JEA

JACKSONVILLE, FLORIDA

BIDDING REQUIREMENTS
AND
CONTRACT DOCUMENTS

for the construction of the

JEA NASSAU REGIONAL WATER TREATMENT PLANT WELLHEAD NO. 3 AND WATER MAIN IMPROVEMENTS WELLHEAD NO. 3 AND 12-INCH RAW WATER MAIN

Volume 3 of 3

Specifications

JEA No. 8004327

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BID DOCUMENTS

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CH2M HILL

Jacksonville, Florida
May 2019

Project No. 697176CH Copy No.____

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SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. The completed Work, as described in Volumes 1, 2, and 3 of the Contract Documents, will provide Owner with a new wellhead and 12-inch raw water main to deliver groundwater from a new well installed on JEA's Nassau Regional Water Reclamation Facility site by others to the Nassau Regional Water Treatment Plant. For the Base Bid open-cut crossing of Amelia Concourse, approximately 2,690 feet of 12-inch raw water main will be installed. For the Alternate Bid, horizontal direction drill (HDD) crossing of Amelia Concourse, there would be approximately 2,224 feet of 12-inch raw water main installed and 500 feet of 12-inch raw water main installed by HDD. In addition, approximately 1,300 feet of 24-inch finished water main will be installed from the Nassau Regional Water Treatment Plant to Amelia Concourse. In general, this Project includes the following items of Work:

1. Wellhead No. 3:
    a. One 2,000 gallon per minute (gpm) wellhead pump driven by a constant speed 75-horsepower electric motor.
    b. One magnetic flowmeter.
    c. Approximately 80 feet of 12-inch ductile iron wellhead discharge piping, valves, and appurtenances
    d. New electrical improvements to feed the new 75-horsepower Well No. 3 motor.
    e. New control panels and instrumentation equipment for operation, control and remote monitoring of the new well.
    f. Concrete apron and wellhead slab.
    g. Final site grading and grass sod installation.
    h. Painting.
    i. Sight lighting.
    j. SCADA system and antenna.
2. Raw Water Main:
    a. Approximately 2,165 feet of 12-inch ductile iron raw water main piping installed by open-cut method to deliver raw water from Wellhead No. 3 to Sta. 32+00.
    b. Base Bid: Approximately 465 feet of 12-inch ductile iron raw water main piping installed by open-cut method to deliver raw water across Amelia Concourse to an existing 16-inch water main located just east of Amelia Concourse.

c. Alternate Bid: Approximately 500 feet of 14-inch HDPE raw water main piping installed by horizontal direction drill (HDD) method to deliver raw water under Amelia Concourse to the connection point described in paragraph 2.a above.
d. Approximately 260 feet of 12-inch ductile iron raw water main piping installed by open-cut method on the WTP site to deliver raw water from an existing 16-inch water main to an existing water storage tank.
e. Concrete sidewalk and curb and asphalt pavement removal and restoration associated with the HDD crossing of Amelia Concourse and connection to an existing 16-inch water main.

3. Finished Water Main:
   a. Approximately 1,300 feet of 24-inch ductile iron finished water main piping installed from the WTP to a connection point at the intersection of Amelia Concourse and Piedmont Drive.
   b. Valves and fittings associated with the installation of the 24-inch finished water main.
   c. Concrete sidewalk, curb and pavement removal and restoration associated with installation of the 24-inch pipeline through the Lofton Pointe subdivision.
   d. Asphalt pavement removal and restoration associated with installation of the 24-inch pipeline through the Lofton Pointe subdivision to the connection point with an existing 16-inch finished water main in the Amelia Concourse right-of-way.
   e. Approximately 1,400 feet of 5-inch PVC electrical conduit and manholes for future installation of new WTP electrical service by others.
   f. Installation of new WTP fencing and gates.

1.02 WORK NOT COVERED BY CONTRACT DOCUMENTS

A. Drilling of Well No. 3.

1.03 PROVISIONS FOR FUTURE WORK

A. Provisions for future construction are as shown.

1.04 OWNER-FURNISHED PRODUCTS

A. Not Used.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Schedule of Values: Submit on Contractor's standard form.
2. Schedule of Estimated Progress Payments:
   a. Submit with initially acceptable Schedule of Values.
   b. Submit adjustments thereto with Application for Payment.
3. Application for Payment.
4. Final Application for Payment.

1.02 SCHEDULE OF VALUES

A. Prepare a separate Schedule of Values for each schedule of the Work under the Agreement.

B. Upon request of Owner, provide documentation to support the accuracy of the Schedule of Values.

C. Unit Price Work: Reflect unit price quantity and price breakdown from conformed Bid Form.

D. Lump Sum Work:

1. Reflect Schedule of Values format included in conformed Bid Form specified allowances, alternates, and equipment selected by Owner, as applicable.
2. List bonds and insurance premiums, mobilization, demobilization, preliminary and detailed progress schedule preparation, equipment testing, facility startup, and contract closeout separately.

E. An unbalanced or front-end loaded schedule will not be acceptable.

F. Summation of the complete Schedule of Values representing all the Work shall equal the Contract Price.

G. Standard General Conditions of the Construction Contract are included in the Front End Documents provided by JEA.

H. Form and Content of Schedule of Values:

1. Type schedule on an 8 1/2-in by 11-in or 8 1/2-in by 14-in white sheet furnished by JEA upon Contractor's request. Identify schedule with:
   a. Title of Project and location.
   b. JEA Project number.
   c. Name and Address of Contractor.
   d. Contract designation.
   e. Date of Submission.
2. Schedule shall list the installed value of the components of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.
3. Identify each line item with the number and title of the respective section.
4. For each major line item list sub-values of major products or operations under the item.
5. For the various portions of the work:
   a. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
   b. For items on which progress payments will be requested for stored materials, break down the value into:
      1) The cost of the materials, delivered and unloaded, with taxes paid. Paid invoices are required for materials.
      2) The total installed value.

I. Subschedule of Unit Material Values:

1. Submit a sub-schedule of unit costs and quantities for: Products on which progress payments will be requested for stored products.
2. The form of submittal shall parallel that of the Schedule of Values, with each item identified the same as the line item in the Schedule of Values.
3. The unit quantity for bulk materials shall include an allowance for normal waste.
4. The unit values for the materials shall be broken down into:
   a. Cost of the material, delivered and unloaded at the site, with taxes paid.
   b. Copies of invoices for component material shall be included with the payment request in which the material first appears.
5. The installed unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

J. Form and Content of Schedule of Asset Values:

1. The Table 01 29 00-1 includes the assets to be accounted for in the Schedule of Asset Values.
2. For each asset listed, provide a constructed cost which will include an allocation of construction activities including but not limited to, demolition, sitework, specialties, materials, labor, general conditions, and overhead and profit associated with the construction of the asset.
3. The combined value of the assets will equal the bid price for the project and will require adjustments as necessary due to change orders. The schedule of asset values will be updated on a monthly basis and will be included in the monthly pay request application for approval.
4. The Owner reserves the right to edit this list prior to the first pay request application and may add up to 10 percent more items than have been identified in the list:

Table 01 29 00-1 Schedule of Assets
Nassau Regional WTP Well No. 3 Wellhead and Raw Water Main
2,000 gpm, 75 hp Vertical Turbine Pump, Column, Bowl, and Discharge Head, NA3-P-1-1-1
12" Raw Water Ductile Iron (PC350) FL & MJ Pipe and Fittings
12" Butterfly Valve
12" Magnetic Meter with Flow Transmitter, NA3-FE/FIT-1-1-1
12" Check Valve with limit switch, NA3-ZSC-1-1-1)
Well Pressure Transducer (-14.7 to 150 PSIG), NA3-PT-1-1-1
Conductivity Analyzer and Transmitter, (NA3-CE/CIT-1-1-1)
Well Submersible Level Transmitter (100 PSIG), NA3-LE/LIT-1-1-1
1" Air and Vacuum Valve for Well Service, NA3-ARV-1-1-1A
2" Air and Vacuum Valve for Pump Discharge, NA3-ARV-1-1-1B
Well Pump Discharge Header Pressure Gauge (0-60 PSI) and Transmitter, NA3-PI/PT-1-1-1
240/120V ac LV Panelboard, PNL-LP-1
480 V Panelboard, PNL-PP-1
Service Entrance Transfer Switch (MTS-NA3)
Motor Starter System (RVSS-NA3)
Stepdown Transformer 480/240-120V ac, 1-Phase
SCADA Panel (NA3-LCP-1-1)
12" Buried Gate Valves
Pole and Luminaire for Site Lighting
Wellhead Concrete Surfacing

1.03 BID ITEM DESCRIPTIONS

A. Work shall include, but is not limited to, mobilization; demolition; site preparation; erosion control; excavation and earthwork; landscaping; mechanical; electrical; instrumentation and control (I&C); restoration; and startup. Work not shown or called out in either the Drawings or the Specifications, but necessary in carrying out the intent of the Project or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described. No additional compensation will be considered for this associated and necessary Work.

B. Work shall be bid as a lump sum including SWA work as described in the Instructions to Bidders.

1.04 SCHEDULE OF ESTIMATED PROGRESS PAYMENTS

A. Show estimated payment requests throughout Contract Times aggregating initial Contract Price.

B. Base estimated progress payments on initially acceptable progress schedule. Adjust to reflect subsequent adjustments in progress schedule and Contract Price as reflected by modifications to the Contract Documents.

1.05 APPLICATION FOR PAYMENT

A. Transmittal Summary Form: Attach one Summary Form with each detailed Application for Payment for each schedule and include Request for Payment of Materials and Equipment on Hand as applicable. Execute certification by authorized officer of Contractor.

B. Use detailed Application for Payment Form provided by Owner.

C. Provide separate form for each schedule as applicable.

D. Include accepted Schedule of Values for each schedule or portion of lump sum Work and the unit price breakdown for the Work to be paid on a unit priced basis.

E. Include separate line item for each Change Order and Work Change Directive executed prior to date of submission. Provide further breakdown of such as requested by Owner.

F. Preparation:

1. Round values to nearest dollar.
2. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form(s) for each schedule as applicable, a listing of materials on hand for each schedule as applicable, and such supporting data as may be requested by Owner.

1.06 MEASUREMENT—GENERAL

A. Weighing, measuring, and metering devices used to measure quantity of materials for Work shall be suitable for purpose intended and conform to tolerances and specifications as specified in National Institute of Standards and Technology, Handbook 44.

B. Whenever pay quantities of material are determined by weight, material shall be weighed on scales furnished by Contractor and certified accurate by state agency responsible. Weight or load slip shall be obtained from weigher and delivered to Owner's representative at point of delivery of material.

C. If material is shipped by rail, car weights will be accepted provided that actual weight of material only will be paid for and not minimum car weight used for assessing freight tariff, and provided further that car weights will not be acceptable for material to be passed through mixing plants.

D. Vehicles used to haul material being paid for by weight shall be weighed empty daily and at such additional times as required by Engineer. Each vehicle shall bear a plainly legible identification mark.

E. Materials that are specified for measurement by the cubic yard measured in the vehicle shall be hauled in vehicles of such type and size that actual contents may be readily and accurately determined. Unless all vehicles are of uniform capacity, each vehicle must bear a plainly legible identification mark indicating its water level capacity. Vehicles shall be loaded to at least their water level capacity. Loads hauled in vehicles not meeting above requirements or loads of a quantity less than the capacity of the vehicle, measured after being leveled off as above provided, will be subject to rejection, and no compensation will be allowed for such material.

F. Quantities Based on Profile Elevations.

G. Quantities will be based on ground profiles shown. Field surveys will not be made to confirm accuracy of elevations shown.

H. Where measurement of quantities depends on elevation of existing ground, elevations obtained during construction will be compared with those shown on Drawings. Variations of 1 foot or less will be ignored, and profiles shown on Drawings will be used for determining quantities.

I. Units of measure shown on Bid Form shall be as follows, unless specified otherwise.

Item	Method of Measurement
AC	Acre—Field Measure by Engineer
CY	Cubic Yard—Field Measure by Engineer within limits specified or shown
CY-VM	Cubic Yard—Measured in Vehicle by Volume
EA	Each—Field Count by Engineer
GAL	Gallon—Field Measure by Engineer
HR	Hour
LB	Pound(s)—Weight Measure by Scale
LF	Linear Foot—Field Measure by Engineer
MFBM	Thousand Foot Board Measure—Delivery Invoice
SF	Square Foot
SY	Square Yard
TON	Ton—Weight Measure by Scale (2,000 pounds)

J. Measurement of Linear Items: Where payment will be made based on linear quantities and on parameters other than length, those parameters shall be as follows:

Item	Measurement Parameters
Trench Safety System	Depth of Trench: 0 to 4 feet; 4 to 10 feet; over 10 feet in 2-foot increments. The depth of trench will be measured at intervals of 25 feet along the centerline of the trench. The depth of each measuring point will be the depth from existing at grade surface to bottom of pipe base, 6 inches below pipe invert and will used for computing the depth of trench for a distance of 25 feet ahead of the point of measurement. The depth figures indicated in Bid Form are inclusive to nearest 0.1 foot; that is, a trench depth measured as 11.9 feet will be paid for at the unit price for excavation 10 to 12 feet deep. A trench depth measured as 12 feet will be paid for at the unit price for excavation 12 to 14 feet deep.

Item	Measurement Parameters
Unclassified Trench Excavation	Depth of Trench: Same as Trench Safety System above.
Trench Backfill and Compaction	Depth of Trench: Same as Unclassified Trench Excavation above.

1.07 PAYMENT

A. General:

1. Progress Payments will be made monthly.
2. The date for Contractor's submission of monthly Application for Payment shall be established at the Preconstruction Conference.

B. Payment for unit price items covers all the labor, materials, and services necessary to furnish and install the following items.

Item	Description
Imported Pipe Bedding	Includes providing imported pipe bedding where required by Owner.
Imported Pipe Zone	Includes providing imported pipe zone where required by Owner.
Trench Excavation and Backfill-Class D	Includes excavation, disposal of excavated material and providing imported backfill, backfill compaction, surface restoration, and associated Work as specified.

1.08 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for following:

1. Loading, hauling, and disposing of rejected material.
2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
3. Rejected loads of material, including material rejected after it has been placed by reason of failure of Contractor to conform to provisions of Contract Documents.
4. Material not unloaded from transporting vehicle.
5. Defective Work not accepted by Owner.
6. Material remaining on hand after completion of Work.

1.09 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT

A. Partial Payment: No partial payments will be made for materials and equipment delivered or stored unless Shop Drawings and preliminary operation and maintenance data is acceptable to Owner.

B. Final Payment: Will be made only for products incorporated in Work; remaining products, for which partial payments have been made, shall revert to Contractor unless otherwise agreed, and partial payments made for those items will be deducted from final payment.

1.10 PARTIAL PAYMENT FOR UNDELIVERED, PROJECT-SPECIFIC MANUFACTURED OR FABRICATED EQUIPMENT

A. Notwithstanding above provisions, partial payments for undelivered (not yet delivered to Site or not stored in the vicinity of Site) products specifically manufactured for this Project, excluding off the shelf or catalog items, will be made for products listed below when all following conditions exist:

1. Partial payment request is supported by written acknowledgment from Suppliers that invoice requirements have been met.
2. Equipment is adequately insured, maintained, stored, and protected by appropriate security measures.
3. Each equipment item is clearly marked and segregated from other items to permit inventory and accountability.
4. Authorization has been provided for access to storage Site for Engineer and Owner.
5. Equipment meets applicable Specifications of these Contract Documents.

B. Payment of 15 percent of manufacturer’s quoted price for undelivered, Project-specific manufactured equipment will be made following Shop Drawing approval. Thereafter, monthly payments will be made based on progress of fabrication as determined by Engineer, but in no case will total of payments prior to delivery exceed 75 percent of manufacturer’s quoted price.

C. Failure of Contractor to continue compliance with above requirements shall give cause for Owner to withhold payments made for such equipment from future partial payments.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS AND COORDINATION

PART 1 GENERAL

1.01 GENERAL

A. Contractor shall schedule physical arrangements for meetings throughout progress of the Work, prepare meeting agenda with regular participant input and distribute with written notice of each meeting, preside at meetings, record minutes to include significant proceedings and decisions, and reproduce and distribute copies of meeting notes within 7 days after each meeting to participants and parties affected by meeting decisions.

1.02 PRECONSTRUCTION CONFERENCE

A. Contractor shall be prepared to discuss the following subjects, as a minimum:

1. Required schedules.
2. Status of Bonds and insurance.
3. Sequencing of critical path work items.
4. Progress payment procedures.
5. Project changes and clarification procedures.
6. Use of Site, access, office and storage areas, security and temporary facilities.
7. Major product delivery and priorities.
8. Contractor’s safety plan and representative.
9. Schedule of values.
10. Shop Drawing processing.

B. Attendees will include:

1. JEA’s representatives.
2. Contractor’s office representative.
3. Contractor’s resident superintendent.
4. Contractor’s quality control representative.
5. Subcontractors’ representatives whom Contractor may desire or Owner may request to attend.
6. Engineer’s representatives.
7. Others as appropriate.

1.03 PROGRESS MEETINGS

A. JEA will schedule regular progress meetings at Site, conducted monthly from notice to proceed to final completion to review the Work progress, Progress Schedule, Schedule of Submittals, Application for Payment, contract modifications, and other matters needing discussion and resolution.

B. Attendees will include:

1. JEA's representative(s), as appropriate.
2. Contractor, Subcontractors, and Suppliers, as appropriate.
3. Engineer's representative(s).
4. Others as appropriate.

1.04 PROCESS INSTRUMENTATION AND CONTROL SYSTEMS (PICS) AND ELECTRICAL COORDINATION MEETINGS

A. JEA will schedule meetings, up to four meetings at Site, to review specific requirements of PICS work and the electrical subcontractors work.

B. Attendees will include:

1. Contractor.
2. JEA.
3. PICS Subcontractor/Installer.
4. Electrical Subcontractor.
5. Engineer's representatives.

1.05 PREINSTALLATION MEETINGS

A. When required in individual Specification sections, convene at Site prior to commencing the Work of that section.

B. Require attendance of entities directly affecting, or affected by, the Work of that section.

C. Notify Owner 4 days in advance of meeting date.

D. Provide suggested agenda to Owner to include reviewing conditions of installation, preparation and installation or application procedures, and coordination with related Work and work of others.

1.06 FACILITY STARTUP MEETINGS

A. Schedule and attend facility startup meetings. The first of such meetings shall be held prior to submitting Facility Startup Plan, as specified in Section 01 91 14, Equipment Testing and Facility Startup, and shall include preliminary discussions regarding such plan.

B. Agenda items shall include, but not be limited to, content of Facility Startup Plan, coordination needed between various parties in attendance, and potential problems associated with startup.

C. Attendees will include:

1. Contractor.
2. Contractor's designated quality control representative.
3. Subcontractors and equipment manufacturer's representatives whom Contractor deems to be directly involved in facility startup.
4. Engineer's representatives.
5. JEA's operations personnel.
6. Others as required by Contract Documents or as deemed necessary by Contractor.

1.07 OTHER MEETINGS

A. In accordance with Contract Documents and as may be required by JEA and Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Preliminary Progress Schedule: Submit at the preconstruction conference. Submit within 15 days after Effective Date of the Agreement.
2. Detailed Progress Schedule:
   a. Submit initial Detailed Progress Schedule within 60 days after Effective Date of the Agreement.
   b. Submit an Updated Progress Schedule at each update, in accordance with Article Detailed Progress Schedule.
3. Submit with Each Progress Schedule Submission:
   a. Contractor's certification that Progress Schedule submission is actual schedule being utilized for execution of the Work.
   b. Progress Schedule: Four legible copies.
   c. Narrative Progress Report: Same number of copies as specified for Progress Schedule.
4. Prior to final payment, submit a final Updated Progress Schedule.

1.02 PRELIMINARY PROGRESS SCHEDULE

A. In addition to basic requirements outlined in General Conditions, show a detailed schedule, beginning with Notice to Proceed, for minimum duration of 90 days, and a summary of balance of Project through Final Completion.

B. Show activities including, but not limited to the following:

1. Notice to Proceed.
2. Permits.
3. Submittals, with review time. Contractor may use Schedule of Submittals specified in Section 01 33 00, Submittal Procedures.
4. Early procurement activities for long lead equipment and materials.
5. Initial Site work.
6. Earthwork.
7. Specified Work sequences and construction constraints.
8. Contract Milestone and Completion Dates.
9. Owner-furnished products delivery dates or ranges of dates.
10. Major structural, mechanical, equipment, electrical, architectural, and instrumentation and control Work.
11. System startup summary.
12. Project close-out summary.
13. Demobilization summary.

C. Update Preliminary Progress Schedule monthly as part of progress payment process. Failure to do so may result in the Owner withholding all or part of the monthly progress payment until the Preliminary Progress Schedule is updated in a manner acceptable to Engineer.

D. Format: In accordance with Article Progress Schedule—Critical Path Network.

1.03 DETAILED PROGRESS SCHEDULE

A. In addition to requirements of General Conditions, submit Detailed Progress Schedule beginning with Notice to Proceed and continuing through Final Completion.

B. Show the duration and sequences of activities required for complete performance of the Work reflecting means and methods chosen by Contractor.

C. When accepted by Owner, Detailed Progress Schedule will replace Preliminary Progress Schedule and become Baseline Schedule. Subsequent revisions will be considered as Updated Progress Schedules.

D. Format: In accordance with Article Progress Schedule—Critical Path Network.

E. Update monthly to reflect actual progress and occurrences to date, including weather delays.

1.04 PROGRESS SCHEDULE—CRITICAL PATH NETWORK

A. General: Comprehensive computer-generated schedule using CPM, generally as outlined in Associated General Contractors of America (AGC) 580, "Construction Project Planning and Scheduling Guidelines." If a conflict occurs between the AGC publication and this Specification, this Specification shall govern.

B. Contents:

1. Schedule shall begin with the date of Notice to Proceed and conclude with the date of Final Completion.
2. Identify Work calendar basis using days as a unit of measure.
3. Show complete interdependence and sequence of construction and Project-related activities reasonably required to complete the Work.
4. Identify the Work of separate stages and other logically grouped activities, and clearly identify critical path of activities.
5. Reflect sequences of the Work, restraints, delivery windows, review times, Contract Times and Project Milestones set forth in the Agreement and Section 01 31 19, Project Meetings and Coordination.

6. Include as applicable, at a minimum:
   a. Obtaining permits, submittals for early product procurement, and long lead time items.
   b. Mobilization and other preliminary activities.
   c. Initial Site work.
   d. Specified Work sequences, constraints, and Milestones, including Substantial Completion date(s) Subcontract Work.
   e. Major equipment design, fabrication, factory testing, and delivery dates.
   f. Sitework and stormwater pond excavation.
   g. Pre-stressed concrete tank.
   h. Concrete Work.
   i. Structural steel Work.
   j. Architectural features Work.
   k. Demolition.
   l. Equipment Work including Well No. 2 flowmeter and Well No. 3.
   m. Mechanical Work.
   n. Yard piping.
   o. Any shutdowns of Well No. 2 to tie-in the new Well No. 2 flowmeter.
   p. Any plant shutdowns to tie-yard piping into the existing high service pump header.
   q. Electrical Work and any required plant shutdowns required to tie-in feeders.
   r. Instrumentation and control Work.
   s. Interfaces with Owner-furnished equipment.
   t. Other important Work for each major facility.
   u. Equipment and system startup and test activities.
   v. Project closeout and cleanup.
   w. Demobilization.
7. No activity duration, exclusive of those for Submittals review and product fabrication/delivery, shall be less than 1 day nor more than 14 days, unless otherwise approved.
8. Activity duration for Submittal review shall not be less than review time specified unless clearly identified and prior written acceptance has been obtained from Engineer.

C. Network Graphical Display:

1. Plot or print on paper Whise11 inches by 17 inches, unless otherwise approved.
2. Title Block: Show name of Project, Owner, date submitted, revision or update number, and the name of the scheduler. Updated schedules shall indicate data date.
3. Identify horizontally across top of schedule the time frame by year, month, and day.

4. Identify each activity with a unique number and a brief description of the Work associated with that activity.
5. Indicate the critical path.
6. Show, at a minimum, the controlling relationships between activities.
7. Plot activities on a time-scaled basis, with the length of each activity proportional to the current estimate of the duration.
8. Plot activities on an early start basis unless otherwise requested by Engineer.
9. Provide a legend to describe standard and special symbols used.

D. Schedule Report:

1. On 8-1/2-inch by 11-inch white paper, unless otherwise approved.
2. List information for each activity in tabular format, including at a minimum:
   a. Activity Identification Number.
   b. Activity Description.
   c. Original Duration.
   d. Remaining Duration.
   e. Early Start Date (Actual start on Updated Progress Schedules).
   f. Early Finish Date (Actual finish on Updated Progress Schedules).
   g. Late Start Date.
   h. Late Finish Date.
   i. Total Float.
3. Sort reports, in ascending order, as listed below:
   a. Activity number sequence with predecessor and successor activity.
   b. Activity number sequence.
   c. Early-start.
   d. Total float.

1.05 PROGRESS OF THE WORK

A. Updated Progress Schedule shall reflect:

1. Progress of Work to within 5 working days prior to submission.
2. Approved changes in Work scope and activities modified since submission.
3. Delays in Submittals or resubmittals, deliveries, or Work.
4. Adjusted or modified sequences of Work.
5. Other identifiable changes.
6. Revised projections of progress and completion.
7. Report of changed logic.

B. Produce detailed subschedules during Project, upon request of Owner or Engineer, to further define critical portions of the Work such as facility shutdowns.

C. If Contractor fails to complete activity by its latest scheduled completion date and this Failure is anticipated to extend Contract Times (or Milestones), Contractor shall, within 7 days of such failure, submit a written statement as to how Contractor intends to correct nonperformance and return to acceptable current Progress Schedule. Actions by Contractor to complete the Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.

D. Owner may order Contractor to increase plant, equipment, labor force or working hours if Contractor fails to:

1. Complete a Milestone activity by its completion date.
2. Satisfactorily execute Work as necessary to prevent delay to overall completion of Project, at no additional cost to Owner.

1.06 NARRATIVE PROGRESS REPORT

A. Format:

1. Organize same as Progress Schedule.
2. Identify, on a cover letter, reporting period, date submitted, and name of author of report.

B. Contents:

1. Number of days worked over the period, work force on hand, construction equipment on hand (including utility vehicles such as pickup trucks, maintenance vehicles, stake trucks).
2. General progress of Work, including a listing of activities started and completed over the reporting period, mobilization/demobilization of subcontractors, and major milestones achieved.
3. Contractor’s plan for management of Site (e.g., lay down and staging areas, construction traffic), utilization of construction equipment, buildup of trade labor, and identification of potential Contract changes.
4. Identification of new activities and sequences as a result of executed Contract changes.
5. Documentation of weather conditions over the reporting period, and any resulting impacts to the work.
6. Description of actual or potential delays, including related causes, and the steps taken or anticipated to mitigate their impact.

7. Changes to activity logic.
8. Changes to the critical path.
9. Identification of, and accompanying reason for, any activities added or deleted since the last report.
10. Steps taken to recover the schedule from Contractor-caused delays.

1.07 SCHEDULE ACCEPTANCE

A. Engineer's acceptance will demonstrate agreement that:

1. Proposed schedule is accepted with respect to:
   a. Contract Times, including Final Completion and all intermediate Milestones are within the specified times.
   b. Specified Work sequences and constraints are shown as specified.
   c. Specified Owner-furnished Equipment or Material arrival dates, or range of dates, are included.
   d. Access restrictions are accurately reflected.
   e. Startup and testing times are as specified.
   f. Submittal review times are as specified.
   g. Startup testing duration is as specified and timing is acceptable.
2. In all other respects, Engineer's acceptance of Contractor's schedule indicates that, in Engineer's judgement, schedule represents reasonable plan for constructing Project in accordance with the Contract Documents. Engineer's review will not make any change in Contract requirements. Lack of comment on any aspect of schedule that is not in accordance with the Contract Documents will not thereby indicate acceptance of that change, unless Contractor has explicitly called the nonconformance to Engineer's attention in submittal. Schedule remains Contractor's responsibility and Contractor retains responsibility for performing all activities, for activity durations, and for activity sequences required to construct Project in accordance with the Contract Documents.

