TLE: ANALOG OUTPUT MODULE 1					
CREATED BY:	DS	APPROVED E	BY:		SB	
SCALE:	NTS	REVISION:			2	
DATE:	05/15/20	SHEET:	10	of:	11	



4 THE "BATTERY VOLTAGE" INPUT IS NOT USED.

2 RE-ORDER AI/O MODULES AS REQUESTED

	EXISTING (20-Pin Connector)	NEW (40-Pin Connector)
∼	6ES7 331-7KB01-0AB0	6ES7 531-7NF10-0AB0
	2 Analog Inputs	8 Analog Inputs
	1 L+ = 24VDC	1 Uv0
© 24	2 M0+ (PIW304)	2 I0+ (PIW336)
	3 M0-	3
	4 M1+ (PIW306)	4 10-
	5 M1-	5 Uv1
◎ 26	6	6 I1+ (PIW338)
	7	7
	8	8 11-
M 20	9	9 Uv2
W 20	10 COMP+	10 12+ (PIW340)
	11 COMP-/Mana	
	12	12 12-
© 30	13	
	14	14 IS+ (PIW342)
	16	
	17	17
© 32	10	17 19 Mana
<u> </u>	10	10 10
	19 $M = DC COM$	20
		20 21 1 1 v4
③ 34		22 I4+ (PIW/344)
		23
		24 14-
		25 Uv5
◎ 36		26 5+ (PIW346)
		27
		28 15-
		29 Uv6
∅ 38		30 I6+ (PIW348)
		31
		32 16-
		33 Uv7
◎ 40		34 I7+ (PIW350)
		35
43 44		36 17-
		37
		38
		39
		40

PROJECT:	JEA HOLIDAY ROAD PUM	P STATION P	PLC UPG	RADE		
TITLE:	ANALOG INPU	JT MODULE	2			
CREATED BY:	DS	APPROVED B	Y:		SB	
SCALE:	NTS	REVISION:			2	
DATE:	05/15/20	SHEET:	11	of:	11	

SECTION 16901

EXISTING GENERATOR SYSTEM SCADA SYSTEM INTEGRATION AND FUEL DELIVERY SYSTEM RELOCATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. The work covered by these specifications consists of providing all design, labor, tools, materials, and testing necessary to:
 - 1. Enhance JEA's SCADA monitoring of the existing diesel-fueled Caterpillar generator; and
- B. The Generator Manufacturer's representative shall coordinate and assist the Contractor's efforts to relocate the existing diesel fuel tank with associated fuel pumping system and fuel tank monitoring system.
- C. The Contractor shall furnish and install a JEA Approved Generator Distributed I/O Control Panel. The standard panel requirements are provided as an attachment to this Specification, and the Contractor's integrator shall finalize the panel requirements as part of their field investigations and coordination with the Generator Manufacturer's authorized personnel. The Contractor shall issue their findings and coordination efforts as part of shop drawing for review and approval by JEA and the Engineer.
- D. The SCADA system expansion shall consist of acquiring additional I/O from the existing 600 kW generator set (Serial Number EKW01588).
- E. JEA shall be capable monitoring statuses and initiating control functions to the generator by utilizing the SCADA system.
- F. Unless otherwise indicated, all electrical equipment and installation shall be in accordance with the Division 16 specifications.

PART 2 - PRODUCTS

2.01 EXISTING GENERATOR PANEL MODIFICATION: The Generator Manufacturer shall modify the existing generator control panel to enhance communications to the JEA SCADA system through connection with the JEA Distributed I/O Control Panel. The Generator Manufacturer shall provide replacement I/O Module(s) and cabling to connect the existing generator control panel to the JEA Distributed I/O Control

Panel. The Generator Manufacturer shall confirm which of the following alarm conditions will be available to JEA via the SCADA system:

- 1. Failing to start after the specified time (OVERCRANK),
- 2. OVERSPEED,
- 3. LOW LUBRICATING OIL PRESSURE,
- 4. HIGH ENGINE TEMPERATURE, and/or
- 5. MANUAL STOP (LOCAL OR REMOTE)
- 6. High engine temperature shutdown
- 7. High engine temperature pre-alarm
- 8. Low engine oil pressure pre-alarm
- 9. Low coolant temperature
- 10. Low fuel
- 11. Run
- 12. Not in automatic start
- 13. Auxiliary (2 each) (Customer identified)
- 14. Low oil pressure (warning)
- 15. Low oil pressure (shutdown)
- 16. Oil pressure sender failure (warning)
- 17. Low coolant temperature (warning)
- 18. High coolant temperature (warning)
- 19. High coolant temperature (shutdown)
- 20. High oil temperature (warning)
- 21. Engine temperature sender failure (warning)
- 22. Low coolant level (warning)
- 23. Fail to crank (shutdown)
- 24. Fail to start/overcrank (shutdown)
- 25. Overspeed (shutdown)
- 26. Low DC voltage (warning)
- 27. High DC voltage (warning)
- 28. Weak battery (warning)
- 29. Low fuel tank (warning)
- 30. High AC voltage (shutdown)
- 31. Low AC voltage (shutdown)
- 32. Under frequency (shutdown)
- 33. Over current (warning)
- 34. Over current (shutdown)
- 35. Short circuit (shutdown)
- 36. Over load (warning)
- 37. Emergency stop (shutdown)
- 38. Four (4) configurable conditions

The Generator Manufacturer shall confirm which of the following digital information is available:

- 1. Engine oil pressure (psi or kPA)
- 2. Engine coolant temperature (degrees F or C)
- 3. Engine oil temperature (degrees F or C)
- 4. Engine speed (rpm)
- 5. Number of hours of operation (hours)
- 6. Number of start attempts
- 7. Battery voltage (DC volts)
- 2.02 JEA GENERATOR DISTRIBUTED I/O CONTROL PANEL: The Contractor shall furnish and install the enclosed control panel configured as required to maximize JEA's SCADA monitoring of the existing Caterpillar generator and exterior diesel fuel tank. The Contractor shall furnish and install all necessary conduits, conductors, and control wiring for a complete and operable system.

PART 3 - EXECUTION

- **3.01 SCADA SYSTEM INITIALIZATION:** A factory-trained qualified service representative from the Generator Manufacturer and the Contractor's SCADA Integrator shall provide all system initialization, customization, startup, and training to provide a complete and operating system.
 - A. The central SCADA system software configuration and programming shall be modified as required to fully integrate the existing generator. See Specification Section 16900 for additional requirements.
 - B. The integrator shall coordinate with JEA to develop, modify, and/or implement operator interface dynamic graphic display screens as required to provide complete remote monitoring and control of the existing generator from SCADA computing systems.
- **3.02 FUEL TANK RELOCATION:** The Contractor shall coordinate with the Manufacturer's representative(s) to relocate the existing fuel tank and make necessary modifications to the fuel delivery system including relocation of the fuel tank monitoring system with associated power and signal wiring changes.
- **3.03 WARRANTY:** The system supplier shall warrant all hardware and telemetry software provided under this contract against all defects in material and workmanship for a period of one year. The system supplier shall warrant the telemetry software to be free of defects for as long as it is in operation by the owner.

- **3.04 TRAINING:** The following tabulation indicates the required minimum training provided.
 - A. Eight (8) hours at the Owner's facility during system start-up.
 - B. Eight (8) hours scheduled 2 to 3 weeks after system start-up.

END OF SECTION



GENERAL NOTES:

- 1. THIS DRAWING IS AN EXAMPLE OF HOW OVERALL CABINET IS TO BE DESIGNED
- 2. REFER TO NOTES AND DETAILS ON ALL DRAWING SHEETS
- 3. ALL FIELD WIRING SHALL BE #18 AWG STRANDED, TIN-PLATED COPPER
- 4. ALL FIELD WIRING SHALL CONNECT DIRECTLY TO I/O BASE TERMINALS USING FERRULES WITH END SLEEVES
- 5. ALL PLC I/O WIRING SHALL BE #18 AWG
- 6. ALL MOUNTING SCREWS SHALL BE DRILLED AND TAPPED (NO SELF-TAPPING SCREWS ARE ALLOWED)
- 7. ALL MOUNTING SCREWS SHALL BE STAINLESS STEEL
- 8. DIN RAIL SHALL BE MODEL 1492-DR9 OR EQUIVALENT
- 9. PROFINET CABLE FROM I/O PANEL TO RTU SHALL BE SIEMENS 6XV1 840-2AH10 AND CONNECTOR SHALL BE SIEMENS 6AG1 901-1BB10-7AA0
- 10. PROFIBUS CABLE FROM I/O PANEL TO RTU SHALL BE SIEMENS 6XV1 830-0EH10 AND TERMINATE AT A CITEL DLA-12D3 SURGE PROTECTOR IN THE RTU