B. Unacceptable Preliminary Progress Schedule:

1. Make requested corrections; resubmit within 10 days.
2. Until acceptable to Engineer as Baseline Progress Schedule, continue review and revision process, during which time Contractor shall update schedule on a monthly basis to reflect actual progress and occurrences to date.

C. Unacceptable Detailed Progress Schedule:

1. Make requested corrections; resubmit within 10 days.
2. Until acceptable to Engineer as Baseline Progress Schedule, continue review and revision process.

D. Narrative Report: All changes to activity duration and sequences, including addition or deletion of activities subsequent to Engineer's acceptance of Baseline Progress Schedule, shall be delineated in Narrative Report current with proposed Updated Progress Schedule.

1.08 ADJUSTMENT OF CONTRACT TIMES

A. Float:

1. Float time is a Project resource available to both parties to meet contract Milestones and Contract Times.
2. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and use of float time disclosed or implied by use of alternate float-suppression techniques shall be shared to proportionate benefit of Owner and Contractor.
3. Pursuant to above float-sharing requirement, no time extensions will be granted nor delay damages paid until a delay occurs which (i) impacts Project's critical path, (ii) consumes available float or contingency time, and (iii) extends Work beyond contract completion date.

B. Claims Based on Contract Times:

1. Where Engineer has not yet rendered formal decision on Contractor's Claim for adjustment of Contract Times, and parties are unable to agree as to amount of adjustment to be reflected in Progress Schedule, Contractor shall reflect an interim adjustment in the Progress Schedule as acceptable to Engineer.
2. It is understood and agreed that such interim acceptance will not be binding on either Contractor or Owner, and will be made only for the purpose of continuing to schedule Work until such time as formal decision has been rendered as to an adjustment, if any, of the Contract Times.
3. Contractor shall revise Progress Schedule prepared thereafter in accordance with Engineer's formal decision.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 DEFINITIONS

A. Action Submittal: Written and graphic information submitted by Contractor that requires Engineer's approval.

B. Informational Submittal: Information submitted by Contractor that does not require Engineer's approval.

1.02 PROCEDURES

A. Establish an electronic drop box to save shop drawing files, provide access to this drop box to the Owner and Engineer.

B. Direct paper copies of the shop drawings and submittals to Engineer at the following address, unless specified otherwise.

1. Jacobs
   245 Riverside Avenue, Suite 300
   Jacksonville, Florida 32202
   Attn: Sean Monaghan

C. Transmittal of Submittal:

1. Contractor shall:
   a. Review each submittal and check for compliance with Contract Documents.
   b. Stamp each submittal with uniform approval stamp before submitting to Engineer.
      1) Stamp to include Project name, submittal number, Specification number, Contractor's reviewer name, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with Contract Documents.
      2) Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
2. Complete, sign, and transmit with each submittal package, one Transmittal of Contractor's Submittal form in format approved by Engineer.

3. Identify each submittal with the following:
    a. Numbering and Tracking System:
        1) Sequentially number each submittal.
        2) Resubmission of submittal shall have original number with sequential alphabetic suffix.
    b. Specification section and paragraph to which submittal applies.
    c. Project title and Engineer's project number.
    d. Date of transmittal.
    e. Names of Contractor, Subcontractor or Supplier, and manufacturer as appropriate.
4. Identify and describe each deviation or variation from Contract Documents.

D. Format:

1. Do not base Shop Drawings on reproductions of Contract Documents.
2. Package submittal information by individual Specification section. Do not combine different Specification sections together in submittal package, unless otherwise directed in Specification.
3. Present in a clear and thorough manner and in sufficient detail to show kind, size, arrangement, and function of components, materials, and devices, and compliance with Contract Documents.
4. Index with labeled tab dividers in orderly manner.

E. Timeliness: Schedule and submit in accordance Schedule of Submittals, and requirements of individual Specification sections.

F. Processing Time:

1. Time for review shall commence on Engineer's receipt of submittal.
2. Engineer will act upon Contractor's submittal and transmit response to Contractor not later than 30 days after receipt, unless otherwise specified.
3. Resubmittals will be subject to same review time.
4. No adjustment of Contract Times or Price will be allowed due to delays in progress of Work caused by rejection and subsequent resubmittals.

G. Resubmittals: Clearly identify each correction or change made.

H. Incomplete Submittals:

1. Engineer will return entire submittal for Contractor's revision if preliminary review deems it incomplete.

2. When any of the following are missing, submittal will be deemed incomplete:
    a. Contractor's review stamp, completed and signed.
    b. Transmittal of Contractor's Submittal, completed and signed.
    c. Insufficient number of copies.

I. Submittals not required by Contract Documents:

1. Will not be reviewed and will be returned stamped "Not Subject to Review."
2. Engineer will keep one copy and return all remaining copies to Contractor.

1.03 ACTION SUBMITTALS

A. Prepare and submit Action Submittals required by individual Specification sections.

B. Shop Drawings:

1. Paper Copies: Four.
2. Electronic Files: Saved to the electronic drop box.
3. Identify and Indicate:
    a. Applicable Contract Drawing and Detail number, products, units and assemblies, and system or equipment identification or tag numbers.
    b. Equipment and Component Title: Identical to title shown on Drawings.
    c. Critical field dimensions and relationships to other critical features of Work. Note dimensions established by field measurement.
    d. Project-specific information drawn accurately to scale.
4. Manufacturer's standard schematic drawings and diagrams as follows:
    a. Modify to delete information that is not applicable to the Work.
    b. Supplement standard information to provide information specifically applicable to the Work.
5. Product Data: Provide as specified in individual Specifications.
6. Foreign Manufacturers: When proposed, include following additional information:
    a. Names and addresses of at least two companies that maintain technical service representatives close to Project.
    b. Complete list of spare parts and accessories for each piece of equipment.

C. Samples:

1. Copies: Two, unless otherwise specified in individual Specifications.
2. Preparation: Mount, display, or package Samples in manner specified to facilitate review of quality. Attach label on unexposed side that includes the following:
    a. Manufacturer name.
    b. Model number.
    c. Material.
    d. Sample source.
3. Manufacturer's Color Chart: Units or sections of units showing full range of colors, textures, and patterns available.
4. Full-size Samples:
    a. Size as indicated in individual Specification section.
    b. Prepared from same materials to be used for the Work.
    c. Cured and finished in manner specified.
    d. Physically identical with product proposed for use.

D. Action Submittal Dispositions: Engineer will review, mark, and stamp as appropriate, and distribute marked-up copies as noted:

1. Approved:
    a. Contractor may incorporate product(s) or implement Work covered by submittal.
    b. Distribution:
        1) One copy furnished Resident Project Representative.
        2) One copy retained in Engineer's file.
        3) Remaining copies returned to Contractor appropriately annotated.
2. Approved as Noted:
    a. Contractor may incorporate product(s) or implement Work covered by submittal, in accordance with Engineer's notations.
    b. Distribution:
        1) One copy furnished Resident Project Representative.
        2) One copy retained in Engineer's file.
        3) Remaining copies returned to Contractor appropriately annotated.
3. Revise and Resubmit:
    a. Contractor may not incorporate product(s) or implement Work covered by submittal.
    b. Distribution:
        1) One copy retained in Engineer's file.
        2) Remaining copies returned to Contractor appropriately annotated.

1.04 INFORMATIONAL SUBMITTALS

A. General:

1. Copies: Submit three copies, unless otherwise indicated in individual Specification section.
2. Refer to individual Specification sections for specific submittal requirements.
3. Engineer will review each submittal. If submittal meets conditions of the Contract, Engineer will forward copies to appropriate parties. If Engineer determines submittal does not meet conditions of the Contract and is therefore considered unacceptable, Engineer will retain one copy and return remaining copies with review comments to Contractor, and require that submittal be corrected and resubmitted.

B. Application for Payment: In accordance with Section 01 29 00, Payment Procedures.

C. Certificates:

1. General:
   a. Provide notarized statement that includes signature of entity responsible for preparing certification.
   b. Signed by officer or other individual authorized to sign documents on behalf of that entity.
2. Welding: In accordance with individual Specification sections.
3. Installer: Prepare written statements on manufacturer's letterhead certifying that installer complies with requirements as specified in individual Specification sections.
4. Material Test: Prepared by qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
5. Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in individual Specification sections.
6. Manufacturer's Certificate of Compliance: In accordance with Section 01 43 33, Manufacturers' Field Services.
7. Manufacturer's Certificate of Proper Installation: In accordance with Section 01 43 33, Manufacturers' Field Services.

D. Construction Photographs: In accordance with Section 01 31 13, Project Meetings and Coordination, and as may otherwise be required in Contract Documents.

E. Contract Closeout Submittals: In accordance with Section 01 77 00, Closeout Procedures.

F. Contractor-Design Data:

1. Written and graphic information.
2. List of assumptions.
3. List of performance and design criteria.
4. Summary of loads or load diagram, if applicable.
5. Calculations.
6. List of applicable codes and regulations.
7. Name and version of software.
8. Information requested in individual Specification section.

G. Manufacturer's Instructions: Written or published information that documents manufacturer's recommendations, guidelines, and procedures in accordance with individual Specification sections.

H. Operation and Maintenance Data: As required in Section 01 78 23, Operation and Maintenance Data.

I. Schedules:

1. Schedule of Submittals: Prepare separately or in combination with Progress Schedule as specified in Section 01 32 00, Construction Progress Documentation.
   a. Show for each, at a minimum, the following:
      1) Specification section number.
      2) Identification by numbering and tracking system as specified under Paragraph Transmittal of Submittal.
      3) Estimated date of submission to Engineer, including reviewing and processing time.
   b. On a monthly basis, submit updated schedule to Engineer if changes have occurred or resubmittals are required.
2. Schedule of Values: In accordance with Section 01 29 00, Payment Procedures.
3. Schedule of Estimated Progress Payments: In accordance with Section 01 29 00, Payment Procedures.
4. Progress Schedules: In accordance with Section 01 32 00, Construction Progress Documentation.

J. Special Guarantee: Supplier's written guarantee as required in individual Specification sections.

K. Statement of Qualification: Evidence of qualification, certification, or registration as required in Contract Documents to verify qualifications of professional land surveyor, engineer, materials testing laboratory, specialty Subcontractor, trade, Specialist, consultant, installer, and other professionals.

L. Submittals Required by Laws, Regulations, and Governing Agencies:

1. Submit promptly notifications, reports, certifications, payrolls, and otherwise as may be required, directly to the applicable federal, state, or local governing agency or their representative.
2. Transmit to Engineer for Owner's records one copy of correspondence and transmittals (to include enclosures and attachments) between Contractor and governing agency.

M. Test and Inspection Reports:

1. General: Shall contain signature of person responsible for test or report.
2. Factory:
    a. Identification of product and Specification section, type of inspection or test with referenced standard or code.
    b. Date of test, Project title and number, and name and signature of authorized person.
    c. Test results.
    d. If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
    e. Provide interpretation of test results, when requested by Engineer.
    f. Other items as identified in individual Specification sections.
3. Field: As a minimum, include the following:
    a. Project title and number.
    b. Date and time.
    c. Record of temperature and weather conditions.
    d. Identification of product and Specification section.
    e. Type and location of test, Sample, or inspection, including referenced standard or code.
    f. Date issued, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
    g. If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
    h. Provide interpretation of test results, when requested by Engineer.
    i. Other items as identified in individual Specification sections.

N. Testing and Startup Data: In accordance with Section 01 91 14, Equipment Testing and Facility Startup.

O. Training Data: In accordance with Section 01 43 33, Manufacturers' Field Services.

1.05 SUPPLEMENTS

A. The supplement listed below, following “End of Section”, is part of this Specification.

1. Form: Transmittal of Contractor’s Submittal.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TRANSMITTAL OF CONTRACTOR'S SUBMITTAL

(ATTACH TO EACH SUBMITTAL)

DATE: _____

TO: _____

_____

_____

_____

_____

Submittal No.: _____

☐ New Submittal ☐ Resubmittal

Project: _____

Project No.: _____

Specification Section No.: _____

(Cover only one section with each transmittal)

Schedule Date of Submittal:

_____

FROM: _____

Contractor

_____

_____

_____

SUBMITTAL TYPE: ☐ Shop Drawing ☐ Sample ☐ Informational

The following items are hereby submitted:

Number of Copies	Description of Item Submitted (Type, Size, Model Number, Etc.)	Spec. and Para. No.	Drawing or Brochure Number	Contains Variation to Contract	
				No	Yes

Contractor hereby certifies that (i) Contractor has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

By: _____

Contractor (Authorized Signature)

SECTION 01 42 13
ABBREVIATIONS AND ACRONYMS

PART 1 GENERAL

1.01 REFERENCE TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES

A. Reference to standards and specifications of technical societies and reporting and resolving discrepancies associated therewith shall be as provided in Article 3 of the General Conditions, and as may otherwise be required herein and in the individual Specification sections.

B. Work specified by reference to published standard or specification of government agency, technical association, trade association, professional society or institute, testing agency, or other organization shall meet requirements or surpass minimum standards of quality for materials and workmanship established by designated standard or specification.

C. Where so specified, products or workmanship shall also meet or exceed additional prescriptive or performance requirements included within Contract Documents to establish a higher or more stringent standard of quality than required by referenced standard.

D. Where two or more standards are specified to establish quality, product and workmanship shall meet or exceed requirements of most stringent.

E. Where both a standard and a brand name are specified for a product in Contract Documents, proprietary product named shall meet or exceed requirements of specified reference standard.

F. Copies of standards and specifications of technical societies:

1. Copies of applicable referenced standards have not been bound in these Contract Documents.
2. Where copies of standards are needed by Contractor, obtain a copy or copies directly from publication source and maintain in an orderly manner at the Site as Work Site records, available to Contractor's personnel, Subcontractors, Owner, and Engineer.

1.02 ABBREVIATIONS

A. Abbreviations for trade organizations and government agencies: Following is a list of construction industry organizations and government agencies to which references may be made in the Contract Documents, with abbreviations used.

1.	AA	Aluminum Association
2.	AABC	Associated Air Balance Council
3.	AAMA	American Architectural Manufacturers Association
4.	AASHTO	American Association of State Highway and Transportation Officials
5.	ABMA	American Bearing Manufacturers' Association
6.	ACI	American Concrete Institute
7.	AEIC	Association of Edison Illuminating Companies
8.	AGA	American Gas Association
9.	AGMA	American Gear Manufacturers' Association
10.	AI	Asphalt Institute
11.	AISC	American Institute of Steel Construction
12.	AISI	American Iron and Steel Institute
13.	AITC	American Institute of Timber Construction
14.	ALS	American Lumber Standards
15.	AMCA	Air Movement and Control Association
16.	ANSI	American National Standards Institute
17.	APA	APA – The Engineered Wood Association
18.	API	American Petroleum Institute
19.	APWA	American Public Works Association
20.	AHRI	Air-Conditioning, Heating, and Refrigeration Institute
21.	ASA	Acoustical Society of America
22.	ASABE	American Society of Agricultural and Biological Engineers
23.	ASCE	American Society of Civil Engineers
24.	ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
25.	ASME	American Society of Mechanical Engineers
26.	ASNT	American Society for Nondestructive Testing
27.	ASSE	American Society of Sanitary Engineering
28.	ASTM	ASTM International
29.	AWI	Architectural Woodwork Institute
30.	AWPA	American Wood Preservers' Association
31.	AWPI	American Wood Preservers' Institute
32.	AWS	American Welding Society
33.	AWWA	American Water Works Association

34.	BHMA	Builders Hardware Manufacturers' Association
35.	CBM	Certified Ballast Manufacturer
36.	CDA	Copper Development Association
37.	CGA	Compressed Gas Association
38.	CISPI	Cast Iron Soil Pipe Institute
39.	CMAA	Crane Manufacturers' Association of America
40.	CRSI	Concrete Reinforcing Steel Institute
41.	CS	Commercial Standard
42.	CSA	Canadian Standards Association
43.	CSI	Construction Specifications Institute
44.	DIN	Deutsches Institut für Normung e.V.
45.	DIPRA	Ductile Iron Pipe Research Association
46.	EIA	Electronic Industries Alliance
47.	EJCDC	Engineers Joint Contract Documents' Committee
48.	ETL	Electrical Test Laboratories
49.	FAA	Federal Aviation Administration
50.	FCC	Federal Communications Commission
51.	FDA	Food and Drug Administration
52.	FEMA	Federal Emergency Management Agency
53.	FIPS	Federal Information Processing Standards
54.	FM	FM Global
55.	Fed. Spec.	Federal Specifications (FAA Specifications)
56.	FS	Federal Specifications and Standards (Technical Specifications)
57.	GA	Gypsum Association
58.	GANA	Glass Association of North America
59.	HI	Hydraulic Institute
60.	HMI	Hoist Manufacturers' Institute
61.	IBC	International Building Code
62.	ICBO	International Conference of Building Officials
63.	ICC	International Code Council
64.	ICEA	Insulated Cable Engineers' Association
65.	IFC	International Fire Code
66.	IEEE	Institute of Electrical and Electronics Engineers, Inc.
67.	IESNA	Illuminating Engineering Society of North America
68.	IFI	Industrial Fasteners Institute
69.	IGMA	Insulating Glass Manufacturer's Alliance
70.	IMC	International Mechanical Code
71.	INDA	Association of the Nonwoven Fabrics Industry
72.	IPC	International Plumbing Code
73.	ISA	Instrumentation, Systems, and Automation Society

74.	ISO	International Organization for Standardization
75.	ITL	Independent Testing Laboratory
76.	JIC	Joint Industry Conferences of Hydraulic Manufacturers
77.	MIA	Marble Institute of America
78.	MIL	Military Specifications
79.	MMA	Monorail Manufacturers' Association
80.	MSS	Manufacturer's Standardization Society
81.	NAAMM	National Association of Architectural Metal Manufacturers
82.	NACE	NACE International
83.	NBGQA	National Building Granite Quarries Association
84.	NEBB	National Environmental Balancing Bureau
85.	NEC	National Electrical Code
86.	NECA	National Electrical Contractor's Association
87.	NEMA	National Electrical Manufacturers' Association
88.	NESC	National Electrical Safety Code
89.	NETA	InterNational Electrical Testing Association
90.	NFPA	National Fire Protection Association
91.	NHLA	National Hardwood Lumber Association
92.	NICET	National Institute for Certification in Engineering Technologies
93.	NIST	National Institute of Standards and Technology
94.	NRCA	National Roofing Contractors Association
95.	NRTL	Nationally Recognized Testing Laboratories
96.	NSF	NSF International
97.	NSPE	National Society of Professional Engineers
98.	NTMA	National Terrazzo and Mosaic Association
99.	NWWDA	National Wood Window and Door Association
100.	OSHA	Occupational Safety and Health Act (both Federal and State)
101.	PCI	Precast/Prestressed Concrete Institute
102.	PEI	Porcelain Enamel Institute
103.	PPI	Plastic Pipe Institute
104.	PS	Product Standards Section-U.S. Department of Commerce
105.	RMA	Rubber Manufacturers' Association
106.	RUS	Rural Utilities Service
107.	SAE	Society of Automotive Engineers
108.	SDI	Steel Deck Institute
109.	SDI	Steel Door Institute
110.	SJI	Steel Joist Institute
111.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
112.	SPI	Society of the Plastics Industry

113. SSPC	The Society for Protective Coatings
114. STI/SPFA	Steel Tank Institute/Steel Plate Fabricators Association
115. SWI	Steel Window Institute
116. TEMA	Tubular Exchanger Manufacturers' Association
117. TCA	Tile Council of North America
118. TIA	Telecommunications Industry Association
119. UBC	Uniform Building Code
120. UFC	Uniform Fire Code
121. UL	Underwriters Laboratories Inc.
122. UMC	Uniform Mechanical Code
123. USBR	U.S. Bureau of Reclamation
124. WCLIB	West Coast Lumber Inspection Bureau
125. WI	Wood Institute
126. WWPA	Western Wood Products Association

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 43 33
MANUFACTURERS' FIELD SERVICES

PART 1 GENERAL

1.01 DEFINITIONS

A. Person-Day: One person for 8 hours within regular Contractor working hours.

1.02 SUBMITTALS

A. Informational Submittals:

1. Training Schedule: Submit, in accordance with requirements of this Specification, not less than 21 days prior to start of equipment installation and revise as necessary for acceptance.
2. Lesson Plan: Submit, in accordance with requirements of this specification, proposed lesson plan not less than 21 days prior to scheduled training and revise as necessary for acceptance.
3. Training Session Tapes: Furnish Owner with two complete sets of tapes fully indexed and cataloged with printed label stating session and date taped.

1.03 QUALIFICATION OF MANUFACTURER'S REPRESENTATIVE

A. Authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystem, or system, with full authority by the equipment manufacturer to issue the certifications required of the manufacturer. Additional qualifications may be specified elsewhere.

B. Representative subject to acceptance by Owner. No substitute representatives will be allowed unless prior written approval by such has been given.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

A. Furnish manufacturers' services when required by an individual Specification section, to meet the requirements of this section.

B. Where time is necessary in excess of that stated in the Specifications for manufacturers' services, or when a minimum time is not specified, the time required to perform the specified services shall be considered incidental.

C. Schedule manufacturer' services to avoid conflict with other onsite testing or other manufacturers' onsite services.

D. Determine, before scheduling services, that all conditions necessary to allow successful testing have been met.

E. Only those days of service approved by Engineer will be credited to fulfill the specified minimum services.

F. When specified in individual Specification sections, manufacturer's onsite services shall include:

1. Assistance during product (system, subsystem, or component) installation to include observation, guidance, instruction of Contractor's assembly, erection, installation or application procedures.
2. Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by manufacturer and necessary to furnish Manufacturer's Certificate of Proper Installation.
3. Providing, on a daily basis, copies of all manufacturers' representatives' field notes and data to Owner.
4. Revisiting the Site as required to correct problems and until installation and operation are acceptable to Engineer.
5. Resolution of assembly or installation problems attributable to, or associated with, respective manufacturer's products and systems.
6. Assistance during functional and performance testing, and facility startup and evaluation.
7. Training of Owner's personnel in the operation and maintenance of respective product as required.
8. Additional requirements may be specified elsewhere.

3.02 MANUFACTURER'S CERTIFICATE OF COMPLIANCE

A. When so specified, a Manufacturer's Certificate of Compliance, a copy of which is attached to this section, shall be completed in full, signed by the entity supplying the product, material, or service, and submitted prior to shipment of product or material or the execution of the services.

B. Owner may permit use of certain materials or assemblies prior to sampling and testing if accompanied by accepted certification of compliance.

C. Such form shall certify that the proposed product, material, or service complies with that specified. Attach supporting reference data, affidavits, and certifications as appropriate.

D. May reflect recent or previous test results on material or product, if acceptable to Owner.

3.03 MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

A. When so specified, a Manufacturer's Certificate of Proper Installation form, a copy of which is attached to this section, shall be completed and signed by the equipment manufacturer's representative.

B. Such form shall certify that the signing party is a duly authorized representative of the manufacturer, is empowered by the manufacturer to inspect, approve, and operate their equipment and is authorized to make recommendations required to assure that the equipment is complete and operational.

3.04 TRAINING

A. General:

1. Furnish manufacturers' representatives for detailed classroom and hands-on training to Owner's personnel on operation and maintenance of specified product (system, subsystem, component) and as may be required in applicable Specifications.
2. Furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with Owner, and familiar with operation and maintenance manual information specified in Section 01 78 23, Operation and Maintenance Data.
3. Manufacturer's representative shall be familiar with facility operation and maintenance requirements as well as with specified equipment.
4. Furnish complete training materials, to include operation and maintenance data, to be retained by each trainee.

B. Training Schedule:

1. List specified equipment and systems that require training services and show:
   a. Respective manufacturer.
   b. Estimated dates for installation completion.
   c. Estimated training dates.
2. Allow for multiple sessions when several shifts are involved.
3. Adjust schedule to ensure training of appropriate personnel as deemed necessary by Owner, and to allow full participation by manufacturers' representatives. Adjust schedule for interruptions in operability of equipment.
4. Coordinate with Section 01 32 00, Construction Progress Documentation, and Section 01 91 14, Equipment Testing and Facility Startup.

C. Lesson Plan: When manufacturer or vendor training of Owner personnel is specified, prepare a lesson plan for each required course containing the following minimum information:

1. Title and objectives.
2. Recommended attendees (e.g., managers, engineers, operators, maintenance).
3. Course description, outline of course content, and estimated class duration.
4. Format (e.g., lecture, self-study, demonstration, hands-on).
5. Instruction materials and equipment requirements.
6. Resumes of instructors providing the training.

D. Pre-startup Training:

1. Coordinate training sessions with Owner's operating personnel and manufacturers' representatives, and with submission of operation and maintenance manuals in accordance with Section 01 78 23, Operation and Maintenance Data.
2. Complete at least 14 days prior to beginning of facility startup.

E. Post-startup Training: If required in Specifications, furnish and coordinate training of Owner's operating personnel by respective manufacturer's representatives.

3.05 SUPPLEMENTS

A. The supplements listed below, following "End of Section", are part of this Specification.

1. Form: Manufacturer's Certificate of Compliance.
2. Form: Manufacturer's Certificate of Proper Installation.

END OF SECTION

MANUFACTURER'S CERTIFICATE OF COMPLIANCE

OWNER:

PRODUCT, MATERIAL, OR SERVICE SUBMITTED:

PROJECT NAME:

PROJECT NO:

Comments:_____

_____

_____

_____

_____

_____

I hereby certify that the above-referenced product, material, or service called for by the contract for the named project will be furnished in accordance with all applicable requirements. I further certify that the product, material, or service are of the quality specified and conform in all respects with the contract requirements, and are in the quantity shown.

Date of Execution: _____, 20___

Manufacturer:_____

Manufacturer's Authorized Representative *(print)*: _____

_____

(Authorized Signature)

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER _____ EQPT SERIAL NO:_____

EQPT TAG NO:_____ EQPT/SYSTEM:_____

PROJECT NO:_____ SPEC. SECTION:_____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

- ☐ Installed in accordance with Manufacturer's recommendations.
- ☐ Inspected, checked, and adjusted.
- ☐ Serviced with proper initial lubricants.
- ☐ Electrical and mechanical connections meet quality and safety standards.
- ☐ All applicable safety equipment has been properly installed.
- ☐ Functional tests.
- ☐ System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Note: Attach any performance test documentation from manufacturer.

Comments:_____

_____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate his equipment and (iii) authorized to make recommendations required to assure that the equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20___

Manufacturer:_____

By Manufacturer's Authorized Representative: _____
(Authorized Signature)

SECTION 01 45 16.13
CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
   a. D3740-12A, Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
   b. E329-11C, Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

1.02 DEFINITIONS

A. Contractor Quality Control (CQC): The means by which Contractor ensures that the construction, to include that performed by subcontractors and suppliers, complies with the requirements of the Contract.

1.03 SUBMITTALS

A. Informational Submittals:

1. CQC Plan: Submit, not later than 30 days after receipt of Notice to Proceed.
2. CQC Report: Submit, weekly, an original and one copy in report form.

1.04 OWNER'S QUALITY ASSURANCE

A. All Work is subject to Owner's quality assurance inspection and testing at all locations and at all reasonable times before acceptance to ensure strict compliance with the terms of the Contract Documents.

B. Owner's quality assurance inspections and tests are for the sole benefit of Owner and do not:

1. Relieve Contractor of responsibility for providing adequate quality control measures;
2. Relieve Contractor of responsibility for damage to or loss of the material before acceptance;
3. Constitute or imply acceptance; or
4. Affect the continuing rights of Owner after acceptance of the completed Work.

C. The presence or absence of a quality assurance inspector does not relieve Contractor from any Contract requirement.

D. Promptly furnish all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by Engineer.

E. Owner may charge Contractor for any additional cost of inspection or test when Work is not ready at the time specified by Contractor for inspection or test, or when prior rejection makes re-inspection or retest necessary. Quality assurance inspections and tests will be performed in a manner that will not unnecessarily delay the Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Maintain an adequate inspection system and perform such inspections as will ensure that the Work conforms to the Contract Documents.

B. Maintain complete inspection records and make them available at all times to Owner and Engineer.

C. The quality control system shall consist of plans, procedures, and organization necessary to produce a product that complies with the Contract Documents. The system shall cover all construction and demolition operations, both onsite and offsite, including Work by subcontractors, fabricators, suppliers and purchasing agents, and shall be keyed to the proposed construction sequence.

3.02 COORDINATION MEETING

A. After the Preconstruction Conference, but before start of construction, and prior to acceptance of the CQC Plan, schedule a meeting with Engineer and Owner to discuss the quality control system.

B. Develop a mutual understanding of the system details, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite Work, and the interrelationship of Contractor's management and control with the Owner's Quality Assurance.

C. There may be occasions when subsequent conferences may be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures that may require corrective action by Contractor.

3.03 QUALITY CONTROL ORGANIZATION

A. CQC System Manager:

1. Designate an individual within Contractor's organization who will be responsible for overall management of CQC and have the authority to act in CQC matters for the Contractor.
2. CQC System Manager may perform other duties on the Project.
3. CQC System Manager shall be an experienced construction person, with a minimum of 3 years construction experience on similar type Work.
4. CQC System Manager shall report to the Contractor's project manager or someone higher in the organization. Project manager in this context shall mean the individual with responsibility for the overall quality and production management of the Project.
5. CQC System Manager shall be onsite during construction; periods of absence may not exceed 2 weeks at any one time.
6. Identify an alternate for CQC System Manager to serve with full authority during the System Manager's absence. The requirements for the alternate will be the same as for designated CQC System Manager.

B. CQC Staff:

1. Designate a CQC staff, available at the Site at all times during progress, with complete authority to take any action necessary to ensure compliance with the Contract. CQC staff members shall be subject to acceptance by Engineer.
2. CQC staff shall take direction from CQC System Manager in matters pertaining to QC.
3. CQC staff must be of sufficient size to ensure adequate QC coverage of Work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned QC responsibilities and must be allowed sufficient time to carry out these responsibilities.
4. The actual strength of the CQC staff may vary during any specific Work period to cover the needs of the Project. Add additional staff when necessary for a proper CQC organization.

C. Organizational Changes: Obtain Engineer's acceptance before replacing any member of the CQC staff. Requests for changes shall include name, qualifications, duties, and responsibilities of the proposed replacement.

3.04 QUALITY CONTROL PHASING

A. CQC shall include at least three phases of control to be conducted by CQC System Manager for all definable features of Work, as follows:

1. Preparatory Phase:
   a. Notify Owner at least 48 hours in advance of beginning any of the required action of the preparatory phase.
   b. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The CQC System Manager shall instruct applicable CQC staff as to the acceptable level of workmanship required in order to meet Contract requirements.
   c. Document the results of the preparatory phase meeting by separate minutes prepared by the CQC System Manager and attached to the QC report.
   d. Perform prior to beginning Work on each definable feature of Work:
      1) Review applicable Contract Specifications.
      2) Review applicable Contract Drawings.
      3) Verify that all materials and/or equipment have been tested, submitted, and approved.
      4) Verify that provisions have been made to provide required control inspection and testing.
      5) Examine the Work area to verify that all required preliminary Work has been completed and is in compliance with the Contract.
      6) Perform a physical examination of required materials, equipment, and sample Work to verify that they are on hand, conform to approved Shop Drawing or submitted data, and are properly stored.
      7) Review the appropriate activity hazard analysis to verify safety requirements are met.
      8) Review procedures for constructing the Work, including repetitive deficiencies.
      9) Document construction tolerances and workmanship standards for that phase of the Work.
      10) Check to verify that the plan for the Work to be performed, if so required, has been accepted by Engineer.
2. Initial Phase:
   a. Accomplish at the beginning of a definable feature of Work:
      1) Notify Owner at least 48 hours in advance of beginning the initial phase.

2) Perform prior to beginning Work on each definable feature of Work:
   a) Review minutes of the preparatory meeting.
   b) Check preliminary Work to verify compliance with Contract requirements.
   c) Verify required control inspection and testing.
   d) Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Comparison with sample panels is appropriate.
   e) Resolve all differences.
   f) Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
3) Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the QC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
4) The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3. Follow-up Phase:
   a. Perform daily checks to verify continuing compliance with Contract requirements, including control testing, until completion of the particular feature of Work.
   b. Daily checks shall be made a matter of record in the CQC documentation and shall document specific results of inspections for all features of Work for the day or shift.
   c. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of Work that will be affected by the deficient Work. Constructing upon or concealing nonconforming Work will not be allowed.
4. Additional Preparatory and Initial Phases: Additional preparatory and initial phases may be conducted on the same definable features of Work as determined by Owner if the quality of ongoing Work is unacceptable; or if there are changes in the applicable QC staff or in the onsite production supervision or work crew; or if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.05 CONTRACTOR QUALITY CONTROL PLAN

A. General:

1. Plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used.
2. An interim plan for the first 30 days of operation will be considered.

3. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of Work to be started.
4. Work outside of the features of Work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of Work to be started.

B. Content:

1. Plan shall cover the intended CQC organization for the entire Contract and shall include the following, as a minimum:
   a. Organization: Description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff will implement the three-phase control system (see Paragraph QC Phasing) for all aspects of the Work specified.
   b. CQC Staff: The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a QC function.
   c. Letters of Authority: A copy of a letter to the CQC System Manager signed by an authorized official of the firm, describing the responsibilities and delegating sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop Work which is not in compliance with the Contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities and responsibilities. Copies of these letters will also be furnished to Owner.
   d. Submittals: Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers and purchasing agents.
   e. Testing: Control, verification and acceptance testing procedures for each specific test to include the test name, frequency, specification paragraph containing the test requirements, the personnel and laboratory responsible for each type of test, and an estimate of the number of tests required.
   f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests, including documentation.
   g. Procedures for tracking deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.
   h. Reporting procedures, including proposed reporting formats; include a copy of the CQC report form.

C. Acceptance of Plans: Acceptance of the Contractor's basic and addendum CQC plans is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. Owner reserves the right to require Contractor to make changes in the CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.

D. Notification of Changes: After acceptance of the CQC plan, Contractor shall notify Engineer, in writing, a minimum of 7 calendar days prior to any proposed change. Proposed changes are subject to acceptance by Engineer.

3.06 CONTRACTOR QUALITY CONTROL REPORT

A. As a minimum, prepare a CQC report for every 7 calendar days. Account for all days throughout the life of the Contract. Reports shall be signed and dated by CQC System Manager. Include copies of test reports and copies of reports prepared by QC staff.

B. Maintain current records of quality control operations, activities, and tests performed, including the Work of subcontractors and suppliers.

C. Records shall be on an acceptable form and shall be a complete description of inspections, the results of inspections, daily activities, tests, and other items, including but not limited to the following:

1. Contractor/subcontractor and their areas of responsibility.
2. Operating plant/equipment with hours worked, idle, or down for repair.
3. Work performed today, giving location, description, and by whom. When a network schedule is used, identify each phase of Work performed each day by activity number.
4. Test and/or control activities performed with results and references to specifications/plan requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
5. Material received with statement as to its acceptability and storage.
6. Identify submittals reviewed, with Contract reference, by whom, and action taken.
7. Offsite surveillance activities, including actions taken.
8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
9. List instructions given/received and conflicts in Drawings and/or Specifications.
10. Contractor's verification statement.

11. Indicate a description of trades working on the Project; the number of personnel working; weather conditions encountered; and any delays encountered.
12. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in file work and workmanship comply with the Contract.

3.07 SUBMITTAL QUALITY CONTROL

A. Submittals shall be as specified in Section 01 33 00, Submittal Procedures. The CQC organization shall be responsible for certifying that all submittals are in compliance with the Contract requirements. Owner will furnish copies of test report forms upon request by Contractor. Contractor may use other forms as approved.

3.08 TESTING QUALITY CONTROL

A. Testing Procedure:

1. Perform tests specified or required to verify that control measures are adequate to provide a product which conforms to Contract requirements. Procure services of a licensed testing laboratory. Perform the following activities and record the following data:
    a. Verify testing procedures comply with contract requirements.
    b. Verify facilities and testing equipment are available and comply with testing standards.
    c. Check test instrument calibration data against certified standards.
    d. Verify recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
    e. Documentation:
        1) Record results of all tests taken, both passing and failing, on the CQC report for the date taken.
        2) Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test.
        3) Actual test reports may be submitted later, if approved by Engineer, with a reference to the test number and date taken.
        4) Provide directly to Engineer an information copy of tests performed by an offsite or commercial test facility. Test results shall be signed by an engineer registered in the state where the tests are performed.
        5) Failure to submit timely test reports, as stated, may result in nonpayment for related Work performed and disapproval of the test facility for this Contract.

B. Testing Laboratories: Laboratory facilities, including personnel and equipment, utilized for testing soils, concrete, asphalt and steel shall meet criteria detailed in ASTM D3740-12A and ASTM E329-11C, and be accredited by the American Association of Laboratory Accreditation (AALA), National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO), or other approved national accreditation authority. Personnel performing concrete testing shall be certified by the American Concrete Institute (ACI).

3.09 COMPLETION INSPECTION

A. CQC System Manager shall conduct an inspection of the Work at the completion of all Work or any milestone established by a completion time stated in the Contract.

B. Punchlist:

1. CQC System Manager shall develop a punchlist of items which do not conform to the Contract requirements.
2. Include punchlist in the CQC report, indicating the estimated date by which the deficiencies will be corrected.
3. CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Owner.
4. These inspections and any deficiency corrections required will be accomplished within the time stated for completion of the entire Work or any particular increment thereof if the Project is divided into increments by separate completion dates.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Association of Nurserymen (AAN): American Standards for Nursery Stock.
2. Federal Emergency Management Agency (FEMA).
3. National Fire Prevention Association (NFPA): 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
4. Telecommunications Industry Association (TIA); Electronic Industries Alliance (EIA): 568B, Commercial Building Telecommunications Cabling Standard.
5. U.S. Department of Agriculture (USDA): Urban Hydrology for Small Watersheds.
6. U.S. Weather Bureau: Rainfall-Frequency Atlas of the U.S. for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years.

1.02 MOBILIZATION

A. Mobilization shall include, but not be limited to, these principal items:

1. Obtaining required permits.
2. Moving Contractor’s field office and equipment required for first month operations onto Site.
3. Installing temporary construction power, wiring, and lighting facilities.
4. Providing onsite communication facilities, including telephones.
5. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
6. Arranging for and erection of Contractor’s work and storage yard.
7. Posting OSHA required notices and establishing safety programs and procedures.
8. Having Contractor’s superintendent at Site full time.

1.03 PROTECTION OF WORK AND PROPERTY

A. Comply with Owner’s safety rules while on Owner’s property.

B. Keep Owner informed of serious onsite accidents and related claims.

PART 2 PRODUCTS

2.01 PROJECT SIGN

A. Provide and maintain one, 8-foot wide by 4-foot high sign constructed of 3/4-inch exterior high density overlaid plywood. Sign shall bear name of Project, Owner, Contractor, Engineer, and other participating agencies. Lettering shall be blue applied on a white background by an experienced sign painter. Paint shall be exterior type enamel. Information to be included will be provided by Owner.

PART 3 EXECUTION

3.01 TEMPORARY UTILITIES

A. Power and Water: Contractor may connect into the existing Nassau Regional Wastewater Treatment Plant (WWTP)water system for use in this construction.

1. The cost of making the connection to the water system shall be included in the Contractor's lump sum bid.
2. The cost of water will be provided by the Owner (free service).
3. Contractor shall be responsible for providing electrical power required for this construction.

B. Lighting: Provide temporary lighting to meet applicable safety requirements to allow erection, application, or installation of materials and equipment, and observation or inspection of the Work.

C. Heating, Cooling, and Ventilating:

1. Provide as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for installation of materials, and to protect materials, equipment, and finishes from damage due to temperature or humidity.
2. Provide adequate forced air ventilation of enclosed areas to cure installed materials, to dispense humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
3. Pay all costs of installation, maintenance, operation, removal, and fuel consumed.
4. Provide portable unit heaters, complete with controls, oil- or gas-fired, and suitably vented to outside as required for protection of health and property.
5. If permanent natural gas piping is used for temporary heating units, do not modify or reroute gas piping without approval of utility company. Provide separate gas metering as required by utility.

D. Sanitary and Personnel Facilities: Provide and maintain facilities for Contractor's employees, Subcontractors, and all other onsite employers' employees. Service, clean, and maintain facilities and enclosures.

E. Telephone Service:

1. Contractor: Arrange and provide onsite telephone service for use during construction. Pay costs of installation and monthly bills.

F. Fire Protection: Furnish and maintain on Site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of NFPA 241.

3.02 PROTECTION OF WORK AND PROPERTY

A. General:

1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
3. In areas where Contractor's operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by Contractor.
4. Do not impair operation of existing sewer system or Nassau Regional WWTP. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, rapid infiltration basins or other sewer structures.
5. Maintain original Site drainage wherever possible.

B. Site Security: Provide and maintain additional temporary security fences as necessary to protect the Work and Contractor-furnished products not yet installed.

C. Barricades and Lights:

1. Provide as necessary to prevent unauthorized entry to construction areas and affected roads, streets, and alleyways, inside and outside of fenced area, and as required to ensure public safety and the safety of Contractor's employees, other employer's employees, and others who may be affected by the Work.
2. Provide to protect existing facilities and adjacent properties from potential damage.
3. Locate to enable access by facility operators and property owners.

D. Signs and Equipment:

1. Conform to requirements of manual published by the State Department of Transportation.
2. Provide at obstructions, such as material piles and equipment.
3. Use to alert general public of construction hazards, which would include surface irregularities, unramped walkways, grade changes, and trenches or excavations in roadways and in other public access areas.

E. Trees and Plantings:

1. Protect from damage and preserve trees, shrubs, and other plants outside limits of the Work and within limits of the Work, which are designated on the Drawings to remain undisturbed.
   a. Where practical, tunnel beneath trees when on or near line of trench.
   b. Employ hand excavation as necessary to prevent tree injury.
   c. Do not stockpile materials or permit traffic within drip lines of trees.
   d. Provide and maintain temporary barricades around trees.
   e. Water vegetation as necessary to maintain health.
   f. Cover temporarily exposed roots with wet burlap, and keep burlap moist until soil is replaced around roots.
   g. No trees, except those specifically shown on Drawings to be removed, shall be removed without written approval of Engineer.
   h. Dispose of removed trees in a legal manner off the Site.
2. Balling and burlapping of trees indicated for replacement shall conform to recommended specifications set forth in the American Standards for Nursery Stock, published by American Association of Nurserymen. All balls shall be firm and intact and made-balls will not be accepted. Handle ball and burlap trees by ball and not by top.
3. In event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, treat damage by corrective pruning, bark tracing, application of a heavy coating of tree paint, and other accepted horticultural and tree surgery practices.
4. Replace each plant that dies because of construction activities.

F. Finished Construction: Protect finished floors and concrete floors exposed as well as those covered with composition tile or other applied surfacing.

G. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

H. Dewatering: Construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain foundations and parts of the Work free from water.

I. Endangered and Threatened Species:

1. Take precautions necessary and prudent to protect native endangered and threatened flora and fauna.
2. Notify Engineer of construction activities that might threaten endangered and threatened species or their habitats.
3. Engineer will mark areas known as habitats of endangered and threatened species prior to commencement of onsite activities.
4. Additional areas will be marked by Engineer as other habitats of endangered and threatened species become known during construction.

J. Wetlands: Protect from damage and preserve all wetlands outside limits of the Work and within limits of the Work, which are designated on the Drawings. Do not allow access into any designation wetland and limit access to buffer areas surrounding each wetland. No storage of any type is allowed within the buffer area.

3.03 TEMPORARY CONTROLS

A. Air Pollution Control:

1. Minimize air pollution from construction operations.
2. Burning: Flammable debris and refuse may be burned onsite provided requirements set forth by proper fire authorities and air quality control agencies are met.
3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.

B. Noise Control: Provide acoustical barriers so noise emanating from tools or equipment will not exceed legal noise levels.

C. Water Pollution Control:

1. Prior to commencing excavation and construction, obtain Owner’s agreement with detailed plans showing procedures intended to handle and dispose of sewage, groundwater, and stormwater flow, including dewatering pump discharges.

2. Comply with procedures outlined in U.S. Environmental Protection Agency manuals entitled, “Guidelines for Erosion and Sedimentation Control Planning” and “Implementation, Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity,” and “Erosion and Sediment Control-Surface Mining in Eastern United States.”
3. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

D. Erosion, Sediment, and Flood Control: Provide, maintain, and operate temporary facilities to control erosion and sediment releases, and to protect the Work and existing facilities from flooding during construction period.

3.04 STORAGE YARDS AND BUILDINGS

A. Coordinate requirements with Section 01 61 00, Common Product Requirements.

B. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.

C. Temporary Storage Buildings:

1. Provide environmental control systems that meet recommendations of manufacturers of equipment and materials stored.
2. Arrange or partition to provide security of contents and ready access for inspection and inventory.
3. Store combustible materials (paints, solvents, fuels) in a well-ventilated, and remote building meeting safety standards.

3.05 ACCESS ROADS

A. Construct access roads as shown and within easements, rights-of-way, or Project limits.

B. Maintain drainage ways. Install and maintain culverts to allow water to flow beneath access roads. Provide corrosion-resistant culvert pipe of adequate strength to resist construction loads.

C. Provide gravel, crushed rock, or other stabilization material to permit access by all motor vehicles at all times.

D. Where access road crosses existing fences, install and maintain gates. Gates and gate posts shall conform to those as specified in JEA Section 492.

3.06 PARKING AREAS

A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations.

3.07 VEHICULAR TRAFFIC

A. Comply with Laws and Regulations regarding closing or restricting use of public streets or highways. No public or private road shall be closed, except by written permission of proper authority. Assure the least possible obstruction to traffic and normal commercial pursuits.

B. Conduct the Work to interfere as little as possible with public travel, whether vehicular or pedestrian.

C. Whenever it is necessary to cross, close, or obstruct roads, driveways, and walks, whether public or private, provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.

D. Road Closures: Maintain satisfactory means of exit for persons residing or having occasion to transact business along route of the Work. If it is necessary to close off roadway or alley providing sole vehicular access to property for periods greater than 2 hours, provide written notice to each owner so affected 3 days prior to such closure. In such cases, closings of up to 4 hours may be allowed. Closures of up to 10 hours may be allowed if a week's written notice is given and undue hardship does not result.

E. Maintenance of traffic is not required if Contractor obtains written permission from Owner and tenant of private property, or from authority having jurisdiction over public property involved, to obstruct traffic at designated point.

F. In making street crossings, do not block more than one-half the street at a time. Whenever possible, widen shoulder on opposite side to facilitate traffic flow. Provide temporary surfacing on shoulders as necessary.

G. Maintain top of backfilled trenches before they are paved, to allow normal vehicular traffic to pass over. Provide temporary access driveways where required. Cleanup operations shall follow immediately behind backfilling.

H. When flaggers and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices.

END OF SECTION

SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. This section covers Work necessary for stabilization of soil to prevent erosion during construction and land disturbing activities. The minimum areas requiring soil erosion and sediment control measures are indicated on the Drawings. Engineer reserves right to modify use, location, and quantities of soil erosion and sediment control measures based on activities of Contractor.

B. The Contractor is responsible for obtaining a NPDES General Permit for Stormwater Discharges for Small Construction Activities. As part of the NPDES permit, the Contractor shall prepare a Stormwater Pollution Prevention Plan (SWPPP).

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
   a. D638, Standard Test Method for Tensile Properties of Plastics.
   b. D3776/D3776M, Standard Test Methods for Mass Per Unit Area (Weight) of Fabric.
   c. D4355, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in Xenon Arc Type Apparatus.
   d. D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
2. Federal Emergency Management Agency (FEMA).
3. U.S. Department of Agriculture: Urban Hydrology for Small Watersheds; Soil Conservation Service Engineering Technical Release No. 55, 1986.
4. U.S. Environmental Protection Agency:
   a. Guidelines for Erosion and Sedimentation Control Planning.
   b. Implementation, Processes, Procedures, and Methods to Control Pollution Resulting from all Construction Activity.
   c. Erosion and Sediment Control Surface Mining in Eastern United States.
5. U.S. Weather Bureau: Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years, Technical Paper No. 40, 1981.

1.03 SYSTEM DESCRIPTION

A. Erosion and Sediment Control: Provide, maintain, and operate temporary facilities to control erosion and sediment releases during construction period.

B. Soil erosion stabilization and sedimentation control consists of the following elements: Construction of temporary erosion control facilities such as silt fences and inlet protection.

C. Activities shall conform to the Florida Stormwater, Erosion, and Sedimentation Control Inspectors Manual, latest version and Drawings. In the event of a conflict, the more stringent requirement shall apply.

1.04 QUALITY ASSURANCE

A. Water pollution control shall comply with procedures outlined in U.S. Environmental Protection Agency manuals entitled, "Guidelines for Erosion and Sedimentation Control Planning" and "Implementation, Processes, Procedures, and Methods to Control Pollution Resulting from all Construction Activity".

PART 2 PRODUCTS

2.01 GEOTEXTILE

A. Geotextiles shall consist only of long chain polymeric fibers or yarns formed into a stable network such that the fibers or yarns retain their position relative to each other during handling, placement, and design service life. At least 95 percent by weight of the material shall be polyolefins or polyesters. The material shall be free from defects or tears. Geotextile shall also be free of any treatment or coating which might adversely alter its hydraulic or physical properties after installation. Geotextile properties shall be as specified in Table 1.

Table 1
Geotextile for Temporary Silt Fence

Geotextile Property	ASTM Test Method	Geotextile Property Requirements	
		Unsupported Between Posts	
AOS	D4751	U.S. No. 30 max. for silt wovens, U.S. No. 50 for all other geotextile types, U.S. No. 100 min.	
Water Permittivity	D4491	0.2 sec^{-1} min.	
Grab Tensile Strength, in machine and x-machine direction	D4632/ D4632M	180 lb min. in machine direction, 100 lb min. in x-machine direction	

Table 1 Geotextile for Temporary Silt Fence			
		Geotextile Property Requirements	
Geotextile Property	ASTM Test Method	Unsupported Between Posts	
Grab Failure Strain, in machine and x-machine direction	D4632/ D4632M	30% max. at 180 lb or more	
Ultraviolet (UV) Radiation Stability	D4355	70% strength retained min., after 500 hours in xenon arc device	

2.02 CLEARING LIMIT FENCE

A. High Visibility Fence: UV stabilized, orange, high-density polyethylene or polypropylene mesh.

B. Height: 4 feet minimum.

C. Support Posts: Wood or steel with sufficient strength and durability to support the fence through the life of the Project.

2.03 SILT (SEDIMENT) FENCE

A. Geotextile: As specified in Article Geotextile.

B. Support Posts: As recommended by manufacturer of geotextile.

C. Fasteners: Heavy-duty wire staples at least 1-inch long, tie wires, or hog rings, as recommended by manufacturer of geotextile.

PART 3 EXECUTION

3.01 PREPARATION

A. Include proposed stockpile areas and installation of temporary erosion control devices, ditches, or other facilities in Work phasing plans.

B. Areas designated for Contractor's use during Project may be temporarily developed as specified to provide working, staging, and administrative areas. control of sediment from these areas.

C. Clearing Limit Fencing: Install fencing in accordance with the Drawings.

D. Silt (Sediment) Fence:

1. Silt fence shall be installed in accordance with the Drawings.
2. Attach geotextile to posts and support system using staples, wire, or in accordance with manufacturer's recommendations. Geotextile shall be sewn together at the point of manufacture, or at a location approved by Engineer, to form geotextile lengths as required.
3. Provide wood or steel support posts at sewn seams and overlaps and as shown on the Drawings and necessary to support fence.
4. Wood Posts: Minimum dimensions of 1-1/4-inch by 1-1/4-inch by the minimum length shown on the Drawings.
5. Steel Posts: Minimum weight of 0.90 lb/ft.
6. When sediment deposits reach approximately one-third the height of the silt fence, remove and stabilize deposits.

E. Street Cleaning: Use self-propelled pickup street sweepers whenever required by Engineer to prevent transport of sediment and other debris off Project Site. Provide street sweepers designed and operated to meet air quality standards. Street washing with water will require approval by Engineer. Intentional washing of sediment into storm sewers or drainage ways must not occur. Vacuuming or dry sweeping and material pickup must be used to cleanup released sediments.

3.02 MAINTENANCE

A. The measures described in this specification are minimum requirements for anticipated Site conditions. During the construction period, upgrade these measures as needed to comply with all applicable local, state, and federal erosion and sediment control regulations.

B. Maintain erosion and sediment control BMPs so they properly perform their function until Engineer determines they are no longer needed.

C. Construction activities must avoid or minimize excavation and creation of bare ground during wet weather.

D. The intentional washing of sediment into storm sewers or drainage ways must not occur. Vacuuming or dry sweeping and material pickup must be used to cleanup released sediments.

E. Inspect BMPs in accordance with the schedule in the Construction Stormwater Discharge Permit(s) or as directed by Engineer.

F. Complete an inspection report within 24 hours of an inspection. Each inspection report shall be signed and identify corrective actions. Document that corrective actions are performed within 7 days of identification. Keep a copy of all inspection reports at the Site or at an easily accessible location.

G. Silt Fence: Remove trapped sediment before it reaches one-third of the above ground fence height and before fence removal.

H. Initiate repair or replacement of damaged erosion and sediment control BMPs immediately, and work completed by end of next work day. Significant replacement or repair must be completed within 7 days, unless infeasible.

I. Within 24 hours, remediate any significant sediment that has left construction site. Investigate cause of the sediment release and implement steps to prevent a recurrence of discharge within same 24 hours. Perform in-stream cleanup of sediment according to applicable regulations.

J. Provide permanent erosion control measures on all exposed areas. Do not remove temporary sediment control practices until permanent vegetation or other cover of exposed areas is established. However, do remove all temporary erosion control measures as exposed areas become stabilized, unless doing so conflicts with local requirements. Properly dispose of construction materials and waste, including sediment retained by temporary BMPs.

3.03 REMOVAL

A. When Engineer determines that an erosion control BMP is no longer required, remove BMP and all associated hardware from the Project limits. When materials are biodegradable, Engineer may approve leaving temporary BMP in place.

B. Permanently stabilize all bare and disturbed soil after removal of erosion and sediment control BMPs. Dress sediment deposits remaining after BMPs have been removed to conform to existing grade. Prepare and seed graded area. If installation and use of erosion control BMPs have compacted or otherwise rendered soil inhospitable to plant growth, such as construction entrances, take measures to rehabilitate soil to facilitate plant growth. This may include, but is not limited to, ripping the soil, incorporating soil amendments, or seeding with specified seed.

END OF SECTION

SECTION 01 61 00
COMMON PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 DEFINITIONS

A. Products:

1. New items for incorporation in the Work, whether purchased by Contractor or Owner for the Project, or taken from previously purchased stock, and may also include existing materials or components required for reuse.
2. Includes the terms material, equipment, machinery, components, subsystem, system, hardware, software, and terms of similar intent and is not intended to change meaning of such other terms used in Contract Documents, as those terms are self-explanatory and have well recognized meanings in construction industry.
3. Items identified by manufacturer's product name, including make or model designation, indicated in manufacturer's published product literature, that is current as of the date of the Contract Documents.

1.02 DESIGN REQUIREMENTS

A. Where Contractor design is specified, design of installation, systems, equipment, and components, including supports and anchorage, shall be in accordance with provisions of Florida Building Code Fifth Edition (2014).

1. Refer to Sheet Structural General Notes in the Drawings for additional Project specific information.

1.03 PREPARATION FOR SHIPMENT

A. When practical, factory assemble products. Mark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with strippable protective coating.

B. Package products to facilitate handling and protect from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of Project and Contractor, equipment number, and approximate weight. Include complete packing list and bill of materials with each shipment.