CONTROL TERMINAL COLOR:

ORANGE	+12VDC SUPPLY
BROWN	-12VDC SUPPLY
BLUE	+24VDC CONTROL CIRCUITS
	-24VDC CONTROL CIRCUITS
GRAY	REMOTELY POWERED CIRCUITS
GREEN / YELLOW	GROUND

DRAWING LAYER COLOR LEGEND:

GREY	NOTES
BLACK	ELECTRICAL SCHEMATIC WIRING DIAG
BLUE	PART IDENTIFICATION
PURPLE	WIRE NUMBERS
GREEN	FIELD DEVICES AND WIRING OUTSIDE
RED	FUTURE / OPTIONAL DEVICES AND WIR
EAL	DIMENSIONS

	DESIGNER:	SHEET TITLE: FRONT PANEL VIEW
	DRAWN BY:	PROJECT:
	DATE:	PROJECT NAME
	CHECKED BY:	GENERATOR DISTRIBUTED I/O PANEL
sm sm	DATE	
ing Community	BATE.	– JOB No: SHEET OF
ing communitysm	2018 STANDARD PACKAGE	12345678 1 8

GRAMS AND DEVICES

ENCLOSURE (DASHED) RING



				BILL of MATERIAL		
	ITEM	TAG	PART No.	DESCRIPTION	MANUFACTURER	QTY.
	Α		AH16148C	ENCLOSURE, NEMA 4X, POLYCARBONATE, CLEAR COVER	ATTABOX	1
	В		BP1614A	BACK PANEL, 12ga., ALUMINUM, UNPAINTED	ATTABOX	1
	С	CB1	2907562	CIRCUIT BREAKER, UL489 BRANCH RATED, C-CURVE, 1-POLE, 5A	PHOENIX CONTACT	1
\wedge		тм	6AG1 155-6AA01-7BN0	INTERFACE MODULE, SIPLUS ET200SP IM155-6PN STANDARD	SIEMENS	1
<u>/1</u>		1141	6AG1 155-6BA00-7CN0	INTERFACE MODULE, SIPLUS ET200SP IM155-6DP HIGH FEATURE	SIEMENS	
	-		6AG1 131-6BF01-7BA0	DIGITAL INPUT MODULE, SIPLUS ET200SP DI 8x24VDC ST	SIEMENS	3
			6AG1 193-6BP00-7DA0	BASE MODULE, WHITE	SIEMENS	3
	E		6AG1 134-6GD00-7BA1	ANALOG INPUT MODULE, SIPLUS ET200SP AI 4xI 2- / 4-WIRE ST	SIEMENS	1
	Г		6AG1 193-6BP00-7DA0	BASE MODULE, WHITE	SIEMENS	1
	G	SP1	DS220S-24DC	SURGE PROTECTOR, 24VDC	CITEL	1
\wedge		NI	2313931	PROFINET NETWORK ISOLATOR	PHOENIX CONTACT	1
<u>/2</u> \		PSP	DLA-12D3	PROFIBUS SURGE PROTECTOR	CITEL	
	Ι	М	2002-1406	TERMINAL, PUSH-IN, 1-CIRCUIT, YELLOW	WAGO	2
	J	L+	2002-1404	TERMINAL, PUSH-IN, 1-CIRCUIT, BLUE	WAGO	2
	К	G	2002-1407	TERMINAL, PUSH-IN, 1-CIRCUIT, GREEN/YELLOW, GROUNDING	WAGO	1
	L		2002-1492	TERMINAL END PLATE, ORANGE	WAGO	3
	М		2002-400	ADJACENT JUMPER, 2-WAY CONTINUOUS	WAGO	2
	Ν		249-116	END ANCHOR, 6mm, GRAY	WAGO	2
	0		210-112	DIN RAIL, GALVANIZED, SLOTTED, 2M	WAGO	1
	Р		PK5GTA	EQUIPMENT GROUND BAR KIT	SQUARE D	1
			6XV1 840-2AH10	PROFINET CABLE, FAST CONNECT	SIEMENS	1
\wedge	Q		6AG1 901-1BB10-7AA0	PROFINET CONNECTOR, SIPLUS	SIEMENS	2
<u>/3</u> \	D		6XV1 830-0EH10	PROFIBUS CABLE, FAST CONNECT	SIEMENS	1
	R.		PA9D01-42	PROFIBUS CONNECTOR, 90°, PG PORT	BRAD HARRISON	1

ENCLOSURE:

AH16148C (16"H x 14"W x 8"D) NEMA 4X RATED, FABRICATED FROM POLYCARBONATE WITH UV INHIBITOR AND CLEAR, HINGED, LATCHING COVER.