C. Extra Materials, Special Tools, Test Equipment, and Expendables:

1. Furnish as required by individual Specifications.
2. Schedule:
   a. Ensure that shipment and delivery occurs concurrent with shipment of associated equipment.
   b. Transfer to Owner shall occur immediately subsequent to Contractor's acceptance of equipment from Supplier.
3. Packaging and Shipment:
   a. Package and ship extra materials and special tools to avoid damage during long term storage in original cartons insofar as possible, or in appropriately sized, hinged-cover, wood, plastic, or metal box.
   b. Prominently displayed on each package, the following:
      1) Manufacturer's part nomenclature and number, consistent with Operation and Maintenance Manual identification system.
      2) Applicable equipment description.
      3) Quantity of parts in package.
      4) Equipment manufacturer.
4. Deliver materials to Site.
5. Replace extra materials and special tools found to be damaged or otherwise inoperable at time of transfer to Owner.

1.04 DELIVERY AND INSPECTION

A. Deliver products in accordance with accepted current Progress Schedule and coordinate to avoid conflict with the Work and conditions at Site. Deliver anchor bolts and templates sufficiently early to permit setting prior to placement of structural concrete.

B. Deliver products in undamaged condition, in manufacturer's original container or packaging, with identifying labels intact and legible. Include on label, date of manufacture and shelf life, where applicable.

C. Unload products in accordance with manufacturer's instructions for unloading or as specified. Record receipt of products at Site. Promptly inspect for completeness and evidence of damage during shipment.

D. Remove damaged products from Site and expedite delivery of identical new undamaged products, and remedy incomplete or lost products to provide that specified, so as not to delay progress of the Work.

1.05 HANDLING, STORAGE, AND PROTECTION

A. Handle and store products in accordance with manufacturer's written instructions and in a manner to prevent damage. Store in approved storage yards or sheds provided in accordance with Section 01 50 00, Temporary Facilities and Controls. Provide manufacturer's recommended maintenance during storage, installation, and until products are accepted for use by Owner.

B. Manufacturer's instructions for material requiring special handling, storage, or protection shall be provided prior to delivery of material.

C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration. Keep running account of products in storage to facilitate inspection and to estimate progress payments for products delivered, but not installed in the Work.

D. Store electrical, instrumentation, and control products, and equipment with bearings in weather-tight structures maintained above 60 degrees F. Protect electrical, instrumentation, and control products, and insulate against moisture, water, and dust damage. Connect and operate continuously space heaters furnished in electrical equipment.

E. Store fabricated products above ground on blocking or skids, and prevent soiling or staining. Store loose granular materials in well-drained area on solid surface to prevent mixing with foreign matter. Cover products that are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

F. Store finished products that are ready for installation in dry and well-ventilated areas. Do not subject to extreme changes in temperature or humidity.

G. After installation, provide coverings to protect products from damage due to traffic and construction operations. Remove coverings when no longer needed.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide manufacturer's standard materials suitable for service conditions, unless otherwise specified in the individual Specifications.

B. Where product specifications include a named manufacturer, with or without model number, and also include performance requirements, named manufacturer's products must meet the performance specifications.

C. Like items of products furnished and installed in the Work shall be end products of one manufacturer and of the same series or family of models to achieve standardization for appearance, operation and maintenance, spare parts and replacement, manufacturer's services, and implement same or similar process instrumentation and control functions in same or similar manner.

D. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.

E. Provide interchangeable components of the same manufacturer, for similar components, unless otherwise specified.

F. Equipment, Components, Systems, and Subsystems: Design and manufacture with due regard for health and safety of operation, maintenance, and accessibility, durability of parts, and shall comply with applicable OSHA, state, and local health and safety regulations.

G. Regulatory Requirement: Coating materials shall meet federal, state, and local requirements limiting the emission of volatile organic compounds and for worker exposure.

H. Safety Guards: Provide for all belt or chain drives, fan blades, couplings, or other moving or rotary parts. Cover rotating part on all sides. Design for easy installation and removal. Use 16-gauge or heavier; galvanized steel, aluminum coated steel, or galvanized or aluminum coated 1/2-inch mesh expanded steel. Provide galvanized steel accessories and supports, including bolts. For outdoors application, prevent entrance of rain and dripping water.

I. Authority Having Jurisdiction (AHJ):

1. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
2. Materials and equipment manufactured within the scope of standards published by Underwriters Laboratories, Inc. shall conform to those standards and shall have an applied UL listing mark.

J. Equipment Finish:

1. Provide manufacturer's standard finish and color, except where specific color is indicated.
2. If manufacturer has no standard color, provide equipment with gray finish as approved by Owner.

K. Special Tools and Accessories: Furnish to Owner, upon acceptance of equipment, all accessories required to place each item of equipment in full operation. These accessory items include, but are not limited to, adequate oil and grease (as required for first lubrication of equipment after field testing), light bulbs, fuses, hydrant wrenches, valve keys, handwheels, chain operators, special tools, and other spare parts as required for maintenance.

L. Lubricant: Provide initial lubricant recommended by equipment manufacturer in sufficient quantity to fill lubricant reservoirs and to replace consumption during testing, startup, and operation until final acceptance by Owner.

2.02 FABRICATION AND MANUFACTURE

A. General:

1. Manufacture parts to U.S.A. standard sizes and gauges.
2. Two or more items of the same type shall be identical, by the same manufacturer, and interchangeable.
3. Design structural members for anticipated shock and vibratory loads.
4. Use 1/4-inch minimum thickness for steel that will be submerged, wholly or partially, during normal operation.
5. Modify standard products as necessary to meet performance Specifications.

B. Lubrication System:

1. Require no more than weekly attention during continuous operation.
2. Convenient and accessible; oil drains with bronze or stainless steel valves and fill-plugs easily accessible from the normal operating area or platform. Locate drains to allow convenient collection of oil during oil changes without removing equipment from its installed position.
3. Provide constant-level oilers or oil level indicators for oil lubrication systems.
4. For grease type bearings, which are not easily accessible, provide and install stainless steel tubing; protect and extend tubing to convenient location with suitable grease fitting.

2.03 SOURCE QUALITY CONTROL

A. Where Specifications call for factory testing to be witnessed by Engineer, notify Engineer not less than 14 days prior to scheduled test date, unless otherwise specified.

B. Calibration Instruments: Bear the seal of a reputable laboratory certifying instrument has been calibrated within the previous 12 months to a standard endorsed by the National Institute of Standards and Technology (NIST).

C. Factory Tests: Perform in accordance with accepted test procedures and document successful completion.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect materials and equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install material or equipment showing such effects. Remove damaged material or equipment from the Site and expedite delivery of identical new material or equipment. Delays to the Work resulting from material or equipment damage that necessitates procurement of new products will be considered delays within Contractor's control.

3.02 INSTALLATION

A. Equipment Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned.

B. No shimming between machined surfaces is allowed.

C. Install the Work in accordance with NECA Standard of Installation, unless otherwise specified.

D. Repaint painted surfaces that are damaged prior to equipment acceptance.

E. Do not cut or notch any structural member or building surface without specific approval of Engineer.

F. Handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's instructions, and as may be specified. Retain a copy of manufacturers' instruction at Site, available for review at all times.

G. For material and equipment specifically indicated or specified to be reused in the Work:

1. Use special care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
2. Arrange for transportation, storage, and handling of products that require offsite storage, restoration, or renovation. Include costs for such Work in the Contract Price.

3.03 FIELD FINISHING

A. As described on the Process Mechanical General Notes in the Drawings Painting and Protective Coatings and individual Specification sections.

3.04 ADJUSTMENT AND CLEANING

A. Perform required adjustments, tests, operation checks, and other startup activities.

3.05 LUBRICANTS

A. Fill lubricant reservoirs and replace consumption during testing, startup, and operation prior to acceptance of equipment by Owner.

END OF SECTION

SECTION 01 77 00
CLOSEOUT PROCEDURES AND AS-BUILT DRAWINGS

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Submit prior to application for final payment.
   a. Record Documents: As required in General Conditions.
   b. Special bonds, Special Guarantees, and Service Agreements.
   c. Consent of Surety to Final Payment: As required in General Conditions.
   d. Releases or Waivers of Liens and Claims: As required in General Conditions.
   e. Releases from Agreements.
   f. Final Application for Payment: Submit in accordance with procedures and requirements stated in Section 01 29 00, Payment Procedures.
   g. Extra Materials: As required by individual Specification sections.
   h. Completed JEA Asset Management spreadsheets.

1.02 RECORD DOCUMENTS

A. Quality Assurance:

1. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents.
2. Accuracy of Records:
   a. Coordinate changes within record documents, making legible and accurate entries on each sheet of Drawings and other documents where such entry is required to show change.
   b. Purpose of Project record documents is to document factual information regarding aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive Site measurement, investigation, and examination.
3. Make entries within 24 hours after receipt of information that a change in the Work has occurred.
4. Prior to submitting each request for progress payment, request Engineer's review and approval of current status of record documents. Failure to properly maintain, update, and submit record documents may result in a deferral by Engineer to recommend whole or any part of Contractor's Application for Payment, either partial or final.

1.03 RELEASES FROM AGREEMENTS

A. Furnish Owner written releases from property owners or public agencies where side agreements or special easements have been made, or where Contractor's operations have not been kept within the Owner's construction right-of-way.

B. In the event Contractor is unable to secure written releases:

1. Inform Owner of the reasons.
2. Owner or its representatives will examine the Site, and Owner will direct Contractor to complete the Work that may be necessary to satisfy terms of the side agreement or special easement.
3. Should Contractor refuse to perform this Work, Owner reserves right to have it done by separate contract and deduct cost of same from Contract Price, or require Contractor to furnish a satisfactory bond in a sum to cover legal Claims for damages.
4. When Owner is satisfied that the Work has been completed in agreement with Contract Documents and terms of side agreement or special easement, right is reserved to waive requirement for written release if: (i) Contractor's failure to obtain such statement is due to grantor's refusal to sign, and this refusal is not based upon any legitimate Claims that Contractor has failed to fulfill terms of side agreement or special easement, or (ii) Contractor is unable to contact or has had undue hardship in contacting grantor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 MAINTENANCE OF RECORD DOCUMENTS

A. General: Requirements for maintaining record drawings during the project shall be as defined in **JEA Water and Wastewater Standards, Section 501 AS-BUILT DRAWINGS**. The following paragraphs supplement the JEA requirements.

1. Promptly following commencement of Contract Times, secure from Engineer at no cost to Contractor, one complete set of Contract Documents. Drawings will be full size.
2. Label or stamp each record document with title, "RECORD DOCUMENTS," in neat large printed letters.
3. Record information concurrently with construction progress and within 24 hours after receipt of information that change has occurred. Do not cover or conceal Work until required information is recorded.

B. Preservation:

1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
2. Make documents and Samples available at all times for observation by Engineer.

C. Making Entries on Drawings:

1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by graphic line and note as required.
   a. Color Coding:
      1) Green when showing information deleted from Drawings.
      2) Red when showing information added to Drawings.
      3) Blue and circled in blue to show notes.
2. Date entries.
3. Call attention to entry by "cloud" drawn around area or areas affected.
4. Legibly mark to record actual changes made during construction, including, but not limited to:
   a. Depths of various elements of foundation in relation to finished first floor data if not shown or where depth differs from that shown.
   b. Horizontal and vertical locations of existing and new Underground Facilities and appurtenances, and other underground structures, equipment, or Work. Reference to at least two measurements to permanent surface improvements.
   c. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
   d. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
   e. Changes made by Addenda and Field Orders, SWAs, Change Order, and Engineer's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
5. Dimensions on Schematic Layouts: Show on record drawings, by dimension, the centerline of each run of items such as are described in previous subparagraph above.
   a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.
   b. Show, by symbol or note, vertical location of item ("under slab," "in ceiling plenum," "exposed," and the like).
   c. Make identification so descriptive that it may be related reliably to Specifications.

D. Preparation of AutoCAD Drawings, PDF and Paper Prints:

1. The requirements for as-built drawings is provided in **JEA Water and Wastewater Standards, As-Built Drawings – Section 501**. The following is an abbreviated summary of the requirements.
2. Contractor shall furnish to JEA an electronic file and certified paper copies of the as-built drawings, which have been re-drawn/revised to indicate the final as-built data (true to scale) and in accordance with addenda, work orders, Supplemental Work Account and all other requirements. An electronic file of the original project drawings will be furnished to the Contractor.
3. Each page of the as-built drawings shall bear the name of the signed as-built certification of the general contractor, and professional surveyor who provides the horizontal and vertical elevations. The certification forms are provided in **JEA Water and Wastewater Standards,** As**-Built Drawings – Section 501**.
4. Upon completion of the work Contractor shall deliver the as-built drawings including electronic files, two certified and embossed prints made from the as-built drawings, and an electronic file in ASCII format (with AutoCAD, PDF).
5. Use the Plane Coordinate System using Florida East Zone and North American Datum of 1983 for horizontal data. North American Vertical Datum (NAVD) 1988 shall be used for elevation data.
6. All valves, bends, tee's, and changes if direction shall be located vertically and horizontally, in addition grade shall be identified at each point. A table shall be provided in a conspicuous location specifying the northing/easting, latitude/longitude, pipe elevation, final grade, cover, utility size and separation. For all valves provide a table that identifies valves size, valve type, manufacturer, number of turns to open valve and valve open direction (right/left)
7. Provide physical dimensioning of the separation of water mains at crossing with all sanitary wastewater pipes.
8. Provide a table identifying all fire hydrants.
9. Submit JEA Record Drawing submittal checklist and the transmittal form as provided in **JEA Water and Wastewater Standards, As-Built Drawings – Section 501**.

3.02 FINAL CLEANING

A. At completion of the Work or of a part thereof and immediately prior to Contractor's request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to Contractor's notice of completion, clean entire Site or parts thereof, as applicable.

1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to Owner.
2. Remove grease, dirt, dust, paint or plaster splatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.
3. Repair, patch, and touchup marred surfaces to specified finish and match adjacent surfaces.
4. Clean all windows.
5. Clean and wax wood, vinyl, or painted floors.
6. Broom clean exterior paved driveways and parking areas.
7. Hose clean sidewalks, loading areas, and others contiguous with principal structures.
8. Rake clean all other surfaces.
9. Remove snow and ice from access to buildings.
10. Replace air-handling filters and clean ducts, blowers, and coils of ventilation units operated during construction.
11. Leave water courses, gutters, and ditches open and clean.

B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

END OF SECTION

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Detailed information for the preparation, submission, and Owner's review of Operations and Maintenance (O&M) Data, as required by individual Specification sections.

1.02 DEFINITIONS

A. Preliminary Data: Initial and subsequent submissions for Owner's review.

B. Final Data: Engineer-accepted data, submitted as specified herein.

C. Maintenance Operation: As used on Maintenance Summary Form is defined to mean any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operations are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

1.03 SEQUENCING AND SCHEDULING

A. Equipment and System Data:

1. Preliminary Data:
   a. Do not submit until Shop Drawing for equipment or system has been reviewed and approved by Engineer.
   b. Submit prior to shipment date.
2. Final Data: Submit Instructional Manual Formatted data not less than 30 days prior to equipment or system field functional testing Submit Compilation Formatted and Electronic Media Formatted data prior to Substantial Completion of Project.

1.04 DATA FORMAT

A. Prepare preliminary data in the form of an instructional manual. Prepare final data in data compilation format on electronic media.

B. Instructional Manual Format:

1. Binder: Commercial quality, permanent, three-ring or three-post binders with durable plastic cover.
2. Size: 8-1/2 inches by 11 inches, minimum.

3. Cover: Identify manual with typed or printed title "OPERATION AND MAINTENANCE DATA" and list:
    a. Project title.
    b. Designate applicable system, equipment, material, or finish.
    c. Identity of separate structure as applicable.
    d. Identify volume number if more than one volume.
    e. Identity of general subject matter covered in manual. Identity of equipment number and Specification section.
4. Spine:
    a. Project title.
    b. Identify volume number if more than one volume.
5. Title Page:
    a. Contractor name, address, and telephone number.
    b. Subcontractor, Supplier, installer, or maintenance contractor's name, address, and telephone number, as appropriate.
        1) Identify area of responsibility of each.
        2) Provide name and telephone number of local source of supply for parts and replacement.
6. Table of Contents:
    a. Neatly typewritten and arranged in systematic order with consecutive page numbers.
    b. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
7. Paper: 20-pound minimum, white for typed pages.
8. Text: Manufacturer's printed data, or neatly typewritten.
9. Three-hole punch data for binding and composition; arrange printing so that punched holes do not obliterate data.
10. Material shall be suitable for reproduction, with quality equal to original. Photocopying of material will be acceptable, except for material containing photographs.

C. Data Compilation Format:

1. Compile all Engineer-accepted preliminary O&M data into a hard-copy, hard-bound set.
2. Each set shall consist of the following:
    a. Binder: Commercial quality, permanent, three-ring or three-post binders with durable plastic cover.
    b. Cover: Identify each volume with typed or printed title "OPERATION AND MAINTENANCE DATA, VOLUME NO. ___ OF ___", and list:
        1) Project title.
        2) Contractor's name, address, and telephone number.

3) If entire volume covers equipment or system provided by one Supplier include the following:
   a) Identity of general subject matter covered in manual.
   b) Identity of equipment number and Specification section.

c. Provide each volume with title page and typed table of contents with consecutive page numbers. Place contents of entire set, identified by volume number, in each binder.

d. Table of contents neatly typewritten, arranged in a systematic order:
   1) Include list of each product, indexed to content of each volume.
   2) Designate system or equipment for which it is intended.
   3) Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.

e. Section Dividers:
   1) Heavy, 80 pound cover weight, tabbed with numbered plastic index tabs.
   2) Fly-Leaf:
      a) For each separate product, or each piece of operating equipment, with typed description of product and major component parts of equipment.
      b) List with Each Product:
         (1) Name, address, and telephone number of Subcontractor, Supplier, installer, and maintenance contractor, as appropriate.
         (2) Identify area of responsibility of each.
         (3) Provide local source of supply for parts and replacement.
      c) Identity of separate structure as applicable.

f. Assemble and bind material, as much as possible, in same order as specified in the Contract Documents.

D. Electronic Media Format:

1. Portable Document Format (PDF):
   a. After all preliminary data has been found to be acceptable to Engineer, submit Operation and Maintenance data in PDF format on CD.
   b. Files to be exact duplicates of Owner-accepted preliminary data. Arrange by specification number and name.
   c. Files to be fully functional and viewable in most recent version of Adobe Acrobat.

1.05 SUBMITTALS

A. Informational:

1. Data Outline: Submit one copy of a detailed outline of proposed organization and contents of Final Data prior to preparation of Preliminary Data.
2. Preliminary Data:
   a. Submit three copies for Engineer's review.
   b. If data meets conditions of the Contract:
      1) One copy will be returned to Contractor.
      2) One copy will be forwarded to Resident Project Representative.
      3) One copy will be retained in Engineer's file.
   c. If data does not meet conditions of the Contract:
      1) All copies will be returned to Contractor with Engineer's comments (on separate document) for revision.
      2) Engineer's comments will be retained in Engineer's file.
      3) Resubmit three copies revised in accordance with Engineer's comments.
3. Final Data: Submit two copies in format specified herein.

1.06 DATA FOR EQUIPMENT AND SYSTEMS

A. Content for Each Unit (or Common Units) and System:

1. Product Data:
   a. Include only those sheets that are pertinent to specific product.
   b. Clearly annotate each sheet to:
      1) Identify specific product or part installed.
      2) Identify data applicable to installation.
      3) Delete references to inapplicable information.
   c. Function, normal operating characteristics, and limiting conditions.
   d. Performance curves, engineering data, nameplate data, and tests.
   e. Complete nomenclature and commercial number of replaceable parts.
   f. Original manufacturer's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.
   g. Spare parts ordering instructions.
   h. Where applicable, identify installed spares and other provisions for future work (e.g., reserved panel space, unused components, wiring, terminals).

2. As-installed, color-coded piping diagrams.
3. Charts of valve tag numbers, with the location and function of each valve.
4. Drawings: Supplement product data with Drawings as necessary to clearly illustrate:
    a. Format:
        1) Provide reinforced, punched, binder tab; bind in with text.
        2) Reduced to 8-1/2 inches by 11 inches, or 11 inches by 17 inches folded to 8-1/2 inches by 11 inches.
        3) Where reduction is impractical, fold and place in 8-1/2-inch by 11-inch envelopes bound in text.
        4) Identify Specification section and product on Drawings and envelopes.
    b. Relations of component parts of equipment and systems.
    c. Control and flow diagrams.
    d. Coordinate drawings with Project record documents to assure correct illustration of completed installation.
5. Instructions and Procedures: Within text, as required to supplement product data.
    a. Format:
        1) Organize in consistent format under separate heading for each different procedure.
        2) Provide logical sequence of instructions for each procedure.
        3) Provide information sheet for Owner's personnel, including:
            a) Proper procedures in event of failure.
            b) Instances that might affect validity of guarantee or Bond.
    b. Installation Instructions: Including alignment, adjusting, calibrating, and checking.
    c. Operating Procedures:
        1) Startup, break-in, routine, and normal operating instructions.
        2) Test procedures and results of factory tests where required.
        3) Regulation, control, stopping, and emergency instructions.
        4) Description of operation sequence by control manufacturer.
        5) Shutdown instructions for both short and extended duration.
        6) Summer and winter operating instructions, as applicable.
        7) Safety precautions.
        8) Special operating instructions.
    d. Maintenance and Overhaul Procedures:
        1) Routine maintenance.
        2) Guide to troubleshooting.
        3) Disassembly, removal, repair, reinstallation, and re-assembly.
6. Guarantee, Bond, and Service Agreement: In accordance with Section 01 77 00, Closeout Procedures.

B. Content for Each Electric or Electronic Item or System:

1. Description of Unit and Component Parts:
    a. Function, normal operating characteristics, and limiting conditions.
    b. Performance curves, engineering data, nameplate data, and tests.
    c. Complete nomenclature and commercial number of replaceable parts.
    d. Interconnection wiring diagrams, including control and lighting systems.
2. Circuit Directories of Panelboards:
3. Electrical service.
4. Control requirements and interfaces.
5. Communication requirements and interfaces.
6. List of electrical relay settings, and control and alarm contact settings.
7. Electrical interconnection wiring diagram, including as applicable, single-line, three-line, schematic and internal wiring, and external interconnection wiring.
8. As-installed control diagrams by control manufacturer.
9. Operating Procedures:
    a. Routine and normal operating instructions.
    b. Startup and shutdown sequences, normal and emergency.
    c. Safety precautions.
    d. Special operating instructions.
10. Maintenance Procedures:
    a. Routine maintenance.
    b. Guide to troubleshooting.
    c. Adjustment and checking.
    d. List of relay settings, control and alarm contact settings.
11. Manufacturer’s printed operating and maintenance instructions.
12. List of original manufacturer’s spare parts, manufacturer’s current prices, and recommended quantities to be maintained in storage.

C. Maintenance Summary:

1. Compile individual Maintenance Summary for each applicable equipment item, respective unit or system, and for components or sub-units.
2. Format:
    a. Use Maintenance Summary Form bound with this section or electronic facsimile of such.
    b. Each Maintenance Summary may take as many pages as required.
    c. Use only 8-1/2-inch by 11-inch size paper.
    d. Complete using typewriter or electronic printing.

3. Include detailed lubrication instructions and diagrams showing points to be greased or oiled; recommend type, grade, and temperature range of lubricants and frequency of lubrication.
4. Recommended Spare Parts:
    a. Data to be consistent with manufacturer's Bill of Materials/Parts List furnished in O&M manuals.
    b. "Unit" is the unit of measure for ordering the part.
    c. "Quantity" is the number of units recommended.
    d. "Unit Cost" is the current purchase price.

1.07 DATA FOR MATERIALS AND FINISHES

A. Content for Architectural Products, Applied Materials, and Finishes:

1. Manufacturer's data, giving full information on products:
    a. Catalog number, size, and composition.
    b. Color and texture designations.
    c. Information required for reordering special-manufactured products.
2. Instructions for Care and Maintenance:
    a. Manufacturer's recommendation for types of cleaning agents and methods.
    b. Cautions against cleaning agents and methods that are detrimental to product.
    c. Recommended schedule for cleaning and maintenance.

B. Content for Moisture Protection and Weather Exposed Products:

1. Manufacturer's data, giving full information on products:
    a. Applicable standards.
    b. Chemical composition.
    c. Details of installation.
2. Instructions for inspection, maintenance, and repair.

1.08 SUPPLEMENTS

A. The supplement listed below, following "End of Section," is part of this Specification.

1. Form: Maintenance Summary Form.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

MAINTENANCE SUMMARY FORM

PROJECT:_____ CONTRACT NO.:_____

1. EQUIPMENT ITEM_____

2. MANUFACTURER _____

3. EQUIPMENT/TAG NUMBER(S) _____

4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS)_____

5. NAMEPLATE DATA (hp, voltage, speed, etc.) _____

6. MANUFACTURER'S LOCAL REPRESENTATIVE _____

   a. Name_____ Telephone No. _____

   b. Address _____

7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	**Frequency**	**Lubricant (If Applicable)**
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

8. LUBRICANT LIST

Reference Symbol	Shell	Exxon Mobile	Chevron Texaco	BP Amoco	Or Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY.

Part No.	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this Contract with two asterisks.				

SECTION 01 91 14
EQUIPMENT TESTING AND FACILITY STARTUP

PART 1 GENERAL

1.01 DEFINITIONS

A. Facility: Entire Project, or an agreed-upon portion, including all its unit processes.

B. Functional Test: Test or tests in presence of Engineer and Owner to demonstrate that installed equipment meets manufacturer's installation, calibration, and adjustment requirements and other requirements as specified.

C. Performance Test: Test or tests performed after any required functional test in presence of Engineer and Owner to demonstrate and confirm individual equipment meets performance requirements specified in individual sections.

D. Unit Process: As used in this section, a unit process is a portion of the facility that performs a specific process function.

E. Facility Performance Demonstration:

1. A demonstration, conducted by Contractor, with assistance of Owner, to demonstrate and document the performance of the entire operating facility, both manually and automatically (if required), based on criteria developed in conjunction with Owner and as accepted by Engineer.
2. Such demonstration is for the purposes of (i) verifying to Owner entire facility performs, and (ii) documenting performance characteristics of completed facility for Owner's records. Neither the demonstration nor the evaluation is intended in any way to make performance of a unit process or entire facility the responsibility of Contractor, unless such performance is otherwise specified.

1.02 SUBMITTALS

A. Informational Submittals:

1. Facility Startup and Performance Demonstration Plan.
2. Functional and performance test results.
3. Completed Unit Process Startup Form for each unit process.
4. Completed Facility Performance Demonstration/Certification Form.

1.03 FACILITY STARTUP AND PERFORMANCE DEMONSTRATION PLAN

A. Develop a written plan, in conjunction with Owner's operations personnel; to include the following:

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Facility Startup Meetings: Schedule, in accordance with requirements of Section 01 31 19, Project Meetings, to discuss test schedule, test methods, materials, chemicals and liquids required, facilities operations interface, and Owner involvement.

B. Contractor's Testing and Startup Representative:

1. Designate and furnish one or more personnel to coordinate and expedite testing and facility startup.
2. Representative(s) shall be present during startup meetings and shall be available at all times during testing and startup.

C. Provide temporary valves, gauges, piping, test equipment and other materials and equipment required for testing and startup.

D. Provide Subcontractor and equipment manufacturers' staff adequate to prevent delays. Schedule ongoing work so as not to interfere with or delay testing and startup.

E. Owner will:

1. Provide water, power, chemicals, and other items as required for startup, unless otherwise indicated.
2. Operate process units and facility with support of Contractor.
3. Provide labor and materials as required for laboratory analyses.

3.02 EQUIPMENT TESTING

A. Preparation:

1. Complete installation before testing.
2. Furnish qualified manufacturers' representatives, when required by individual Specification sections.
3. Obtain and submit from equipment manufacturer's representative Manufacturer's Certificate of Proper Installation Form, in accordance with Section 01 43 33, Manufacturers' Field Services, when required by individual Specification sections.
4. Equipment Test Report Form: Provide written test report for each item of equipment to be tested, to include the minimum information:
    a. Owner/Project Name.
    b. Equipment or item tested.
    c. Date and time of test.
    d. Type of test performed (Functional or Performance).
    e. Test method.
    f. Test conditions.
    g. Test results.
    h. Signature spaces for Contractor and Engineer as witness.
5. Cleaning and Checking: Prior to beginning functional testing:
    a. Calibrate testing equipment in accordance with manufacturer's instructions.
    b. Inspect and clean equipment, devices, connected piping, and structures to ensure they are free of foreign material.
    c. Lubricate equipment in accordance with manufacturer's instructions.
    d. Turn rotating equipment by hand when possible to confirm that equipment is not bound.
    e. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.

f. Check power supply to electric-powered equipment for correct voltage.
g. Adjust clearances and torque.
h. Test piping for leaks.

6. Ready-to-test determination will be by Owner based at least on the following:
   a. Acceptable Operation and Maintenance Data.
   b. Notification by Contractor of equipment readiness for testing.
   c. Receipt of Manufacturer's Certificate of Proper Installation, if so specified.
   d. Adequate completion of work adjacent to, or interfacing with, equipment to be tested, including items to be furnished by Owner.
   e. Availability and acceptability of manufacturer's representative, when specified, to assist in testing of respective equipment.
   f. Satisfactory fulfillment of other specified manufacturer's responsibilities.
   g. Equipment and electrical tagging complete.
   h. Delivery of all spare parts and special tools.

B. Functional Testing:

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

C. Performance Testing:

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

3.03 STARTUP OF UNIT PROCESSES

A. Prior to unit process startup, equipment within unit process shall be accepted by Engineer as having met functional and performance testing requirements specified.

B. Adjust, repairs, and corrections necessary to complete unit process startup.

C. Startup shall be considered complete when, in opinion of Owner, unit process has operated in manner intended for 5 continuous days without significant interruption. This period is in addition to functional or performance test periods specified elsewhere.

D. Significant Interruption: May include any of the following events:

1. Failure of Contractor to provide and maintain qualified onsite startup personnel as scheduled.
2. Failure to meet specified functional operation for more than 2 consecutive hours.
3. Failure of any critical equipment or unit process that is not satisfactorily corrected within 5 hours after failure.
4. Failure of any noncritical equipment or unit process that is not satisfactorily corrected within 8 hours after failure.
5. As determined by Engineer.

E. A significant interruption will require startup then in progress to be stopped. After corrections are made, startup test period to start from beginning again.

3.04 FACILITY PERFORMANCE DEMONSTRATION

A. When, in the opinion of Engineer, startup of all unit processes has been achieved, sequence each unit process to the point that facility is operational.

B. Demonstrate proper operation of required interfaces within and between individual unit processes.

C. After facility is operating, complete performance testing of equipment and systems not previously tested.

D. Document, as defined in Facility Startup and Performance Demonstration Plan, the performance of the facility.

E. Certify, on the Facility Performance Demonstration/Certification Form, that facility can perform its intended function(s), including fully automatic operation.

3.05 SUPPLEMENTS

A. Supplements listed below, following "End of Section," are a part of this Specification:

1. Unit Process Startup Form.
2. Facility Performance Demonstration/Certification Form.

END OF SECTION

UNIT PROCESS STARTUP FORM

OWNER: _____ **PROJECT:** _____

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

_____

_____

_____

_____

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

_____

_____

_____

_____

_____

Startup Requirements (Water, power, chemicals, etc.): _____

_____

_____

Evaluation Comments: _____

_____

_____

_____

FACILITY PERFORMANCE DEMONSTRATION/CERTIFICATION FORM

OWNER:_____ **PROJECT:**_____

Unit Processes Description (List unit processes involved in facility startup):

_____

_____

_____

_____

Unit Processes Startup Sequence (Describe sequence for startup, including computerized operations, if any):

_____

_____

_____

_____

_____

Contractor Certification that Facility can perform its intended function(s), including fully automatic operation:

Contractor: _____ **Date:** _____**, 20**____

Engineer: _____ **Date:** _____**, 20**____

(Authorized Signature)

SECTION 03 30 10
STRUCTURAL CONCRETE

PART 1 GENERAL

1.01 GENERAL

A. Work shall conform to requirements of ACI 301-16, Specifications for Structural Concrete, unless otherwise specified.

1.02 SUBMITTALS

A. Shop Drawings:

1. Bending lists and placing drawings of reinforcing steel prepared in accordance with CRSI Manual of Standard Practice and ACI SP-66 Detailing Manual:
2. Mix Design:
    a. Documentation of average strength for proposed mix design in accordance with ACI 301.
    b. Test Reports:
        1) Cement: Chemical analysis report.
        2) Supplementary Cementitious Materials: Chemical analysis report and report of other specified test analyses.
    c. Aggregates:
        1) Deleterious substances in fine aggregate per ASTM C33/C33M, Table 2.
        2) Deleterious substances in coarse aggregate per ASTM C33/C33M, Table 4.
    d. Admixtures: Manufacturer’s product data sheets for each admixture used in proposed mix designs.
3. Statement of Qualification:
    a. Batch Plant: Certification as specified herein.
    b. Mix designer.
    c. Installer.
    d. Mix designer.
    e. Testing agency.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Batch Plant: NRMCA Program for Certification of Ready-Mixed Concrete Production Facilities or approved equivalent program.
2. Testing Agency: Unless otherwise permitted, an independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.

PART 2 PRODUCT

2.01 CONCRETE

A. Materials:

1. Cementitious Materials:
   a. Cement: Portland Cement: Unless otherwise specified, conform to requirements of ASTM C150/C150M.
   b. Fly ash:
      1) Use of fly ash is optional. Fly ash content shall be a minimum of 15 percent and maximum of 20 percent of weight of total cementitious materials. Combine fly ash with cement at rate of 1.0 lb fly ash/lb in reduction in cement.
      2) Fly Ash (Pozzolan): Class F fly ash in accordance with ASTM C618, except as modified herein:
         a) ASTM C618, Table 1, Loss on Ignition: Unless permitted otherwise, maximum 3 percent.
2. Aggregates: Unless otherwise permitted, furnish from one source for each aggregate type used in a mix design.
   a. Aggregates:
      1) In accordance with ASTM C33/C33M, except as modified herein.
         a) Class Designation: 4M unless otherwise specified.
      2) Fine Aggregates:
         a) Clean, sharp, natural sand.
         b) ASTM C33/C33M.
         c) Limit deleterious substances in accordance with ASTM C33/C33M, Table 2 and as follows:
            (1) Limit material finer than 75-µm (No. 200) sieve to 3 percent mass of total sample.
            (2) Limit coal and lignite to 0.5 percent.

3) Coarse Aggregate:
   a) Natural gravels, combination of gravels and crushed gravels, crushed stone, or combination of these materials containing no more than 15 percent flat or elongated particles (long dimension more than five times the short dimension).
   b) Limit deleterious substances in accordance with ASTM C33/C33M, Table 4 for specified class designation.

3. Admixtures: Unless otherwise permitted, furnish from one manufacturer.
   a. Air-Entraining Admixture: ASTM C260/C260M.
   b. Water-Reducing Admixture: ASTM C494/C494M, Type A or Type D.
   c. Retarding Admixture: ASTM C 494/C 494M, Type B.
   d. Accelerating Admixture: ASTM C 494/C 494M, Type C.
   e. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F or Type G.
   f. Plasticizing Admixture: ASTM C1017/C1017M, Type I or Type II.
   g. Do not use calcium chloride as an admixture.
4. Water and Ice: Mixing water for concrete and water used to make ice shall be potable water.

B. Concrete Mix Design:

1. Exposure Categories and Classifications: F0S1P1C1.
2. Mix Properties:
   a. Minimum concrete compressive strength (f'c) shall be 4,500 psi at 28 days.
   b. Limit water to cementitious materials ratio (W/Cm) in mix design to maximum value of 0.45.
   c. Air content: 3 percent ± 1.5 percent.
3. Desired fresh properties of concrete shall be determined by Contractor, and coordinated with concrete producer. Fresh properties of concrete shall remain stable to satisfaction of Contractor, for duration of placement and consolidation.
4. Potential alkali-aggregate reactivity of concrete: Do not use aggregates known to be susceptible to alkali-carbonate reaction (ACR).
5. Slump:
   a. Selected target slump shall not exceed 9 inches.
   b. Determine slump by ASTM C143/C143M.
   c. Slump tolerances shall meet the requirements of ACI 117.
   d. Design mixes that include a high-range, water-reducing admixture and shall have a minimum slump of 2 inches prior to addition of

admixture. Unless otherwise permitted, slump shall be 8 inches maximum at point of delivery, for concrete with a high-range, water-reducing admixture.

2.02 REINFORCING STEEL

A. Deformed Steel Reinforcing Bars: ASTM A615/A615M, Grade 60. Welding of reinforcing bars is not permitted.

B. Fabrication: Follow CRSI Manual of Standard Practice.

C. Unless otherwise specified, place reinforcing steel in accordance with CRSI Recommended Practice for Placing Reinforcing Bars.

D. Splices and Laps:

1. Lap splice reinforcing: Refer to Structural General Notes in Drawings for additional information.
2. Tie splices with 18-gauge annealed wire as specified in CRSI Standard.

2.03 ANCILLARY MATERIALS

A. Bonding Agent: Unless otherwise specified, in accordance with the following:

1. ASTM C881/C881M, Type V.
2. Two-component, moisture insensitive, 100 percent solids epoxy.
3. Consult manufacturer for surface finish, pot life, set time, vertical or horizontal application, and forming restrictions.

B. Bond Breaker: Nonstaining type, providing positive bond prevention.

C. Tie Wire: Black, soft-annealed 16-gauge wire. Nylon-, epoxy-, or plastic-coated wire.

D. Bar Supports and Spacers:

1. Use precast concrete bar supports for supporting reinforcing off grade.
2. Use all plastic or stainless steel supports for side form spacers.

E. Premolded Joint Filler: Bituminous Type: ASTM D994 or ASTM D1751.

F. Curing Compound: Water-based, high-solids content, nonyellowing, curing compound meeting requirements of ASTM C1315 Type I, Class A.

G. Nonshrink Grout:

1. Nonmetallic, nongas-liberating.

2. Prepackaged natural aggregate grout requiring only the addition of water.
3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.
4. Manufacturers and Products:
    a. BASF Building Systems, Inc., Shakopee, MN; MasterFlow 928.
    b. Five Star Products Inc., Fairfield, CT; Five Star Fluid Grout 100.
    c. Euclid Chemical Co., Cleveland, OH; Hi Flow Grout.
    d. Dayton Superior Corp., Miamisburg, OH; Sure Grip High Performance Grout.

H. Repair Mortar:

1. Repair mortar shall be Site mixed.
2. Manufacturers and Products:
    a. BASF Building Systems Inc., Shakopee, MN; MasterEmaco S-Series products.
    b. Sika Chemical Corp., Lyndhurst, NJ; SikaTop-Series.

I. Pourable Joint Fillers:

1. Although product is a sealant, it is being specified as a filler to prevent debris accumulation and allow expansion and contraction under shrinkage and thermal loads. It does not need to meet proportional sealant geometry requirements.
2. For Potable Water Containment structures, meet requirements of NSF 61.
3. Multicomponent sealant, self-leveling or nonsag as required for level, sloping, or vertical joints.
    a. Color: White.
    b. Manufacturer and Product: Sika Corp., Lyndhurst, NJ; Sikaflex 2c.

PART 3 EXECUTION

3.01 FORMWORK

A. Contractor is responsible for formwork design.

B. Form Construction:

1. For exposed areas, use hard plastic finished plywood, overlaid waterproof particle board, or steel in “new and undamaged” condition, of sufficient strength and surface smoothness to produce specified finish.
2. For unexposed areas, use new shiplap or plywood.
3. Construct forms and provide smooth-form finish.
4. Form 3/4-inch bevels at concrete edges, unless otherwise shown.

C. Form Ties:

1. Material: Steel.
2. Spreader Inserts:
   a. Conical or spherical type.
   b. Design to maintain positive contact with forming material.
   c. Furnish units that will leave no metal closer than 1.5 inches to concrete surface when forms, inserts, and tie ends are removed.
3. Wire ties not permitted.

3.02 CONCRETE PLACEMENT INTO FORMWORK

A. Inspection: Notify Engineer and Inspector at least one work day in advance before starting to place concrete.

B. Placement into Formwork:

1. Place concrete as soon as possible after leaving mixer, without segregation or loss of ingredients, without splashing forms or steel above, and in layers not over 1.5 feet deep, except for slabs that shall be placed full depth. Place and consolidate successive layers prior to initial set of first layer to prevent cold joints.
2. Placement frequency shall be such that lift lines will not be visible in exposed concrete finishes.

3.03 COLD WEATHER PLACEMENT

A. Shall be in accordance with requirements of ACI 301 and ACI 306.1.

3.04 HOT WEATHER PLACEMENT

A. Shall be in accordance with ACI 301 and ACI 305.1.

3.05 CONCRETE BONDING

A. Construction Joints at Existing Concrete:

1. Thoroughly clean and roughen existing concrete surfaces to roughness profile of 1/4 inch.
2. Saturate surface with water for 24 hours prior to placing new concrete.

3.06 FINISHING FORMED SURFACES

A. Provide surface finish 2.0 (SF-2.0) in accordance with ACI 301 and as herein specified.

B. Tie Holes: Fill with specified repair material. Prepare substrate and mix, place, and cure repair material per manufacturer's written recommendations.

3.07 FINISHING UNFORMED SURFACES

A. Slab: Float finish.

1. Use magnesium or aluminum hand floats or power floats with slip on float shoes.
2. Float finish shall result in uniform smooth granular texture.

B. Stair: Float and broom finish. Use fine, soft-bristled broom and broom at right angles to direction of traffic.

C. Formed surfaces: Ordinary finish.

1. Patch honey combing, stone pockets, form ties, spalls, and other irregularities with repair mortar.
2. Where joint marks or fins exceed 1/4 inch, grind smooth.

3.08 PROTECTION AND CURING

A. Protect and cure concrete in accordance with requirements of ACI 301, ACI 308.1, and as follows:

1. Protect fresh concrete from direct rays of sunlight, drying winds, and wash by rain.
2. Cure formed surfaces with curing compound applied in accordance with manufacturer's written instructions as soon as forms are removed and finishing is completed.
3. Remove and replace concrete damaged by freezing.
4. Repair areas damaged by construction, using specified repair materials and approved repair methods.

3.09 BACKFILL AGAINST STRUCTURES

A. Do not backfill against walls until concrete has obtained specified 28-day compressive strength.

3.10 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

A. General:

1. Contractor-Furnished Quality Control: Inspection and testing as required in Section 01 45 16.13, Contractor Quality Control.
2. Provide adequate facilities for safe storage and proper curing of concrete test specimens onsite for first 24 hours, and for additional time as may be required before transporting to test lab.

3. Unless otherwise specified, sample concrete for testing for making test specimens, from point of delivery. For pumped concrete, sample concrete for testing at point of discharge.
4. Evaluation will be in accordance with ACI 301 and Specifications except as modified herein:
    a. Obtain one composite sample for each 50 cubic yards of concrete, minimum of one per day if less than 50 cubic yards of concrete.
    b. For every truck, test slump of samples taken per ASTM C94/ C94M, paragraph 12.5.1. Where specified slump is more than 4 inches, and if slump tests differ by more than 2 inches, discontinue use of truck mixer, unless causing condition is corrected and satisfactory performance is verified by additional slump tests.
5. Test specimens shall be made, cured, and tested in accordance with ASTM C31/C31M and ASTM C39/C39M.

B. Concrete Strength Test:

1. Unless otherwise specified, one specimen at age of 7 days for information, and two 6-inch diameter or when permitted three 4-inch diameter test specimens at age of 28 days for acceptance.
2. If result of 7-day concrete strength test is less than 50 percent of specified 28-day strength, extend period of moist curing by 7 additional days.
3. Provide a minimum of one spare test specimen per sample. Test spare cylinder as directed by Engineer.

END OF SECTION

SECTION 03 63 00
CONCRETE DOWELING

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. American National Standards Institute (ANSI).
2. ASTM International (ASTM):
   a. C881/C881M, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
   b. E488, Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
3. International Code Council (ICC):
   a. Florida Building Code 6th Edition (2017).
   b. Evaluation Services Reports.
4. NSF International (NSF): 61, Drinking Water System Components – Health Effects.

1.02 DEFINITIONS

A. ICC Evaluation Services Report: Published by ICC for products provided by concrete adhesive anchor manufacturers.

1.03 SUBMITTALS

A. Action Submittals:

1. Product Data: Manufacturer’s catalog information.

B. Informational Submittals:

1. Manufacturer’s instructions for preparation, placement, drilling of holes, installation of anchors and adhesive, and handling of cartridges, nozzles, and equipment.
2. Manufacturer’s written letter of certification identifying installer’s qualifications to install products.
3. ICC Evaluation Services Report: Specific to proposed doweling system manufacturer.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: At least three similar projects with same products within last 3 years.
2. Installer: Trained and certified by manufacturer.

B. Regulatory Requirements: Adhesive shall be certified as meeting NSF 61 for use in potable water structures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Container Markings: Include manufacturer's name, product name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.

B. Store adhesive components in accordance with manufacturer's written instructions.

C. Dispose of when:

1. Shelf life has expired.
2. Stored other than per manufacturer's instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Adhesive:

1. Approved by an ICC Evaluation Services Report for conformance to 2015 IBC requirements for doweling of steel reinforcing bars in cracked concrete.
2. Suitable for long-term loads as well as for wind and seismic loads.
3. Meet requirements of ASTM C881/C881M.
4. Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments.
5. Disposable, Self-Contained Cartridge System:
   a. Capable of dispensing both components in proper mixing ratio.
   b. Fit into manually or pneumatically operated caulking gun.
6. Mixed Adhesive: Nonsag, light paste consistency with ability to remain in a 1-inch diameter overhead drilled hole without runout.
7. Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.

8. Potable Water Structures: Adhesive shall be acceptable for use by NSF 61.
9. Manufacturers and Products:
    a. Hilti, Inc., Tulsa, OK; HIT-RE 500-SD (ESR-2322) or HIT-HY 200 (ESR-3187) Adhesive Anchors.
    b. Powers Fasteners, Brewster, NY; Power PURE110+ Epoxy Adhesive Anchor System (ESR-3298).
    c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; SET-XP Epoxy Adhesive Anchors (ESR-2508).

B. Mixing Nozzles:

1. Disposable, manufactured in several sizes to accommodate size of reinforcing dowels.
2. Nonremovable internal static mixer required to ensure proper blending of components.

PART 3 EXECUTION

3.01 INSTALLATION

A. Drilling Equipment:

1. Drilling Hammers for Dowel Holes:
    a. Electric or pneumatic rotary type with medium or light impact.
    b. Hollow drills with flushing air systems are preferred.
2. Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.

B. Hole Diameter: Use drill bit diameter meeting ICC Evaluation Services Report requirements and as recommended by manufacturer.

C. Obstructions in Drill Path: When existing steel reinforcement is encountered during drilling, obtain Engineer approval for proposed fix.

D. Doweling:

1. Install per details shown on Drawings and in accordance with adhesive manufacturer’s instructions.
2. When using epoxy anchors, dowels may be prebent prior to installation to 15 degrees to align with other bars. Do not heat dowels to bend.
3. Bent Bar Dowels: Where edge distances are critical, and intersection with steel reinforcement is likely, drill hole at 10-degree angle or less and use prebent reinforcing bars.

E. Adhesive:

1. Install in accordance with written manufacturer's instructions.
2. Dispense components through specially designed static mixing nozzle that thoroughly mixes components and places mixed adhesive at base of predrilled hole.
3. Dispensing, Metering, and Mixing Adhesive Components: Use portable, automatic metering and mixing device or machine capable of maintaining prescribed mix ratio within deviation of 5 percent or less, by volume.

3.02 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

A. Contractor-Furnished Quality Control: Inspection and testing as required in Section 01 45 16.13, Contractor Quality Control.

END OF SECTION

SECTION 05 05 19
POST-INSTALLED ANCHORS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI):
   a. 318, Building Code Requirements for Structural Concrete.
   b. 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete.
   c. 355.4, Qualification of Post-Installed Adhesive Anchors in Concrete.
2. American Iron and Steel Institute (AISI): Stainless Steel Type 316.
3. American National Standards Institute (ANSI).
4. ASTM International (ASTM):
   a. A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   b. A143, Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
   c. A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   d. A193/A193M, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
   e. A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
   f. A380, Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
   g. A385, Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
   h. A563, Specification for Carbon and Alloy Steel Nuts.
   i. A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
   j. A967, Specification for Chemical Passivation Treatments for Stainless Steel Parts.
   k. E488, Standard Test Methods for Strength of Anchors in Concrete Elements.
   l. F436, Specification for Hardened Steel Washers.
   m. F468, Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.

n. F568M, Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners.
o. F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
p. F594, Specification for Stainless Steel Nuts.
q. F1554, Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

5. International Code Council Evaluation Service (ICC-ES):
   a. Evaluation Reports for Concrete.
   b. AC70, Acceptance Criteria for Fasteners Power-driven into Concrete, Steel and Masonry Elements.
   c. AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
   d. AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements. Evaluation Reports for Concrete and Masonry Anchors.
6. NSF International (NSF): 61, Drinking Water System Components - Health Effects.
7. Specialty Steel Industry of North America (SSINA):
   a. Specifications for Stainless Steel.
   b. Design Guidelines for the Selection and Use of Stainless Steel.
   c. Stainless Steel Fabrication.
   d. Stainless Steel Fasteners.

1.02 DEFINITIONS

A. Corrosive Area: Containment area or area exposed to delivery, storage, transfer, or use of chemicals.

B. Exterior Area: Location not protected from weather by a building or other enclosed structure to include buried roof structures.

C. Interior Dry Area: Location inside building or structure where floor is not subject to liquid spills or wash down, and where wall or roof slab is not common to a water-holding or earth-retaining structure.

D. Interior Wet Area: Location inside building or structure where floor is sloped to floor drains or gutters and is subject to liquid spills or wash down, or where wall, floor, or roof slab is common to a water-holding or earth-retaining structure.

E. Submerged: Location at or below top of wall of open water-holding structure, such as a basin or channel, or wall, ceiling, or floor surface inside a covered water-holding structure, or exterior below grade wall or roof surface of water-holding structure, open or covered.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Specific instructions for concrete anchor installation, including drilled hole size and depth, preparation, placement, procedures, and instructions for safe handling of anchoring systems.

B. Informational Submittals:

1. Concrete Anchors:
   a. Manufacturer's product description and installation instructions.
   b. Current ICC-ES or IAPMO-UES Report for each type of post-installed anchor to be used.
   c. Adhesive Anchor Installer Certification.
2. Passivation method for stainless steel members.
3. Hot-Dip Galvanizing: Certificate of Compliance signed by galvanizer, with description of material processed and ASTM standard used for coating.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Installers of adhesive anchors horizontally or upwardly inclined to support sustained tension loads shall be certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Installer Certification Program or equivalent.
2. Galvanized Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following procedures of Quality Assurance Manual of the American Galvanizers Association.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package stainless steel items in a manner to provide protection from carbon impregnation.

B. Protect hot-dip galvanized finishes from damage as a result of metal banding and rough handling.

PART 2 PRODUCTS

2.01 GENERAL

A. Unless otherwise indicated, meet the following requirements:

Item	ASTM Reference
Stainless Steel:	
Threaded Rods	F593, AISI Type 316, Condition CW
Nuts*	F594, AISI Type 316, Condition CW
Carbon Steel:	
Threaded Rods	A193/A193M, Grade B7
Flat and Beveled Washers (Hardened)	F436
Nuts*	A194/A194M, Grade 2H
Galvanized Steel:	
All	A153/A153M
*Nuts of other grades and styles having specified proof load stresses greater than specified grade and style are also suitable. Nuts must have specified proof load stresses equal to or greater than minimum tensile strength of specified threaded rod.	

B. Bolts, Washers, and Nuts: Use stainless steel, hot-dip galvanized steel, and zinc-plated steel material types as indicated in Fastener Schedule at end of this section.

2.02 POST-INSTALLED CONCRETE ANCHORS

A. General:

1. AISI Type 316 stainless, hot-dip galvanized or zinc-plated steel, as shown in Fastener Schedule at end of this section.
2. Post-installed anchor systems used in concrete shall be approved by ICC Evaluation Services Report or equivalent for use in cracked concrete and for short-term and long-term loads including wind and earthquake.

3. Mechanical Anchors: Comply with the requirements of ICC-ES AC193 or ACI 355.2.
4. Adhesive Anchors: Comply with the requirements of ICC-ES AC308 or ACI 355.4.
5. Acceptable for use in potable water structures by EPA and local health agencies or NSF 61.

B. Torque-Controlled Expansion Anchors (Wedge Anchors):

1. Manufacturers and Products:
   a. Hilti, Inc., Tulsa, OK; Kwik-Bolt –TZ (KB-TZ) Anchors (ESR-1917).
   b. DeWalt/Powers Fasteners, Brewster, NY; Power-Stud +SD1, +SD2, +SD4, or +SD6 Anchors (ESR-2502 and ESR-2818).
   c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Strong-Bolt 2 Anchors (ESR-1771 and ESR-3037).

C. Undercut Anchors:

1. Manufacturers and Products:
   a. USP Structural Connectors, Burnsville, MN; DUC Undercut Anchor (ESR-1970).
   b. Hilti, Inc., Tulsa, OK; HDA Undercut Anchor (ESR-1546).
   c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; TORQ-CUT Self-Undercutting Anchor (ESR-2705).
   d. DeWalt/Powers Fasteners, Brewster, NY; Atomic+ Undercut Anchor (ESR-3067).

D. Self-Tapping Concrete Screw Anchors:

1. Manufacturers and Products:
   a. DeWalt/Powers Fasteners, Brewster, NY; Wedge-Bolt+ (ESR-2526).
   b. DeWalt/Powers Fasteners, Brewster, NY; Vertigo+ Rod Hanger Screw Anchor (ESR-2989).
   c. DeWalt/Powers Fasteners, Brewster, NY; Snake+ Flush Mount Screw Anchor (ESR-2272).
   d. Hilti, Inc., Tulsa, OK; HUS-EZ Screw Anchor (ESR-3027).
   e. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Titen HD Screw Anchor (ESR-2713).

E. Adhesive Anchors:

1. Threaded Rod:
   a. Diameter as shown on Drawings.
   b. Length as required to provide minimum depth of embedment indicated and thread projection required.
   c. Clean and free of grease, oil, or other deleterious material.
2. Adhesive:
   a. Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments.
   b. Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.
3. Packaging and Storage:
   a. Disposable, self-contained system capable of dispensing both components in proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
   b. Store adhesive on pallets or shelving in a covered storage area.
   c. Package Markings: Include manufacturer's name, product name, batch number, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
   d. Dispose of When:
      1) Shelf life has expired.
      2) Stored other than in accordance with manufacturer's instructions.
4. Manufacturers and Products:
   a. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System, HIT RE 500 V3 (ESR-3814), or HIT-HY 200 (ESR-3187).
   b. Simpson Strong-Tie Co., Inc., Pleasanton, CA; SET-XP Epoxy Adhesive Anchors (ESR-2508), or AT-XP Adhesive Anchors (IAPMO UES-263).
   c. DeWalt/Powers Fasteners, Brewster NY; Pure 110+ Epoxy adhesive anchor system (ESR-3298).

F. Adhesive Threaded Inserts:

1. Type 316 stainless steel, internally threaded inserts.
2. Manufacturer and Product: Hilti, Inc., Tulsa, OK; HIS-RN Insert with HIT-RE 500-V3 or HIT-HY 200 adhesive.

PART 3 EXECUTION

3.01 CONCRETE ANCHORS

A. Begin installation only after concrete to receive anchors has attained design strength.

B. Locate existing reinforcing with Ground Penetrating Radar or other method approved by Engineer prior to drilling. Coordinate with Engineer to adjust anchor locations where installation would result in hitting reinforcing.

C. Install in accordance with written manufacturer's instructions.

D. Provide minimum embedment, edge distance, and spacing as indicated on Drawings.

E. Use only drill type and bit type and diameter recommended by anchor manufacturer.

F. Clean hole of debris and dust per manufacturer's requirements.

G. When unidentified embedded steel, rebar, or other obstruction is encountered in drill path, slant drill to clear obstruction. If drill must be slanted more than indicated in manufacturer's installation instructions to clear obstruction, notify Engineer for direction on how to proceed.