BACK PANEL:

BP1614A (16"H x 14"W) FABRICATED FROM UNPAINTED 12GA. ALUMINUM.

GENERAL NOTES:

- 1. INTERFACE MODULE WILL CHANGE DEPENDING ON SPECIFIED COMMUNICATION PROTOCOL
- 2. SURGE PROTECTION DEVICE WILL CHANGE DEPENDING ON SPECIFIED COMMUNICATION PROTOCOL
- 3. COMMUNICATION CABLE AND CONNECTORS WILL CHANGE DEPENDING ON SPECIFIED COMMUNICATION PROTOCOL

DESIGNER	1.
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DATE:	
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	SHEET TITLE:	BACK PAN		UT	
		27.01017.0		• •	
	PROJECT:	PROJE	CT NAME		
	GENER	ATOR DIST	FRIBUTED	I/O PAN	IEL
	JOB No:		SHEET	OF	
AGE	1234567	78	2		8



	SHEET TITLE: 24 VDC	VOLTAGE		
	PROJECT:			
	PROJE	CT NAME	-	
	GENERATOR DIS		O PANE	L
	JOB No:	SHEET	OF	
AGE	12345678	3		8



SLOT: 2

	GENERATOR	6A0	G1 131-6BF01-7BA0
	CONTROL STATUS: NOT IN "AUTO"		DI 8x24VDC ST
	GENERATOR	1	Input 5.0
	STATUS: FAULT	2	Input 5.1
		3	Input 5.2
	STATUS: RUNNING	4	Input 5.3
		5	Input 5.4
	GENERATOR	6	Input 5.5
	STATUS: "E-STOP"	7	Input 5.6
		8	Input 5.7
		9	24VDC
		10	24VDC
		11	24VDC
		12	24VDC
	GENERATOR	13	24VDC
	STATUS: OVER-CRANK	14	24VDC
	GENERATOR	15	24VDC
	RUN-TIME	16	24VDC
			24\/DC Infeed
	GENERATOR	M	24VDC Common
	Spare		
N4			
I ^V I	ł		
WH/BL			
	L		
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	PROJECT:				
	PROJECT NAME				
	GENERATOR DIST	FRIBUTED I	O PANE	L	
	JOB No:	SHEET	OF		
AGE	12345678	4		8	





	SHEET TITLE: PLC D	GITAL I/O		
	PROJECT:			
	PROJE	CT NAME -		
	GENERATOR DIS	TRIBUTED I		L
	JOB No:	SHEET	OF	
AGE	12345678	5		8



	GENERATOR DISTRIBUTE	DISTRIBUTED	D I/O PANEL	
AGE	JOB No: 12345678	SHEET 6	OF	8

FIELD WIRING CONNECTION DETAILS



2018 STANDARD PACKAGE

12345678

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NO.	BY	DATE	REVISIONS
6.			
5.			
4.			
3.			
2.	AJF	12/13/19	UPDATE ENCLOSURE, ADDED DATA CONVERTER
1.	AJF	7/9/18	ADDED PROFIBUS

CONTACT_NAME CONTACT_NUMBER

FIELD WIRING CONNECTION DETAILS



NO.	BY	DATE	REVISIONS
6.			
5.			
4.			
3.			
2.	AJF	12/13/19	UPDATE ENCLOSURE, ADDED DATA CONVERTER
1.	AJF	7/9/18	ADDED PROFIBUS
	1	1	

ADDRESS1 ADDRESS2

CONTACT_NAME CONTACT_NUMBER

sm

Building Community_{sm}

DESIGNER:	SHEET TITLE: FIELD WIF	RING DETAIL
DRAWN BY:	PROJECT:	
DATE:	PROJECT NAME GENERATOR DISTRIBUTED I/O PANEL	
CHECKED BY:		
DATE:	IOR No:	
2018 STANDARD PACKAGE	12345678	8 8

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