H. Adhesive Anchors:

1. Unless otherwise approved by Engineer and adhesive manufacturer:
   a. Do not install adhesive anchors when temperature of concrete or masonry is below 40 degrees F or above 100 degrees F.
   b. Do not install prior to concrete attaining an age of 21 days.
   c. Remove any standing water from hole with oil-free compressed air. Inside surface of hole shall be dry.
   d. Do not disturb anchor during recommended curing time.
   e. Do not exceed maximum torque as specified in manufacturer's instructions.

3.02 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

A. Contractor-Furnished Quality Control: Inspection and testing as required in Section 01 45 16.13, Contractor Quality Control.

3.03 MANUFACTURER'S SERVICES

A. Adhesive and Mechanical Anchors: Conduct Site training of installation personnel for proper installation, handling, and storage of adhesive anchor system. Notify Engineer of time and place for sessions.

3.04 FASTENER SCHEDULE

A. Unless indicated otherwise on Drawings, provide fasteners as follows:

Service Use and Location	Product	Remarks
1. Post-Installed Anchors for Metal Components to Cast-in-Place Concrete (such as, Ladders, Handrail Posts, Electrical Panels, Platforms, and Equipment)		
All Areas not noted otherwise	Stainless steel anchors	Verify product acceptability and manufacturer's requirements if anchor installation will occur in an overhead application
Submerged, Exterior, Interior Wet, and Corrosive Areas	Stainless steel adhesive anchors	Verify product acceptability and manufacturer's requirements if anchor installation will occur in an overhead application
2. All Others		
All service uses and locations	Stainless steel fasteners	

B. Antiseizing Lubricant: Use on all stainless steel threads.

C. Do not use adhesive anchors to support fire-resistive construction or where ambient temperature will exceed 120 degrees F.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. The Aluminum Association, Inc. (AA): The Aluminum Design Manual.
2. American Galvanizers Association (AGA):
   a. Inspection of Hot-Dip Galvanized Steel Products.
   b. Quality Assurance Manual.
3. American Institute of Steel Construction (AISC):
   a. 201, Certification Program for Structural Steel Fabricators.
   b. 206, Certification Program for Structural Steel Erectors—Standard for Structural Steel Erectors.
   c. 303, Code of Standard Practices for Steel Buildings and Bridges.
   d. 325, Steel Construction Manual.
   e. 326, Detailing for Steel Construction.
   f. 341, Seismic Provisions for Structural Steel Buildings.
   g. 360, Specification for Structural Steel Buildings.
   h. 420, Certification Standard for Shop Application of Complex Protective Coating Systems.
4. American Iron and Steel Institute (AISI): Stainless Steel Types.
5. American National Standards Institute (ANSI).
6. American Society of Safety Engineers (ASSE): A10.11, Safety Requirements for Personnel and Debris Nets.
7. American Welding Society (AWS):
   a. D1.1/D1.1M, Structural Welding Code - Steel.
   b. D1.2/D1.2M, Structural Welding Code - Aluminum.
   c. D1.6/D1.6M, Structural Welding Code - Stainless Steel.
8. ASTM International (ASTM):
   a. A36/A36M, Standard Specification for Carbon Structural Steel.
   b. A48/A48M, Specification for Gray Iron Castings.
   c. A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   d. A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
   e. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   f. A143/A143M, Standard for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

g. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
h. A193/A193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
i. A194/A194M, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
j. A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
k. A276, Standard Specification for Stainless Steel Bars and Shapes.
l. A283/A283M, Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
m. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
n. A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
o. A384/A384M, Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
p. A385/A385M, Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
q. A489, Standard Specification for Carbon Steel Lifting Eyes.
r. A500/A500M, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
s. A501, Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
t. A563, Standard Specification for Carbon and Alloy Steel Nuts.
u. A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
v. A780/A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
w. A786/A786M, Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
x. A793, Standard Specification for Rolled Floor Plate, Stainless Steel.
y. A967, Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts.
z. A992/A992M, Standard Specification for Structural Steel Shapes.

aa. A1085, Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
bb. B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
cc. B308/B308M, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
dd. B429/B429M, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
ee. B632/B632M, Standard Specification for Aluminum-Alloy Rolled Tread Plate.
ff. C881/C881M, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
gg. D1056, Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
hh. F436, Standard Specification for Hardened Steel Washers.
ii. F468, Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
jj. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
kk. F594, Standard Specification for Stainless Steel Nuts.
ll. F844, Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.
mm. F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
nn. F3125, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

9. NSF International (NSF): 61, Drinking Water System Components—Health Effects.
10. Specialty Steel Industry of North America (SSINA):
    a. Specifications for Stainless Steel.
    b. Design Guidelines for the Selection and Use of Stainless Steel.
    c. Stainless Steel Fabrication.
    d. Stainless Steel Fasteners.

1.02 DEFINITIONS

A. Anchor Bolt: Cast-in-place anchor; concrete or masonry.

B. Corrosive Area: Containment area or area exposed to delivery, storage, transfer, or use of chemicals. Corrosive area includes areas exposed to corrosive atmosphere such as hydrogen sulfide from wastewater.

C. Exterior Area: Location not protected from weather by building or other enclosed structure.

D. Interior Dry Area: Location inside building or structure where floor is not subject to liquid spills or washdown, nor where wall or roof slab is common to a water-holding or earth-retaining structure.

E. Interior Wet Area: Location inside building or structure where floor is sloped to floor drains or gutters and is subject to liquid spills or washdown, or where wall, floor, or roof slab is common to a water-holding or earth-retaining structure.

F. Submerged: Location at or below top of wall of open water-holding structure, such as basin or channel, or wall, ceiling or floor surface inside a covered water-holding structure, or exterior belowgrade wall or roof surface of water-holding structure, open or covered.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Metal fabrications, including welding and fastener information.
2. Samples: Color samples of abrasive stair nosings.

B. Informational Submittals:

1. U-Channel Concrete Inserts:
   a. Manufacturer’s product description.
   b. Allowable load tables.
2. Passivation method for stainless steel members.
3. Galvanized coating applicator qualifications.
4. Hot-Dip Galvanizing: Certificate of compliance signed by galvanizer, with description of material processed and ASTM standard used for coating.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Galvanized Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following procedures of Quality Assurance Manual of the American Galvanizers Association.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Insofar as practical, factory assemble specified items. Package assemblies, which have to be shipped unassembled to protect materials from damage and tag to facilitate identification and field assembly.

B. Package stainless steel items to provide protection from carbon impregnation.

C. Protect painted coatings and hot-dip galvanized finishes from damage as a result of metal banding and rough handling. Use padded slings and straps.

D. Store fabricated items in dry area, not in direct contact with ground.

PART 2 PRODUCTS

2.01 GENERAL

A. For hot-dip galvanized steel that is exposed to view and does not receive paint, limit the combined phosphorus and silicon content to 0.04 percent. For steels that require a minimum of 0.15 percent silicon (such as plates over 1.5 inches thick for ASTM A36/A36M steel), limit maximum silicon content to 0.21 percent and phosphorous content to 0.03 percent.

B. Unless otherwise indicated, meet the following requirements:

Item	**ASTM Reference**
Aluminum – Plates and Shapes:	
Plates	B209, Alloy 6061-T6
Shapes	B308/B308M, Alloy 6061-T6
Aluminum – Fasteners:	
Bolts	F468, Alloy 2024-T4
Nuts	F467, Alloy 2024-T4
Washers	
Cast Iron:	
Cast Iron:	A48/A48M, Class 35
Stainless Steel – Plates and Shapes:	
Angles and Bars	A276, AISI Type 316 (316L for welded connections), 30 kips per square inch minimum yield stress
Plate, Sheet, and Strip	A240/A240M, AISI Type 316 (316L for welded connections), 30 kips per square inch minimum yield stress
Shapes – Rolled	A276, AISI Type 304 (304L for welded connections), 30 kips per square inch minimum yield stress A1069 (Laser-fused process), 30 kips per square inch minimum yield stress

Item	ASTM Reference
Stainless Steel – Anchors and Fasteners:	
Anchor Bolts and Rods	F593, AISI Type 316, Group 2 Condition CW
Bolts	F593, AISI Type 316, Group 2 Condition CW
Nuts	F594, AISI Type 316, Condition CW
Threaded Rods	F593, AISI Type 316, Group 2 Condition CW
Washers	
Steel – Plates and Shapes:	
Hollow Structural Sections (HSS) – Round	A1085
Hollow Structural Sections (HSS) – Square and Rectangular	A1085
Pipe	A53/A53M, Grade B
Plates and Other Shapes	A36/A36M or A572/A572M, Grade 50 or A992/A992M for other steel shapes
Wide Flange Shapes	A992/992M
Steel – Anchors and Fasteners:	
Anchor Bolts and Rods	F1554, Grade 36, with weldability supplement S1.
Bolts	A307
High-Strength Bolts	F3125, Type 1
Eyebolts	A489
Flat Washers (Unhardened)	F844
Flat and Beveled Washers (Hardened)	F436
Nuts	A563
Threaded Rods	A36/A36M
Welded Anchor Studs	A108, Grades C-1010 through C-1020

C. Bolts, Washers, and Nuts: Use stainless steel, hot-dip galvanized steel, zinc-plated steel, and aluminum material types as indicated in Fastener Schedule at end of this section.

2.02 ANCHOR BOLTS AND ANCHOR BOLT SLEEVES

A. Cast-In-Place Anchor Bolts:

1. Headed type, unless otherwise shown on Drawings.
2. Material type and protective coating as shown in Fastener Schedule at end of this section.

B. Anchor Bolt Sleeves:

1. Plastic:
   a. Single unit construction with corrugated sleeve.
   b. Top of sleeve shall be self-threading to provide adjustment of threaded anchor bolt projection.
   c. Material: High-density polyethylene.
2. Fabricated Steel: ASTM A36/A36M.

2.03 POST-INSTALLED CONCRETE AND MASONRY ANCHORS

A. See Section 05 05 19, Post-Installed Anchors.

2.04 ACCESSORIES

A. Antiseizing Lubricant for Stainless Steel Threaded Connections:

1. Suitable for potable water supply.
2. Resists washout.
3. Manufacturers and Products:
   a. Bostik, Middleton, MA; Neverseez.
   b. Saf-T-Eze Div., STL Corp., Lombard, IL; Anti-Seize.

B. Neoprene Gasket:

1. ASTM D1056, 2C1, soft, closed-cell neoprene gasket material, suitable for exposure to sewage and sewage gases, unless otherwise shown on Drawings.
2. Thickness: Minimum 1/4 inch.
3. Furnish without skin coat.
4. Manufacturer and Product: Monmouth Rubber and Plastics Corporation, Long Branch, NJ; Durafoam DK1111LD.

2.05 FABRICATION

A. General:

1. Finish exposed surfaces smooth, sharp, and to well-defined lines.
2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in neat, substantial manner.
3. Conceal fastenings where practical; where exposed, flush countersink.
4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
5. Grind cut edges smooth and straight. Round sharp edges to small uniform radius. Grind burrs, jagged edges, and surface defects smooth.
6. Fit and assemble in largest practical sections for delivery to Site.

B. Materials:

1. Use steel shapes, unless otherwise noted.
2. Steel to be hot-dip galvanized: Limit silicon content to less than 0.04 percent or to between 0.15 percent and 0.25 percent.
3. Fabricate aluminum in accordance with AA Specifications for Aluminum Structures–Allowable Stress Design.

C. Welding:

1. Weld connections and grind exposed welds smooth. When required to be watertight, make welds continuous.
2. Welded fabrications shall be free from twisting or distortion caused by improper welding techniques.
3. Steel: Meet fabrication requirements of AWS D1.1/D1.1M, Section 5.
4. Aluminum: Meet requirements of AWS D1.2/D1.2M.
5. Stainless Steel: Meet requirements of AWS D1.6/D1.6M.
6. Complete welding before applying finish.

D. Painting:

1. Coat surfaces of galvanized steel and aluminum fabricated items to be in direct contact with concrete, grout, masonry, or dissimilar metals, as specified on Drawing 0-G-040 (Process Mechanical General Notes), unless indicated otherwise.
2. Do not apply protective coating to galvanized steel anchor bolts or galvanized steel welded anchor studs, unless indicated otherwise.

E. Galvanizing:

1. Fabricate steel to be galvanized in accordance with ASTM A143/A143M, ASTM A384/A384M, and ASTM A385/A385M. Avoid fabrication techniques that could cause distortion or embrittlement of the steel.
2. Provide venting and drain holes for tubular members and fabricated assemblies in accordance with ASTM A385/A385M.
3. Remove welding slag, splatter, burrs, grease, oil, paint, lacquer, and other deleterious material prior to delivery for galvanizing.
4. Remove by blast cleaning or other methods surface contaminants and coatings not removable by normal chemical cleaning process in the galvanizing operation.
5. Hot-dip galvanize steel members, fabrications, and assemblies after fabrication in accordance with ASTM A123/A123M.

6. Hot-dip galvanize bolts, nuts, washers, and hardware components in accordance with ASTM A153/A153M. Oversize holes to allow for zinc alloy growth. Shop assemble bolts and nuts.
7. Galvanized steel sheets in accordance with ASTM A653/A653M.
8. Galvanize components of bolted assemblies separately before assembly. Galvanizing of tapped holes is not required.

F. Electrolytic Protection: Coat surfaces of galvanized steel and aluminum fabricated items to be in direct contact with concrete, grout, masonry, or dissimilar metals, as specified on Drawing 0-G-040 (Process Mechanical General Notes), unless indicated otherwise.

G. Fitting: Where movement of fabrications is required or shown, cut, fit, and align items for smooth operation. Make corners square and opposite sides parallel.

H. Accessories: Furnish as required for a complete installation. Fasten by welding or with stainless steel bolts or screws.

2.06 SOURCE QUALITY CONTROL

A. Visually inspect all fabrication welds and correct deficiencies.

1. Steel: AWS D1.1/D1.1M, Section 6 and Table 6.1, Visual Inspection Acceptance Criteria.
2. Aluminum: AWS D1.2/D1.2M.
3. Stainless Steel: AWS D1.6/D1.6M.

PART 3 EXECUTION

3.01 INSTALLATION OF METAL FABRICATIONS

A. General:

1. Install metal fabrications plumb and level, accurately fitted, free from distortion or defects.
2. Install rigid, substantial, and neat in appearance.
3. Install manufactured products in accordance with manufacturer’s recommendations.
4. Obtain Engineer approval prior to field cutting steel members or making adjustments not scheduled.

B. Aluminum:

1. Do not remove mill markings from concealed surfaces.
2. Remove inked or painted identification marks on exposed surfaces not otherwise coated after installed material has been inspected and approved.
3. Fabrication, mechanical connections, and welded construction shall be in accordance with the AA Aluminum Design Manual.

3.02 CAST-IN-PLACE ANCHOR BOLTS

A. Locate and hold anchor bolts in place with templates at time concrete is placed.

B. Use anchor bolt sleeves for location adjustment and provide two nuts and one washer per bolt of same material as bolt.

C. Minimum Bolt Size: 1/2-inch diameter by 12 inches long, unless otherwise shown.

3.03 ELECTROLYTIC PROTECTION

A. Aluminum and Galvanized Steel:

1. Coat surfaces of galvanized steel and aluminum fabricated items to be in direct contact with concrete, grout, masonry, or dissimilar metals, as specified on Drawing 0-G-040 (Process Mechanical General Notes), unless indicated otherwise.
2. Do not apply protective coating to galvanized steel anchor bolts or galvanized steel welded anchor studs, unless indicated otherwise.
3. Allow coating to dry before installation of the material.
4. Protect coated surfaces during installation.
5. Should coating become marred, prepare and touch up in accordance with paint manufacturer’s written instructions.

B. Titanium: Where titanium equipment is in contact with concrete or dissimilar metal, provide full-face neoprene insulation gasket, 3/32-inch minimum thickness and 70-durometer hardness.

C. Stainless Steel:

1. During handling and installation, take necessary precautions to prevent carbon impregnation of stainless steel members.
2. After installation, visually inspect stainless steel surfaces for evidence of iron rust, oil, paint, and other forms of contamination.

3. Remove contamination using cleaning and passivation methods in accordance with requirements of ASTM A380 and ASTM A967.
4. Brushes used to remove foreign substances shall utilize only stainless steel or nonmetallic bristles.
5. After treatment, visually inspect surfaces for compliance.

3.04 PAINTING

A. Painted Galvanized Surfaces: Prepare as specified on Drawing 0-G-040 (Process Mechanical General Notes).

B. Repair of Damaged Hot-Dip Galvanized Coating:

1. Conform to ASTM A780/A780M.
2. For minor repairs at abraded areas, use sprayed zinc conforming to ASTM A780/A780M.
3. For flame cut or welded areas, use zinc-based solder, or zinc sticks, conforming to ASTM A780/A780M.
4. Use magnetic gauge to determine thickness is equal to or greater than base galvanized coating.

C. Field Painting of Shop Primed Surfaces: Prepare surfaces and field finish in accordance with Drawing 0-G-040 (Process Mechanical General Notes).

3.05 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

A. Contractor-Furnished Quality Control:

1. Inspection and testing required in Section 01 45 16.13, Contractor Quality Control.
2. Manufacturer’s Certificate of Compliance per Section 01 61 00, Common Product Requirements, for test results, or calculations, or drawings that ensure material and equipment design and design criteria meet requirements of Section 01 61 00, Common Product Requirements.

3.06 FASTENER SCHEDULE

A. Unless indicated otherwise on Drawings, provide fasteners as follows:

Service Use and Location	Product	Remarks
1. Anchor Bolts Cast Into Concrete for Structural Steel, Metal Fabrications and Castings		
Exterior and Interior Areas	Stainless steel headed anchor bolts	

Service Use and Location	Product	Remarks
2. Anchor Bolts Cast Into Concrete for Equipment Bases		
Submerged, Exterior, Interior, and Corrosive Areas	Stainless steel headed anchor bolts with fusion bonded coating, unless otherwise specified with equipment	See Drawing 0-G-040 (Process Mechanical General Notes)
3. Post-Installed Anchors: See Section 05 05 19, Post-Installed Anchors		
4. Connections for Structural Steel Framing		
Exterior and Interior Areas	High-strength steel bolted connections	Use hot-dipped galvanized high-strength bolted connections for galvanized steel framing members.
5. Connections of Aluminum Components		
Submerged, Exterior and Interior Areas	Stainless steel bolted connections, unless otherwise specified with equipment	
6. All Others		
Exterior and Interior Wet and Dry Areas	Stainless steel fasteners	

B. Antiseizing Lubricant: Use on stainless steel threads.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 DEFINITIONS

A. Interfering or Objectionable Material: Trash, rubbish, and junk; vegetation and other organic matter, whether alive, dead, or decaying; topsoil.

B. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface.

C. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots greater than 2-inch caliper to a depth of 6 inches below subgrade.

D. Stripping: Removal of top four inches of soil (topsoil) remaining after applicable clearing and grubbing is completed.

E. Project Limits: Areas, as shown or specified, within which Work is to be performed.

1.02 SCHEDULING AND SEQUENCING

A. Prepare Site only after adequate erosion and sediment controls are in place. Limit areas exposed uncontrolled to erosion during installation of temporary erosion and sediment controls.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in general accordance with JEA Water & Wastewater Standard Section 406 – Site Preparation, Cleanup, and Restoration - and as specified herein.

B. Clear, grub, and strip areas actually needed for Site improvements within limits shown or specified.

C. Do not injure or deface vegetation that is not designated for removal.

3.02 LIMITS

A. Clearing and Grubbing limits shall be as follows, but not to extend beyond Project limits.

1. Excavation: 5 feet beyond top of cut slopes.
2. Structures: 15 feet outside of new structures.
3. Other Areas: As shown.

B. Remove rubbish, trash, and junk from entire area within Project limits.

3.03 CLEARING, GRUBBING, AND STRIPPING

A. Clear, grub, and strip areas within limits shown or specified.

B. Cut stumps not designated for grubbing flush with ground surface.

C. Cut off shrubs, brush, weeds, and grasses to within 2 inches of ground surface.

D. Do not remove topsoil until after clearing and grubbing is completed.

E. Stockpile strippings (topsoil), separately from other excavated material.

3.04 TREE REMOVAL OUTSIDE CLEARING LIMITS

A. Remove Within Project Limits: Dead, dying, leaning, or otherwise unsound trees that may strike and damage Project facilities in falling.

B. Cut stumps off flush with ground, remove debris, and if disturbed, restore surrounding area to its original condition.

3.05 SALVAGE

A. Saleable log timber may be sold to Contractor’s benefit. Promptly remove from Project Site.

3.06 DISPOSAL

A. Clearing and Grubbing Debris:

1. Dispose of debris offsite unless approved by the client.
2. Limit offsite disposal of clearing and grubbing debris to locations that are approved by federal, state, and local authorities, and that will not be visible from Project.

END OF SECTION

SECTION 31 23 13
SUBGRADE PREPARATION

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section: ASTM International (ASTM): D1557, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

1.02 DEFINITIONS

A. Optimum Moisture Content: As defined in Section 31 23 23, Fill and Backfill.

B. Prepared Ground Surface: As defined in Section 31 23 23, Fill and Backfill.

C. Proof-Rolling: Testing of subgrade by compactive effort to identify areas that will not support the future loading without excessive settlement.

D. Relative Compaction: As defined in Section 31 23 23, Fill and Backfill.

E. Subgrade: Layer of existing soil after completion of clearing, grubbing, and stripping, and prior to placement of fill, roadway structure, or foundations.

1.03 QUALITY ASSURANCE

A. Notify Engineer when subgrade is ready for compaction or proof-rolling or whenever compaction or proof-rolling is resumed after a period of extended inactivity.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Keep subgrade free of water, debris, and foreign matter during compaction or proof-rolling.

B. Bring subgrade to proper grade and cross-section and uniformly compact surface.

C. Do not use sections of prepared ground surface as haul roads. Protect prepared subgrade from traffic.

D. Maintain prepared ground surface in finished condition until next course is placed.

3.02 COMPACTION

A. Under Earthfill: Compact the upper 12 inches to minimum of 95 percent relative compaction as determined by ASTM D1557.

B. Under Floor Slabs On Grade, or Granular Fill Under Structures: Compact the upper 12 inches to minimum of 95 percent relative compaction as determined by ASTM D1557.

3.03 MOISTURE CONDITIONING

A. Dry Subgrade: Add water, then mix to Optimum Moisture Content uniformly throughout.

B. Wet Subgrade: Aerate material to Optimum Moisture Content uniformly throughout by blading, discing, harrowing, or other methods, to hasten drying process.

3.04 TESTING

A. The Contractor shall retain an independent soil testing company to determine in-place density and moisture content.

B. One test per every 3,000 square feet on every lift of subgrade, or one test per lift, whichever requires more tests.

3.05 CORRECTION

A. Soft or Loose Subgrade:

1. Adjust moisture content and recompact, or
2. Over excavate and replace with selected suitable material, as specified in Section 31 23 23.15, Trench Backfill.

B. Unsuitable Material: Over excavate and replace with selected suitable material, as specified in Section 31 23 23.15, Trench Backfill.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 QUALITY ASSURANCE

A. Provide adequate survey control to avoid unauthorized overexcavation.

1.02 WEATHER LIMITATIONS

A. Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

1.03 SEQUENCING AND SCHEDULING

A. Clearing, Grubbing, and Stripping: Complete applicable Work specified in Section 31 10 00, Site Clearing, prior to excavating.

B. Dewatering: Conform to applicable requirements of Section 31 23 19.01, Dewatering, prior to initiating excavation.

C. Excavation Support: Install and maintain as necessary to support sides of excavations and prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in general accordance with JEA Water & Wastewater Standard Section 408 – Excavation and Earthwork - and as specified herein.

B. Excavate to lines, grades, and dimensions shown and as necessary to accomplish Work. Excavate to within tolerance of plus or minus 0.1 foot, except where dimensions or grades are shown or specified as maximum or minimum. Allow for forms, working space, granular base, sod, topsoil, and similar items, wherever applicable. Trim to neat lines where concrete is to be deposited against earth.

C. Do not overexcavate without written authorization of Engineer.

D. Remove or protect obstructions as shown and as specified in Section 01 50 00, Temporary Facilities and Controls, Article Protection of Work and Property.

3.02 UNCLASSIFIED EXCAVATION

A. Excavation is unclassified. Complete all excavation regardless of the type, nature, or condition of the materials encountered.

3.03 TRENCH WIDTH

A. Minimum Width of Trenches:

1. Single Pipes, Conduits, Direct-Buried Cables, and Duct Banks:
   a. Less than 4-inch Outside Diameter or Width: 18 inches.
   b. Greater than 4-inch Outside Diameter or Width: 18 inches greater than outside diameter or width of pipe, conduit, direct-buried cable, or duct bank.
2. Multiple Pipes, Conduits, Cables, or Duct Banks in Single Trench: 18 inches greater than aggregate width of pipes, conduits, cables, duct banks, plus space between.
3. Increase trench widths by thicknesses of sheeting.

B. Maximum Trench Width: Unlimited, unless otherwise shown or specified, or unless excess width will cause damage to existing facilities, adjacent property, or completed Work. Pipe of greater strength or superior pipe bedding, when approved in writing by Engineer, may be used in lieu of maintaining the pipe widths shown or specified.

3.04 STOCKPILING EXCAVATED MATERIAL

A. Stockpile excavated material that is suitable for use as fill or backfill until material is needed.

B. Confine stockpiles to within easements, rights-of-way, and approved work areas. Do not obstruct roads or streets.

C. Do not stockpile excavated materials near or over existing facilities, adjacent property, or completed Work, if weight of stockpiled material could induce excessive settlement.

3.05 DISPOSAL OF SPOIL

A. Dispose of excavated materials, which are unsuitable or exceed quantity needed for fill or backfill, offsite.

B. Dispose of debris resulting from removal of organic matter, trash, refuse, and junk as specified in Section 31 10 00, Site Clearing, for clearing and grubbing debris.

END OF SECTION

SECTION 31 23 19.01
DEWATERING

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Well permits.
2. Discharge permits.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in general accordance with JEA Water & Wastewater Standard Section 408 – Excavation and Earthwork - and as specified herein.

B. The Contractor shall be responsible for design, installation, and operation of a dewatering system to keep excavations free of water.

C. Remove and control water during periods when necessary to properly accomplish Work.

3.02 SURFACE WATER CONTROL

A. See Section 01 50 00, Temporary Facilities and Controls, Article Temporary Controls.

B. Remove surface runoff controls when no longer needed.

3.03 DEWATERING SYSTEMS

A. Provide, operate, and maintain dewatering systems of sufficient size and capacity to permit excavation and subsequent construction in dry and to lower and maintain groundwater level a minimum of 2 feet below the lowest point of excavation. Continuously maintain excavations free of water, regardless of source, and until backfilled to final grade.

B. Geotechnical boring locations are shown on the civil plan drawings. Geotechnical Boring Logs are available separately for groundwater levels and materials encountered during the soil borings. Note that groundwater at the time of construction may vary from that at the time of the boring logs.

C. Design and Operate Dewatering Systems:

1. To prevent loss of ground as water is removed.
2. To avoid inducing settlement or damage to existing facilities, completed Work, or adjacent property.
3. To relieve artesian pressures and resultant uplift of excavation bottom.

3.04 DISPOSAL OF WATER

A. Obtain discharge permit for water disposal from authorities having jurisdiction.

B. Treat water collected by dewatering operations, as required by regulatory agencies, prior to discharge.

C. Discharge water as required by discharge permit and in manner that will not cause erosion or flooding, or otherwise damage existing facilities, completed Work, or adjacent property.

D. Remove solids from treatment facilities and perform other maintenance of treatment facilities as necessary to maintain their efficiency.

3.05 REMEDIATION OF GROUNDWATER DEPLETION

A. If dewatering reduces quantity or quality of water produced by existing wells, temporarily supply water to affected well owners from other sources. Furnish water of a quality and quantity equal to or exceeding the quality and quantity available to well owner prior to beginning the Work or as satisfactory to each well owner.

END OF SECTION

SECTION 31 23 23
FILL AND BACKFILL

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
   a. C117, Standard Test Method for Materials Finer Than 75-Micrometers (No. 200) Sieve in Mineral Aggregates by Washing.
   b. C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
   c. D75, Standard Practice for Sampling Aggregates.
   d. D1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   e. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
   f. D6938, Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.02 DEFINITIONS

A. Relative Compaction:

1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D1557.
2. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as determined by Engineer.

B. Optimum Moisture Content:

1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.
2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

C. Prepared Ground Surface: Ground surface after completion of required demolition, clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and subgrade preparation.

D. Completed Course: A course or layer that is ready for next layer or next phase of Work.

E. Lift: Loose (uncompacted) layer of material unless described otherwise.

F. Well-Graded: A mixture of particle sizes that has no specific concentration or lack thereof of one or more sizes producing a material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids. Satisfying both of the following requirements, as defined in ASTM D2487:

1. Coefficient of Curvature: Greater than or equal to 1 and less than or equal to 3.
2. Coefficient of Uniformity: Greater than or equal to 4 for materials classified as gravel, and greater than or equal to 6 for materials classified as sand.

G. Influence Area: Area within planes sloped downward and outward at 60-degree angle from horizontal measured from:

1. 1 foot outside outermost edge at base of foundations or slabs.
2. 1 foot outside outermost edge at surface of roadways or shoulder.
3. 0.5 foot outside exterior at spring line of pipes or culverts.

H. Borrow Material: Material from required excavations or from designated borrow areas on or near Site.

I. Selected Backfill Material: Materials available onsite that Engineer determines to be suitable for specific use.

J. Imported Material: Materials obtained from source(s) offsite, suitable for specified use.

K. Structural Fill: Fill materials as required under structures, pavements, and other facilities.

L. Embankment: Fill materials required to raise existing grade on the well pad and in areas other than under structures.

1.03 SUBMITTALS

A. Informational Submittals:

1. Certified Gradation Analysis: Submit not less than 30 days prior to delivery for imported materials or anticipated use for excavated materials, except for trench stabilization material that will be submitted prior to material delivery to Site.
2. Certified test results from independent testing agency.

1.04 QUALITY ASSURANCE

A. Notify Engineer when:

1. Soft or loose subgrade materials are encountered wherever embankment or site fill is to be placed.
2. Fill material appears to be deviating from Specifications.

1.05 SEQUENCING AND SCHEDULING

A. Complete applicable Work specified in Section 31 10 00, Site Clearing; Section 31 23 16, Excavation; and Section 31 23 13, Subgrade Preparation, prior to placing fill or backfill.

B. Backfill against concrete structures only after concrete has attained compressive strength, specified in Section 03 30 10, Cast-in-Place Concrete. Obtain Engineer's acceptance of concrete work and attained strength prior to placing backfill.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Gradation Tests:

1. As necessary to locate acceptable sources of imported material.
2. During production of imported material, test as follows:
   a. Granular Fill: One test per 750 tons.
   b. Sand: One test per 750 tons.
   c. Base Course Rock: One test per 1500 tons.
   d. Foundation Stabilization Rock: One test per 1500 tons.

2.02 EARTHFILL

A. Excavated or imported sand with no more than 25 percent nonplastic fines, classified as SP, SP-SM, or SM in accordance with the Unified Soil Classification System (ASTM D2487).

B. Material shall be free from rocks larger than 3 inches, from roots and other organic matter, ashes, cinders, trash, debris, and other deleterious materials. containing more than 10 percent gravel, stones, or shale particles.

2.03 GRANULAR FILL

A. 1-inch minus crushed gravel or crushed rock or onsite sand classified as SP or SP-SM in accordance with the Unified Soil Classification System.

B. Free from dirt, clay balls, and organic material.

C. Well-graded from coarse to fine and containing sufficient fines to bind material when compacted, but with maximum 8 percent by weight passing No. 200 sieve.

2.04 WATER FOR MOISTURE CONDITIONING

A. Free of hazardous or toxic contaminates, or contaminants deleterious to proper compaction.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in general accordance with JEA Water & Wastewater Standard Section 408 – Excavation and Earthwork - and as specified herein.

B. Keep placement surfaces free of water, debris, and foreign material during placement and compaction of fill and backfill materials.

C. Place and spread fill and backfill materials in horizontal lifts of uniform thickness, in a manner that avoids segregation, and compact each lift to specified densities prior to placing succeeding lifts. Slope lifts only where necessary to conform to final grades or as necessary to keep placement surfaces drained of water.

D. During filling and backfilling, keep level of fill and backfill around each structure and buried tank even.

E. If pipe, conduit, duct bank, or cable is to be laid within fill or backfill:

1. Fill or backfill to an elevation 2 feet above top of item to be laid.
2. Excavate trench for installation of item.
3. Install bedding, if applicable, as specified in Section 31 23 23.15, Trench Backfill.
4. Install item.
5. Backfill envelope zone and remaining trench, as specified in Section 31 23 23.15, Trench Backfill, before resuming filling or backfilling specified in this section.

F. Tolerances:

1. Final Lines and Grades: Within a tolerance of 0.1 foot unless dimensions or grades are shown or specified otherwise.
2. Grade to establish and maintain slopes and drainage as shown. Reverse slopes are not permitted.

G. Settlement: Correct and repair any subsequent damage to structures, pavements, curbs, slabs, piping, and other facilities, caused by settlement of fill or backfill material.

3.02 BACKFILL UNDER AND AROUND STRUCTURES

A. Place, compact, and test granular fill in general accordance with JEA Water & Wastewater Standard Section 408– Excavation and Earthwork - and as specified herein.

3.03 EARTH FILL

A. Lift Thickness not to exceed 12-inch loose lifts.

B. Compact each lift to a minimum 95 percent relative compaction as determined in accordance with ASTM D1557. Perform a minimum of 2 tests per lift or every 500 cubic yards, whichever is greater.

C. Dress completed embankment with allowance for sod, crest surfacing, topsoil, and slope protection, where applicable.

3.04 SITE TESTING

A. In general accordance with JEA Water & Wastewater Standard Section 408 – Excavation and Earthwork - and as specified herein.

3.05 REPLACING OVEREXCAVATED MATERIAL

A. Replace excavation carried below grade lines shown or established by Engineer as follows:

1. Beneath Footings: Granular fill.
2. Beneath Fill or Backfill: Same material as specified for overlying fill or backfill.
3. Beneath Slabs-On-Grade: Granular fill.

4. Trenches:
   a. Unauthorized Overexcavation: Either trench stabilization material or granular pipe base material, as specified in Section 31 23 23.15, Trench Backfill.
   b. Authorized Overexcavation: Trench stabilization material, as specified in Section 31 23 23.15, Trench Backfill.
5. Permanent Cut Slopes (Where Overlying Area is Not to Receive Fill or Backfill):
   a. Flat to Moderate Steep Slopes (3:1, Horizontal Run: Vertical Rise or Flatter): Earthfill.

END OF SECTION

SECTION 31 23 23.15
TRENCH BACKFILL

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Public Works Association (APWA): Uniform Color Code.
2. ASTM International (ASTM):
   a. C33/C33M, Standard Specification for Concrete Aggregates.
   b. C94/C94M, Standard Specification for Ready-Mixed Concrete.
   c. C117, Standard Test Method for Materials Finer than 75 Micrometer (No. 200) Sieve in Mineral Aggregates by Washing.
   d. C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   e. C150/C150M, Standard Specification for Portland Cement.
   f. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
   g. C1012/C1012M, Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution.
   h. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).
   i. D1140, Standard Test Methods for Amount of Material in Soils Finer than No. 200 (75 micrometer) Sieve.
   j. D421, Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
   k. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
   l. D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
   m. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
   n. D4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
   o. D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
   p. D4832, Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
3. National Electrical Manufacturers Association (NEMA): Z535.1, Safety Colors.

1.02 DEFINITIONS

A. Bedding Material: Granular material upon which pipes, conduits, cables, or duct banks are placed.

B. Imported Material: As defined in Section 31 23 23, Fill and Backfill.

C. Lift: As defined in Section 31 23 23, Fill and Backfill.

D. Pipe Zone: Backfill zone that includes full trench width and extends from prepared trench bottom to an upper limit above top outside surface of pipe, conduit, cable or duct bank.

E. Prepared Trench Bottom: Graded trench bottom after excavation and installation of stabilization material, if required, but before installation of bedding material.

F. Relative Compaction: As defined in Section 31 23 23, Fill and Backfill.

G. Optimum Moisture Content: As defined in Section 31 23 23, Fill and Backfill.

H. Selected Backfill Material: As defined in Section 31 23 23, Fill and Backfill.

I. Well-Graded: As defined in Section 31 23 23, Fill and Backfill.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Manufacturer’s descriptive literature for tracer wire.

B. Informational Submittals:

1. Certified Gradation Analysis: Submit not less than 30 days prior to delivery for imported materials or anticipated use for excavated materials, except for trench stabilization material that will be submitted prior to material delivery to Site.

PART 2 PRODUCTS

2.01 TRACER WIRE

A. Refer to drawings for locate wire requirements.

2.02 TRENCH STABILIZATION MATERIAL

A. Granular Fill: As specified in Section 31 23 23, Fill and Backfill.

2.03 BEDDING MATERIAL AND PIPE ZONE MATERIAL

A. Granular Fill: As specified in Section 31 23 23, Fill and Backfill.

2.04 EARTH BACKFILL

A. Earthfill: As specified in Section 31 23 23, Fill and Backfill.

B. Onsite sand with no more than 25 percent nonplastic fines, classified as SP, SP-SM, or SM in accordance with the Unified Soil Classification System (ASTM D2487).

2.05 SOURCE QUALITY CONTROL

A. Contractors testing laboratory to perform gradation analysis in accordance with ASTM D421 or C136 for:

1. Trench stabilization material.
2. Bedding and pipe zone material.

B. Certify Laboratory Performance of Mix Designs: Controlled low strength material.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in general accordance with JEA Water & Wastewater Standard Section 408 – Excavation and Earthwork - and as specified herein.

3.02 TRENCH PREPARATION

A. Water Control: Provide continuous water control until trench backfill is complete.

B. Remove foreign material and backfill contaminated with foreign material that falls into trench.

3.03 TRENCH BOTTOM

A. Firm Subgrade: Grade with hand tools, remove loose and disturbed material, and trim off high areas and ridges left by excavating bucket teeth. Allow space for bedding material if shown or specified.

B. Soft Subgrade: If subgrade is encountered that may require removal to prevent pipe settlement, notify Engineer. Engineer will determine depth of overexcavation, if any required.

3.04 TRENCH STABILIZATION MATERIAL INSTALLATION

A. Rebuild trench bottom with trench stabilization material.

B. Place material over full width of trench in 6-inch lifts to required grade, providing allowance for bedding thickness.

C. Compact each lift so as to provide a firm, unyielding support for the bedding material prior to placing succeeding lifts.

3.05 BACKFILL PIPE ZONE

A. Upper limit of pipe zone shall not be less than following:

1. Pipe: 12 inches, unless shown otherwise.
2. Conduit: 3 inches, unless shown otherwise.
3. Direct-Buried Cable: 3 inches, unless shown otherwise.
4. Duct Bank: 3 inches, unless shown otherwise.

B. Restrain pipe, conduit, cables, and duct banks as necessary to prevent their movement during backfill operations.

C. Place material simultaneously in lifts on both sides of pipe and, if applicable, between pipes, conduit, cables, and duct banks installed in same trench.

1. Pipe 10-Inch and Smaller Diameter: First lift less than or equal to 1/2 pipe diameter.
2. Pipe Over 10-Inch Diameter: Maximum 6-inch lifts.

D. Thoroughly tamp each lift, including area under haunches, with handheld tamping bars supplemented by “walking in” and slicing material under haunches with a shovel to ensure voids are completely filled before placing each succeeding lift.

E. Compaction as specified in JEA Water & Wastewater Standard Section 408 – Excavation and Earthwork.

F. Do not use power-driven impact compactors to compact pipe zone material.

3.06 BACKFILL ABOVE PIPE ZONE

A. General:

1. Do not use power driven impact type compactors for compaction until at least 3 feet of backfill is placed over top of pipe.
2. Backfill to grade with proper allowances for sod, crushed concrete surfacing, and pavement thicknesses, wherever applicable.
3. Backfill around structures with same class backfill as specified for adjacent trench, unless otherwise shown or specified.

B. Backfill under Areas to be Sodded: Compact as Earth Fill as specified in Section 31 23 23, Fill and Backfill.

C. Backfill Areas under Facilities and Pavements: Under and around structures as specified in Section 31 23 23, Fill and Backfill.

3.07 MAINTENANCE OF TRENCH BACKFILL

A. After each section of trench is backfilled, maintain surface of backfilled trench even with adjacent ground surface until final surface restoration is completed.

B. Other Areas: Add excavated material where applicable and keep surface of backfilled trench level with adjacent ground surface.

3.08 SITE TESTING

A. Gradation:

1. One sample from each 100 tons of finished product or more often as determined by Engineer, if variation in gradation is occurring, or if material appears to depart from Specifications.
2. If test results indicate material does not meet Specification requirements, terminate material placement until corrective measures are taken.
3. Remove material placed in Work that does not meet Specification requirements.

B. In-Place Density Testing: In accordance with ASTM D6938. During placement of materials, test as indicated in JEA Water & Wastewater Standard Section 408 – Excavation and Earthwork - and as specified herein.

3.09 SETTLEMENT OF BACKFILL

A. Settlement of trench backfill, or of fill, or facilities constructed over trench backfill will be considered a result of defective compaction of trench backfill.

END OF SECTION

SECTION 40 90 01
PROCESS INSTRUMENTATION AND CONTROL SYSTEMS (PICS)

PART 1 GENERAL

1.01 SUMMARY

A. Contractor is responsible for providing timely coordination with Owner, so as to maintain Project Schedule.

B. Work Includes:

1. Furnishing, installing, calibrating, adjusting, testing, documenting, and starting up for all Contractor furnished equipment to makeup a complete Process Instrumentation and Control System for the well site.
   a. Contractor furnished items shall include the SCADA panel and all well instrumentation including primary elements, transmitters, control devices, surge protection, terminal resistors, wiring and associated equipment.
   b. Testing: Contractor shall perform testing as specified and directed by JEA.
2. Contractor shall coordinate directly with JEA for the programming of the SCADA panel. All programming shall be by JEA.
3. Prior to beginning work on the Project, Contractor shall coordinate directly with JEA to ensure instrumentation and control panel components meet current JEA standards.
4. Additional well control functions and requirements are described in the Specifications and Drawings found in Volumes 1 and 2 of the Contract Documents.

C. Detailed Design: PICS as shown and specified includes functional and performance requirements and component specifications. Contractor to complete detailed PICS design.

1.02 DEFINITIONS

A. Signal Types:

1. Analog Signals, Current Type:
   a. 4 to 20 mA dc signals conforming to ISA S50.1.
   b. Unless otherwise indicated for specific PICS Subsystem components, use the following ISA 50.1 options:
      1) Transmitter Type: Number 2, two-wire.
      2) Transmitter Load Resistance Capacity: Class L.
      3) Fully isolated transmitters and receivers.

2. Analog Signals, Voltage Type: 1 to 5 volts dc within panels where a common high precision dropping resistor is used.
3. Discrete signals, two-state logic signals using dc or 120V ac sources as indicated.
4. Pulse Frequency Signals:
   a. Direct current pulses whose repetition rate is linearly proportional to process variable.
   b. Pulses generated by contact closures or solid state switches as indicated.
   c. Power source less than 30V dc.
5. Special Signals: Other types of signals used to transmit analog and digital information between field elements, transmitters, receivers, controllers, and digital devices.

B. Instrument Tag Numbers:

1. A shorthand tag number notation is used in the Loop Specifications. For example: RID AI-1-2(2)(3)[pH]

Notation	Explanation
ID	Site Designator –Ridenour (Coordinate specific Site Designator with JEA)
I	Unit Process Number
AI	ISA designator for Analysis Indicator
2	Loop number
(2)	First unit number; number of same component types in a given loop; -1 and -2 in this example
(3)	Second unit number; number of same component types with same first unit number in a given loop; -1, -2, and -3 in this example
[pH]	Same notation shown at 2 o'clock position on ISA circle symbol on P&ID

2. In this Example, RID 1AI-1-12(2)(3)[pH] is Shorthand for:

   RID 1AI-1-12-1-1[pH], RID 1AI-1-12-1-2[pH], RID 1AI-1-12-1-3[pH]
   RID 1AI-1-12-2-1[pH], RID 1AI-1-12-2-2[pH], RID 1AI-1-12-2-3[pH]

1.03 DELIVERY, STORAGE, AND HANDLING

A. Provide site and warehouse storage facilities for PICS equipment.

B. Prior to installation, store items in dry indoor locations. Provide heating in storage areas for items subject to corrosion under damp conditions.

C. Cover panels and other elements that are exposed to dusty construction environments.

1.04 SEQUENCING AND SCHEDULING

A. Activity Completion: The following is a list of key activities and their completion criteria:

1. Hardware Delivery: Hardware delivered to Site.
2. Performance Acceptance Test (PAT): Completed and required test documentation accepted.

B. PICS Substantial Completion: When Owner issues Certificate of Substantial Completion.

1. Prerequisites:
   a. PICS has successfully completed PAT.
   b. All spares, expendables, and test equipment have been delivered to Owner.

C. PICS Acceptance: When Owner issues a written notice of Final Payment and Acceptance.

1. Prerequisites:
   a. Certificate of Substantial Completion issued for PICS.
   b. Punch-list items completed.

PART 2 PRODUCTS

2.01 ELECTRICAL REQUIREMENTS

A. In accordance with Electrical Specifications and requirements as shown on the Plans.

B. I&C and Electrical Components, Terminals, Wires, and Enclosures: NRTL Labeled or Listed.

C. Wires within Enclosures:

1. AC Circuits:
   a. Type: 300-volt, Type MTW stranded copper.
   b. Size: For current to be carried, but not less than No. 18 AWG.

2. Analog Signal Circuits:
   a. Type: 300-volt stranded copper, twisted shielded pairs.
   b. Size: No. 18 AWG, minimum.
3. Other dc Circuits.
   a. Type: 300-volt, Type MTW stranded copper.
   b. Size: For current carried, but not less than No. 18 AWG.
4. Special Signal Circuits: Use manufacturer's standard cables.
5. Wire Identification: Numbered and tagged at each termination.
   a. Wire Tags: Snap-on or slip-on PVC wire markers with legible machine printed markings and numbers. Adhesive or taped-on tags are not acceptable.

D. Wires entering or leaving enclosures, terminate and identify as follows:

1. Analog and discrete signal, terminate at numbered terminal blocks.
2. Special signals, terminated using manufacturer's standard connectors.
3. Identify wiring in accordance with Electrical Specifications and requirements as shown on the Plans.

E. Terminal Blocks for Enclosures:

1. Quantity:
   a. Accommodate present and spare indicated needs.
   b. Wire spare PLC I/O points to terminal blocks.
   c. One wire per terminal for field wires entering enclosures.
   d. Maximum of two wires per terminal for No. 18 AWG wire for internal enclosure wiring.
   e. Spare Terminals: 20 percent of all connected terminals, but not less than 10 per terminal block.
2. General:
   a. Connection Type: Screw compression clamp.
   b. Compression Clamp:
      1) Complies with DIN-VDE 0611.
      2) Hardened steel clamp with transversal groves that penetrate wire strands providing a vibration-proof connection.
      3) Guides strands of wire into terminal.
   c. Screws: Hardened steel, captive and self-locking.
   d. Current Bar: Copper or treated brass.
   e. Insulation:
      1) Thermoplastic rated for minus 55 to plus 110 degree C.
      2) Two funneled shaped inputs to facilitate wire entry.
   f. Mounting:
      1) Standard DIN rail.
      2) Terminal block can be extracted from an assembly without displacing adjacent blocks.
      3) End Stops: Minimum of one at each end of rail.

g. Wire preparation: Stripping only permitted.
h. Jumpers: Allow jumper installation without loss of space on terminal or rail.
i. Marking System:
    1) Terminal number shown on both sides of terminal block
    2) Allow use of preprinted and field marked tags.
    3) Terminal strip numbers shown on end stops.
    4) Mark terminal block and terminal strip numbers as shown on Panel Control Diagrams and Loop Diagrams.
    5) Fuse Marking for Fused Terminal Blocks: Fuse voltage and amperage rating shown on top of terminal block.
j. Test Plugs: Soldered connections for 18 AWG wire.
    1) Pin Diameter: 0.079 inch.
    2) Quantity: 10.
    3) Manufacturer and Product:
        a) Weidmuller, Type PS.

3. Spare Fuse Holder:
    a. Provide spare fuse holder(s) for all enclosures containing fuses.
    b. Quantity: As required to hold all spare fuses for each enclosure.
    c. DIN Rail Mountable.
    d. Manufacturer and Product: Weidmuller, 7914760001.
4. Terminal Block, General-Purpose:
    a. Rated Voltage: 600V ac.
    b. Rated Current: 30 amp.
    c. Wire Size: 22 AWG to 10 AWG.
    d. Rated Wire Size: 10 AWG.
    e. Color: Grey body.
    f. Spacing: 0.25 inch, maximum.
    g. Test Sockets: One screw test socket 0.079-inch diameter.
    h. Manufacturers and Products:
        1) Weidmuller WDU4 series; 1020100000 with 0280600000.
5. Terminal Block, Ground:
    a. Wire Size: 22 AWG to 12 AWG.
    b. Rated Wire Size: 12 AWG.
    c. Color: Green and yellow body.
    d. Spacing: 0.25 inch, maximum.
    e. Grounding: Ground terminal blocks electrically grounded to the mounting rail.
    f. Manufacturers and Products:
        1) Weidmuller WDU4 series; 1010100000.
6. Terminal Block, Blade Disconnect Switch:
    a. Rated Voltage: 600V ac.
    b. Rated Current: 10-amp.
    c. Wire Size: 22 AWG to 12 AWG.
    d. Rated Wire Size: 12 AWG.

e. Color: Grey body, orange switch.
f. Spacing: 0.25 inch, maximum.
g. Manufacturers and Products:
    1) Weidmuller WDU4 series; 7910210000.

7. Terminal Block, Diode:
    a. Rated Voltage: 24V dc.
    b. Rated Current: 30 ma.
    c. Wire Size: 16 AWG.
    d. Manufacturers and Products:
        1) Weidmuller WDU4 series.
8. Terminal Block, Fused, 24V dc:
    a. Rated Voltage: 600V dc.
    b. Rated Current: 16-amp.
    c. Wire Size: 22 AWG to 10 AWG.
    d. Rated Wire Size: 10 AWG.
    e. Color: Grey body.
    f. Fuse: 0.25 inch by 1.25 inches.
    g. Indication: LED diode 24V dc.
    h. Spacing: 0.512 inch, maximum.
    i. Manufacturers and Products:
        1) Weidmuller WDU4 series 1880410000.
9. Terminal Block, Fused, 120V ac:
    a. Rated Voltage: 600V ac.
    b. Rated Current: 16-amp.
    c. Wire Size: 22 AWG to 10 AWG.
    d. Rated Wire Size: 10 AWG.
    e. Color: Grey body.
    f. Fuse: 0.25 inch by 1.25 inches.
    g. Indication: Neon Lamp 110V ac.
    h. Leakage Current: 1.8 mA, maximum.
    i. Spacing: 0.512 inch, maximum
    j. Manufacturers and Products:
        1) Weidmuller WDU4 series 1880420000.
10. Terminal Block, Fused, 120V ac, High Current:
    a. Rated Voltage: 600V ac.
    b. Rated Current: 35 amps.
    c. Wire Size: 18 AWG to 8 AWG.
    d. Rated Wire Size: 8 AWG.
    e. Color: Grey.
    f. Fuse: 13/32 inch by 1.5 inches.
    g. Spacing: 0.95 inch, maximum.
    h. Manufacturers and Products: Weidmuller WDU4 series 7940029428.

F. Grounding of Enclosures:

1. Furnish isolated copper grounding bus for signal and shield ground connections.
2. Ground bus grounded at a common signal ground point in accordance with National Electrical Code requirements.
3. Single Point Ground for Each Analog Loop:
   a. Locate at dc power supply for loop.
   b. Use to ground wire shields for loop.
4. Ground terminal block rails to ground bus.

G. Analog Signal Isolators: Furnish signal isolation for analog signals that are sent from one enclosure to another. Do not wire in series instruments on different panels, cabinets, or enclosures.

2.02 ELECTRICAL TRANSIENT PROTECTION

A. Surge Suppressors:

1. General:
   a. Construction: First-stage high-energy metal oxide varistor and second-stage bipolar silicon avalanche device separated by series impedance; includes grounding wire, stud, or terminal.
   b. Response: 5 nanoseconds maximum.
   c. Recovery: Automatic.
   d. Temperature Range: Minus 20 degrees C to plus 85 degrees C.
2. Suppressors on 120V ac Power Supply Connections:
   a. Occurrences: Tested and rated for a minimum of 50 occurrences of IEEE C62.41 Category B test waveform.
   b. First-Stage Clamping Voltage: 350 volts or less.
   c. Second-Stage Clamping Voltage: 210 volts or less.
   d. Continuous Operation: Power supplies for one four-wire transmitter or receiver: 5 amps minimum at 130V ac. All other applications: 30 amps minimum at 130V ac.
3. Suppressors on Analog Signal Lines:
   a. Test Waveform: Linear 8 microsecond rise in current form 0 amps to a peak current value followed by an exponential decay of current reaching one-half the peak value in 20 microseconds.
   b. Surge Rating: Tested and rated for 50 occurrences of 2,000-amp peak test waveform.
      1) dc Clamping Voltage: 20 percent to 40 percent above operating voltage for circuit.
      2) dc Clamping Voltage Tolerance: Less than plus or minus 10 percent.
      3) Maximum Loop Resistance: 18 ohms per conductor.

4. Physical Characteristics:
    a. Mounted in Enclosures: Encapsulated inflame retardant epoxy.
    b. For Analog Signals Lines: Citel DLAW-24D3.
    c. For Profibus DP (RS-485) Signal Lines Citel DLA-12DBC.
    d. For 120V ac Lines: Citel DS42S-120 w/ DS40G.
    e. For 24V dc Lines: Citel DS210-24DC.
    f. Field Mounted at Two-Wire Instruments: Encapsulated in stainless steel pipe nipples. EDCO SS64 series or equivalent Citel or Phoenix Contact.
    g. Field Mounted at Profibus DP (RS-485) Instruments: With 120V ac surge suppressor, ac switch, and signal line surge suppressor, all in enclosure.
        1) Enclosure:
            a) NEMA 4X Type 316 stainless steel with door.
            b) Maximum Size: Coordinate size of each unit to fit within the transmitter hood.
        2) Custom build enclosure with devices using the appropriate Citel surge suppressors for power and Profibus DP listed above.
    h. Field Mounted at Four-Wire Instruments: With 120V ac surge suppressor, ac switch, and signal line surge suppressor, all in enclosure.
        1) Enclosure:
            a) NEMA 4X Type 316 stainless steel with door.
            b) Maximum Size: Coordinate size of each unit to fit within the transmitter hood.
        2) Custom build enclosure with devices using the appropriate Citel surge suppressors for power and Analog signals listed above.

B. Installation and Grounding of Suppressors: As shown. See Surge Suppressor Installation Details. Grounding equipment, installation of grounding equipment, and terminations for field mounted devices are provided under Division 26, Electrical.

2.03 WIRING

A. Wiring within PICS Panels:

1. Restrain by plastic ties or ducts or metal raceways.
2. Arrange wiring neatly, cut to proper length, and remove surplus wire.
3. Abrasion protection for wire bundles which pass through holes or across edges of sheet metal.

4. Connections to Screw Type Terminals:
    a. Locking-fork-tongue or ring-tongue lugs.
    b. Use manufacturer's recommended tool with required sized anvil to make crimp lug terminations.
    c. Wires terminated in a crimp lug, maximum of one.
    d. Lugs installed on a screw terminal, maximum of two.
5. Connections to Compression Clamp Type Terminals:
    a. Strip, prepare, and install wires in accordance with terminal manufacturer's recommendations.
    b. Wires installed in a compression screw and clamp, maximum of one for field wires entering enclosure, otherwise maximum of two.
6. Splicing and tapping of wires, allowed only at device terminals or terminal blocks.
7. Separate analog and dc circuits by at least 6 inches from ac power and control wiring, except at unavoidable crossover points and at device terminations.
8. Arrange wiring to allow access for testing, removal, and maintenance of circuits and components.

PART 3 EXECUTION

3.01 EXAMINATION

A. For equipment not provided by PICS, but that directly interfaces with the PICS, verify the following conditions:

1. Proper installation.
2. Calibration and adjustment of positioners and I/P transducers.
3. Correct control action.
4. Switch settings and dead bands.
5. Opening and closing speeds and travel stops.
6. Input and output signals.

3.02 INSTALLATION

A. Material and Equipment Installation: Retain a copy of manufacturers' instructions at site, available for review at all times.

B. Wiring connected to PICS components and assemblies, including power wiring in accordance with requirements as specified in Division 26, Electrical.

C. Mechanical Systems:

1. Drawings for PICS Mechanical Systems are diagrammatic and not intended to specifically define element locations or piping and tubing run lengths. Base materials and installations on field measurements.
2. Copper and Stainless Steel Tubing Support: Continuously supported by an aluminum tubing raceway system.
3. Plastic Tubing Supports: Except as shown on Drawings, provide continuous support in conduits or by aluminum tubing raceway system.
4. Install tubing conduit for plastic tubing and tubing raceways parallel with, or at right angles to, structural members of buildings. Make vertical runs straight and plumb.
5. Tubing and Conduit Bends:
    a. Tool-formed without flattening, and all of same radius.
    b. Bend Radius: Equal to or larger than conduit and tubing manufacturer's recommended minimum bend radius.
    c. Slope instrument connection tubing in accordance with installation details.
    d. Do not run liquid filled instrument tubing immediately over or within a 3-foot plan view clearance of electrical panels, motor starters, or mechanical mounting panel without additional protection. Where tubing must be located in these zones, shield electrical device to prevent water access to electrical equipment.
    e. Straighten coiled tubing by unrolling on flat surface. Do not pull to straighten.
    f. Cut tubing square with sharp tubing cutter. Deburr cuts and remove chips. Do not gouge or scratch surface of tubing.
    g. Blow debris from inside of tubing.
    h. Makeup and install fittings in accordance with manufacturer's recommendations. Verify makeup of tube fittings with manufacturer's inspection gauge.
    i. Use lubricating compound or TFE tape on stainless steel threads to prevent seizing or galling.
    j. Run tubing to allow, e.g., clear access to doors, controls, and control panels; and to allow for easy removal of equipment.
    k. Provide separate support for components in tubing runs.
    l. Supply expansion loops and use adapters at pipe, valve, or component connections for proper orientation of fitting.
    m. Keep tubing and conduit runs at least 12 inches from hot pipes.
    n. Locate and install tubing raceways in accordance with manufacturer's recommendations. Locate tubing to prevent spillage, overflow, or dirt from above.
    o. Securely attach tubing raceways to building structural members.
6. Enclosure Lifting Rings: Remove rings following installation and plug holes.

3.03 FIELD QUALITY CONTROL

A. Startup and Testing Team:

1. Thoroughly inspect installation, termination, and adjustment for components and systems.
2. Complete onsite tests.
3. Provide startup assistance.

B. Phase I: Operational Readiness Inspections and Calibrations: Prior to startup, inspect and test to ensure that entire PICS is ready for operation.

1. Loop/Component Inspections and Calibrations:
   a. Check PICS for proper installation, calibration, and adjustment on a loop-by-loop and component-by-component basis.
   b. Prepare component calibration sheet for each active component (except simple hand switches, lights, gauges, and similar items).
      1) Project name.
      2) Loop number.
      3) Component tag number.
      4) Component code number.
      5) Manufacturer for elements.
      6) Model number/serial number.
      7) Summary of Functional Requirements, for Example:
         a) Indicators and recorders, scale and chart ranges.
         b) Transmitters/converters, input and output ranges.
         c) Computing elements' function.
         d) Controllers, action (direct/reverse) and control modes (PID).
         e) Switching elements, unit range, differential (fixed/adjustable), reset (auto/manual).
      8) Calibrations, for Example:
         a) Analog Devices: Actual inputs and outputs at 0, 10, 50, and 100 percent of span, rising and falling.
         b) Discrete Devices: Actual trip points and reset points.
         c) Controllers: Mode settings (PID).
      9) Space for comments.
   c. Check signal integrity from field sensor all the way up to field I/O points.
   d. These inspections and calibrations will be spot checked.

C. Performance Acceptance Tests (PAT):

1. General:
   a. Test all PICS elements to demonstrate that PICS satisfies all requirements.
   b. Test Format: Cause and effect.
      1) Person conducting test initiates an input (cause).
      2) Specific test requirement is satisfied if correct result (effect) occurs.
   c. Procedures, Forms, and Checklists:
      1) Conduct tests in accordance with, and documented on, Owner accepted procedures, forms, and checklists.
      2) Describe each test item to be performed.
      3) Have space after each test item description for sign off by appropriate party after satisfactory completion.
   d. Required Test Documentation: Test procedures, forms, and checklists. All signed by Owner.
   e. Conducting Tests:
      1) Provide special testing materials, equipment, and software.
      2) Wherever possible, perform tests using actual process variables, equipment, and data.
      3) If it is not practical to test with real process variables, equipment, and data, provide suitable means of simulation.
      4) Define simulation techniques in test procedures.
   f. Coordinate PICS testing with Owner.
2. Test Requirements:
   a. Once facility has been started up and is operating, perform a witnessed PAT on complete PICS to demonstrate that it is operating as required. Demonstrate each required function on a paragraph-by-paragraph and loop-by-loop basis.
   b. Perform local and manual tests for each loop before proceeding to remote and automatic modes.
   c. Where possible, verify test results using visual confirmation of process equipment and actual process variable. Unless otherwise directed, exercise and observe devices supplied by others, as needed to verify correct signals to and from such devices and to confirm overall system functionality. Test verification by means of disconnecting wires or measuring signal levels is acceptable only where direct operation of plant equipment is not possible.
   d. Make updated versions of documentation required for PAT available to Owner at site, both before and during tests.
   e. Make one copy of O&M Manuals available to Owner at the site both before and during testing.
   f. Refer to referenced examples of PAT procedures and forms in Article SUPPLEMENTS.

3.04 SUPPLEMENTS

A. Supplements listed below, following "END OF SECTION," are part of this Specification.

1. Instrument Calibration Sheet: Provides detailed information on each instrument (except simple hand switches, lights, and similar items).
2. Performance Acceptance Test Sheet: Describes the PAT for a given loop. The format is mostly free form.
   a. Lists the requirements of the loop.
   b. Briefly describes the test.
   c. Cites expedited results.
   d. Provides space for check off by witness.

END OF SECTION

CH2M HILL **INSTRUMENT CALIBRATION SHEET** Rev.06.05.92

COMPONENT	MANUFACTURER	PROJECT
Code:	Name:	Number:
Name:	Model:	Name:
	Serial #:	

FUNCTIONS

	RANGE	VALUE	UNITS	COMPUTING FUNCTIONS? Y / N	CONTROL? Y / N
Indicate? Y / N	Chart:			Describe:	Action? direct / reverse
					Modes? P / I / D
Record? Y / N	Scale:				SWITCH? Y / N
					Unit Range:
Transmit/	Input:				Differential: fixed/adjustable
Convert? Y / N	Output:				Reset? automatic / manual

ANALOG CALIBRATIONS

REQUIRED			AS CALIBRATED			
Input	Indicated	Output	Increasing Input		Decreasing Input	
			Indicated	Output	Indicated	Output
CONTROL MODE SETTINGS:			P:	I:	D:	

DISCRETE CALIBRATIONS

REQUIRED			AS CALIBRATED		**Note No.**
Number	Trip Point	Reset Pt.	Trip Point	Reset Pt.	
	(note rising or falling)		(note rising or falling)		
1.					
2.					
3.					
4.					
5.					
6.					
7.					

#	**NOTES:**

Component Calibrated and Ready for Startup

By:

Date:

Tag No.:

CH2M HILL

INSTRUMENT CALIBRATION SHEET

EXAMPLE - ANALYZER/TRANSMITTER

Rev.06.05.92

COMPONENT	MANUFACTURER	PROJECT
Code: *A7*	Name: *Leeds & Northrup*	Number: *WDC30715.B2*
Name: *pH Element & Analyzer/Transmitter*	Model: *12429-3-2-1-7*	Name: *UOSA AWT PHASE 3*
	Serial #: *11553322*	

FUNCTIONS

	RANGE	VALUE	UNITS	COMPUTING FUNCTIONS? N	CONTROL? N
Indicate? Y Record? N	Chart:			Describe:	Action? direct / reverse Modes? P / I / D
	Scale:	*1-14*	*pH units*		SWITCH? N Unit Range:
Transmit/	Input:	*1-14*	*pH units*		Differential: fixed/adjustable
Convert? Y	Output:	*4-20*	*mA dc*		Reset? automatic / manual

ANALOG CALIBRATIONS

REQUIRED			AS CALIBRATED			
Input	Indicated	Output	Increasing Input		Decreasing Input	
			Indicated	Output	Indicated	Output
1.0	*1.0*	*4.0*	*1.0*	*4.0*	*1.0*	*3.9*
2.3	*2.3*	*5.6*	*2.2*	*5.5*	*2.3*	*5.6*
7.5	*7.5*	*12.0*	*7.5*	*11.9*	*7.5*	*12.0*
12.7	*12.7*	*18.4*	*12.7*	*18.3*	*12.6*	*18.3*
14.0	*14.0*	*20.0*	*14.0*	*20.0*	*14.0*	*20.0*
CONTROL MODE SETTINGS:			P: *N.A.*	I:	D:	

DISCRETE CALIBRATIONS

REQUIRED			AS CALIBRATED	
Number	Trip Point (note rising or falling)	Reset Pt.	Trip Point (note rising or falling)	Reset Pt.
1.	*N.A.*		*N.A.*	
2.				
3.				
4.				
5.				
6.				
7.				

Note No
1.

#	NOTES:
	1. Need to recheck low pH calibration solutions.

Component Calibrated and Ready for Startup

By: *J.D. Sewell*

Date: *Jun-6-92*

Tag No.: AIT-12-6[pH]

CH2M HILL **PERFORMANCE ACCEPTANCE TEST SHEET** ***Rev.06.05.92***

Project Name:	Project No.:

Demonstration Test(s): For each functional requirement of the loop:
(a) List and number the requirement. (b) Briefly describe the demonstration test.
(c) Cite the results that will verify the required performance. (d) Provide space for signoff.

Forms/Sheets Verified	By	Date	**Loop Accepted By OWNER**
Loop Status Report			By:
Instrument Calibration Sheet			Date:
I&C Valve Calibration Sheet			
Performance Acceptance Test	By	Date	
Performed			
Witnessed			Loop No.:

CH2M HILL **PERFORMANCE ACCEPTANCE TEST SHEET** **Rev.06.05.92**

EXAMPLE

Project Name: *SFO SEWPCP Plant Expansion*	Project No.: *SFO12345.C1*

Demonstration Test(s): For each functional requirement of the loop:
(a) List and number the requirement. (b) Briefly describe the demonstration test.
(c) Cite the results that will verify the required performance. (d) Provide space for signoff.

1. MEASURE EFFLUENT FLOW

1.a With no flow, water level over weir should be zero and

FIT indicator should read zero. *Jun-20-92 BDG*

2. FLOW INDICATION AND TRANSMISSION TO LP & CCS

With flow, water level and FIT indicator should be related by expression

*Q(MGD) = 429*H**(2/3) (H = height in inches of water over weir).*

Vary H and observe that following.

2.a Reading of FIT indicator. *Jun-6-92 BDG*

2.b Reading is transmitted to FI on LP-521-1. *Jun-6-92 BDG*

2.c Reading is transmitted and displayed to CCS. *Jun-6-92 BDG*

H(measured)	*0*	*5*	*10*	*15*
Q(computed)	*0*	*47.96*	*135.7*	*251.7*
Q(FIT indicator)	*0*	*48.1*	*137*	*253*
Q(LI on LP-521-1)	*0*	*48.2*	*138*	*254*
Q(display by CCS)	*0*	*48.1*	*136.2*	*252.4*

Forms/Sheets Verified	By	Date	**Loop Accepted By OWNER**
Loop Status Report	*J.D. Sewell*	*May-18-92*	By: *J.D. Smith*
Instrument Calibration Sheet	*J.D. Sewell*	*May-18-92*	Date: *Jun-6-92*
I&C Valve Calibration Sheet	*N.A.*		
Performance Acceptance Test	By	Date	
Performed	*J. Blow MPSDC Co.*	*Jun-6-92*	
Witnessed	*B.deGlanville*	*Jun-6-92*	Loop No.: *30-12*

SECTION 40 90 11
COMPONENTS AND PANELS SUBSYSTEM (CPS)

PART 1 GENERAL

1.01 DEFINITIONS

A. Abbreviations:

1. SWBD: Switchboard.
2. FDT: Factory Demonstration Test.
3. PLC: Programmable Logic Controller.
4. VFD/RVSS: Variable Frequency Drive/Reduced Voltage Soft Starter.

B. Rising/Falling: Terms used to define actions of discrete devices about their set points.

1. Rising: Contacts close when an increasing process variable rises through set point.
2. Falling: Contacts close when a decreasing process variable falls through set point.

C. Signal Types:

1. Analog Signals, Current Type:
   a. 4 to 20 mA dc signals conforming to ISA S50.1.
   b. Unless otherwise indicated for specific CPS Subsystem components, use the following ISA 50.1 options:
      1) Transmitter Type: Four wire.
      2) Fully isolated transmitters and receivers.
2. Analog Signals, Voltage Type: 1 to 5 volts dc within panels where a common high precision dropping resistor is used.
3. Discrete signals, two-state logic signals using dc or 120V ac sources as indicated.
4. Pulse Frequency Signals:
   a. Direct current pulses whose repetition rate is linearly proportional to process variable.
   b. Pulses generated by contact closure or solid state switches as indicated.
   c. Power source less than 30V dc.
5. Special Signals: Other types of signals used to transmit analog and digital information between field elements, transmitters, receivers, controllers, and digital devices.

D. CPS Components: Equipment listed under Component Specifications reference in Article Supplements.

1.02 SYSTEM DESCRIPTION

A. This section covers requirements for Components and Panels Subsystem (CPS).

B. Work includes engineering, fabrication, testing, and documenting for complete control panels as specified herein and on the Drawings.

C. Work shall be provided by one of the following an approved JEA Control Panel Vendor:

1. ECS.
2. EG Controls, Inc.
3. Suncoast.
4. Sun State Systems, Inc.
5. Infamation Technologies Group.

D. Detailed Design: CPS as shown and specified includes functional and performance requirements and Component Specifications. Complete detailed CPS design. The Drawings are a part of the functional requirements of this CPS specification. They are modified versions of the drawings created by the past standard supplier of JEA's well SCADA panels. These Drawings do not necessary comply with the drawing format/content specification included herein.

1. Component numbering (e.g. terminal block numbers, relay numbers) from the previous drawings have been retained, but the new panels do not need to match these designations.
2. Panel Interior and Exterior Door Layouts: Panel layout shall generally follow the layout shown on the Drawings.
3. Processor Connections and Panel Bill-of-Materials: A surge arrestor between the Profibus DP cable entry and the OLM module has been added. The CPU, digital input and output modules and SINAUT have been revised for RIO. This shall be included with the panel. The bill-of-materials specifies the components to be used. Substitutions will be considered on a case-by-case basis. The bill of materials is supplemented by functional specifications for some components.

1.03 SUBMITTALS

A. Shop Drawings:

1. Bill-of-Materials: List of required CPS equipment.
   a. Group equipment items as follows:
      1) CPS Components: By component identification code.
      2) Other CPS Equipment: By equipment type.
   b. Data Included:
      1) Equipment tag number.
      2) Description.
      3) Manufacturer, complete model number and all options not defined by model number.
      4) Quantity supplied.
      5) Component identification code where applicable.
2. Catalog Cuts: CPS components, electrical devices, and mechanical devices:
   a. Catalog information.
   b. Descriptive literature.
   c. External power and signal connections.
   d. Scaled drawings showing exterior dimensions and locations of all electrical and mechanical interfaces.
3. Component Data Sheets: Data sheets for all CPS components.
   a. Format and Level of Detail: In accordance with ISA-S20.
   b. Include component type identification code on data sheet.
   c. Specific features and configuration data for each component:
      1) Location or service.
      2) Manufacturer and complete model number.
      3) Size and scale range.
      4) Set points.
      5) Materials of construction.
      6) Options included.
   d. Name, address, and telephone number of manufacturer's local office, representative, distributor, or service facility.
4. Sizing and Selection Calculations:
   a. Primary Elements: Complete calculations plus process data used. For example, for flow elements: Minimum and maximum values, permanent head loss, and assumptions made.
   b. Controller, computing, and Function Generating Modules: Actual scaling factors with units and how they were computed.
5. Panel Construction Drawings:
   a. Scale Drawings: Show dimensions and locations of panel mounted devices, doors, louvers, subpanels, internal and external.
   b. Panel Legend: List front of panel devices by tag numbers, nameplate inscriptions, service legends, and annunciator inscriptions.

c. Bill of Materials: List devices mounted within panel that are not listed in panel legend. Include tag number, description, manufacturer, and model number.
d. Construction Details: NEMA rating, materials, material thickness, structural stiffeners and brackets, lifting lugs, mounting brackets and tabs, door hinges and latches, and welding and other connection callouts and details.
e. Construction Notes: Finishes, wire color schemes, wire ratings, wire, terminal block numbering, and labeling scheme.

6. Panel Control Diagrams: For discrete control and power circuits.
   a. Diagram Type: Ladder diagrams. Include devices, related to discrete functions, that are mounted in or on the panel and that require electrical connections. Show unique rung numbers on left side of each rung.
   b. Item Identification: Identify each item with attributes listed.
      1) Wires: Wire number and color. Cable number if part of multi-conductor cable.
      2) Terminals: Location (enclosure number, terminal junction box number, or MCC number), terminal strip number, and terminal block number.
      3) Discrete Components:
         a) Tag number, terminal numbers, and location ("FIELD," enclosure number, or MCC number).
         b) Switching action (open or close on rising or falling process variable), set point value and units, and process variable description (e.g. Sump Level High).
      4) I/O Points: PLC or microprocessor base number, I/O tag number, I/O address, terminal numbers, and terminal strip numbers.
      5) Relay Coils:
         a) Tag number and its function.
         b) On right side of rung where coil is located, list contact location by ladder number and sheet number. Underline normally closed contacts.
      6) Relay Contacts: Coil tag number, function, and coil location (ladder rung number and sheet number).
   c. Show each circuit individually. No "typical" diagrams or "typical" wire lists will be allowed.
   d. Ground wires, surge protectors, and connections.
7. Panel Wiring Diagrams: Show point-to-point and terminal-to-terminal wiring within panels.
8. Panel Power Requirements and Heat Dissipation: For control panels tabulate and summarize:
   a. Required voltages, currents, and phases(s).
   b. Maximum heat dissipations Btu per hour.
   c. All calculations.

9. Interconnecting Wiring Diagrams:
    a. Diagrams, device designations, and symbols in accordance with NEMA ICS 250.
    b. Show each circuit individually. No “typical” wiring diagrams will be allowed.

B. Quality Control Submittals:

1. Testing Related Submittals:
    a. Unwitnessed Factory Test: No Submittals required.
    b. Factory Demonstration Test:
        1) Preliminary Test Procedures: Outlines of proposed tests, forms, and checklist.
        2) Final Test Procedures: Proposed test procedures, form, and checklist. Approved test procedure submittal is a prerequisite to conducting factory test.
        3) Test Documentation: Copy of signed off test procedures when tests are completed.
2. O&M Manuals:
    a. Refer to paragraph Shop Drawings for the following items:
        1) Bill-of-Materials.
        2) Catalog cuts.
        3) Component data sheets.
        4) Panel wiring diagrams, one reproducible copy.
        5) Loop diagrams, one reproducible copy.
        6) Interconnecting wiring diagrams, one reproducible copy.
    b. Device O&M manuals for CPS components, electrical devices, and mechanical devices shall include:
        1) Operations procedures.
        2) Installation requirements and procedures.
        3) Maintenance requirements and procedures.
        4) Troubleshooting procedures.
        5) Calibration procedures.
        6) Internal schematic and wiring diagrams.
    c. List of spares and expendables required and recommended.

PART 2 PRODUCTS

2.01 CPS COMPONENTS

A. Components: Furnish all equipment that is necessary to achieve required performance.

2.02 NAMEPLATES AND TAGS

A. Component Nameplates-Panel Face: Component identification located on panel face under or near component.

1. Location and Inscription: As shown on panel Drawing.
2. Materials: Adhesive backed, laminated plastic.
3. Letters: 3/16-inch black on white background, unless otherwise noted.
4. In addition to adhesive backing, fasten nameplate to panel using Type 316 stainless steel self-tapping screws.

B. Component Nameplates-Back of Panel: Component identification located on or near component inside of enclosure.

1. Inscription: Component tag number.
2. Materials: Adhesive backed, laminated plastic.
3. Letters: 3/16-inch black on white background, unless otherwise noted.

C. Service Legends: Component identification nameplate located on face of component.

1. Inscription: As shown on panel Drawing.
2. Materials: Adhesive backed, laminated plastic.
3. Letters: 3/16-inch black on white background, unless otherwise noted.

2.03 PANEL FABRICATION

A. General:

1. Panels with external dimensions and instruments arrangement as specified on Drawings, except as modified in JEA-approved Shop Drawings.
2. Panel Construction and Interior Wiring: In accordance with the National Electrical Code (NEC), state and local codes, and applicable sections of NEMA, ANSI, UL, and ICECA.
3. Fabricate panels, install instruments, wire, and plumb, all at the Manufacturer’s factory.
4. All panels shall bear UL label stating listing per UL 508A.
5. Electrical Work: In accordance with the applicable requirements of NEC.

B. Corrosion Inhibiting Vapor Capsules: Prior to shipment, insert corrosion inhibiting vapor capsules in each panel.

C. Temperature Control:

1. Design Basis:
   a. Ambient temperature range (deg. F): 15 to 100.
   b. Outdoor installation with panel face to north.
   c. Installing contractor will provide solar shield on south side (back).
2. Solar Shields:
   a. Location: Top and sides. Top shield to extend 6 inches beyond front of enclosure.
   b. Air gap: 1 inch.
   c. Material: Same as collar stud. Aluminum can be provided for non-aluminum collar stud if rubber gaskets or washers isolate stud and shield.
   d. Attachment to Enclosure: Welded collar stud, same material as enclosure
3. Temperature Calculations: Perform temperature calculations to ensure the internal panel temperature does not exceed the maximum temperature rating of any panel component. If a component's maximum temperature rating will be exceeded, the Standard supplier may provide a component with a higher rating or increase the panel size with the approval of JEA.
4. Space Heaters:
   a. Thermostatically controlled to maintain internal panel temperatures above dew point.
   b. Required for all panels.

D. Panel Construction:

1. Based on environmental design requirements and referenced in Article Environmental Requirements, provide the following:
   a. For panels:
      1) Enclosure Type: NEMA 4X.
      2) Materials: Aluminum, unless otherwise noted.
2. Doors:
   a. Rubber-gasketed with continuous hinge.
   b. Stainless steel single handle, locking.
   c. Suitable for lock with 3/8-inch shank.
3. Data Pocket:
   a. Provide per bill of materials.
   b. Provide laminated set of panel drawings, updated after functional testing in the field, for insertion into data pocket.

4. Mounting Kit: Provided.
   a. Material: Same as enclosure.
   b. Ingress Protection: Tested by Manufacturer to maintain ingress protection rating of enclosure.
   c. Function: Provides mounting tabs with predrilled hole for mounting to external frame.
5. Manufacturers: Hoffman Engineering Co.

E. Control Panel Electrical:

1. Power Distribution within Panels:
   a. Feeder Circuits:
      1) One or more 120V ac, 60-Hz feeder circuits as shown on Drawings.
      2) Make provisions for feeder circuit conduit entry.
      3) Furnish terminal board for termination of wires.
   b. Power Panel: Furnish main circuit breaker and a circuit breaker on each individual branch circuit distributed from power panel.
      1) Locate to provide clear view of and access to breakers when door is open.
      2) Breaker Sizes: Coordinate such that fault in branch circuit will blow only branch breaker but not trip the main breaker.
         a) Branch Circuit Breakers: 15 amps at 250V ac.
   c. Circuit Wiring: Drawings show function only. Use following rules for actual circuit wiring:
      1) Devices on Single Circuit: 20, maximum.
      2) Multiple Units Performing Parallel Operations: To prevent failure of any single branch circuit from shutting down entire operation, do not group all units on same branch circuit.
      3) Branch Circuit Loading: 12 amperes continuous, maximum.
      4) Panel Lighting and Service Outlets: Put on separate 15-amp 120V ac branch circuit.
      5) Provide 120-volt ac plugmold for panel components with line cords.
      6) Provide 120-volt ac outlet.
2. Signal Distribution:
   a. Within Panels: 4 to 20 mA dc signals may be distributed as 1 to 5V dc.
   b. Outside Panels: Isolated 4 to 20 mA dc only.
   c. All signal wiring shall be twisted, shielded pairs.

3. Signal Switching:
   a. Use dry circuit type relays or switches.
   b. No interruption of 4 to 20 mA loops during switching.
   c. Switching Transients in Associated Signal Circuit:
      1) 4 to 20 mA dc Signals: 0.2 mA, maximum.
      2) 1 to 5V dc Signals: 0.05V, maximum.
4. Relays:
   a. General:
      1) Relay Mounting: Plug-in type socket.
      2) Relay Enclosure: Furnish dust cover.
      3) Socket Type: Screw terminal interface with wiring.
      4) Socket Mounting: Rail.
      5) Provide hold down clips.
   b. Signal Switching Relay:
      1) Type: Dry circuit.
      2) Contact Arrangement: 2 Form C contacts.
      3) Contact Rating: 0 to 5 amps at 28V dc or 120V ac.
      4) Contact Material: Gold or silver.
      5) Coil Voltage: As noted or shown.
      6) Coil Power: 0.9 watts (dc), 1.2VA (ac).
      7) Expected Mechanical Life: 10,000,000 operations.
      8) Expected Electrical Life at Rated Load: 100,000 operations.
      9) Indication Type: Neon or LED indicator lamp.
      10) Seal Type: Hermetically sealed case.
   c. Control Circuit Switching Relay, Non-latching:
      1) Type: Compact general purpose plug-in.
      2) Contact Arrangement: 3 Form C contacts.
      3) Contact Rating: 10A at 28V dc or 240V ac.
      4) Contact Material: Silver cadmium oxide alloy.
      5) Coil Voltage: As noted or shown.
      6) Coil Power: 1.8 watts (dc), 2.7VA (ac).
      7) Expected Mechanical Life: 10,000,000 operations.
      8) Expected Electrical Life at Rated Load: 100,000 operations.
      9) Indication Type: Neon or LED indicator lamp.
      10) Push-to-test button.
5. Power Supplies:
   a. Furnish as required to power instruments requiring external dc power, including two-wire transmitters and dc relays.
   b. Convert 120V ac, 60-Hz power to dc power of appropriate voltage(s) with sufficient voltage regulation and ripple control to assure that instruments being supplied can operate within their required tolerances.

c. Provide output over voltage and over current protective devices to:
   1) Protect instruments from damage due to power supply failure.
   2) Protect power supply from damage due to external failure.
d. Enclosures: NEMA 1.
e. Fuses: For each dc supply line to each individual two-wire transmitter.
   1) Type: Indicating.
   2) Mount so fuses can be easily seen and replaced.

6. Hand Switches and Indicating Lights:
   a. General:
      1) Function: Select, initiate, and display discrete control functions.
      2) Type: Heavy-duty, corrosion-resistant, industrial.
   b. General Features:
      1) Mounting: 30.5 mm, single round hole. Panel thickness 1/16 inch to 1/4 inch.
      2) Legend Plate: Standard size square style laminate with white field and black markings, unless otherwise noted. Markings as shown.
      3) Configuration: Light, pushbutton, or switch as noted or shown.
   c. Light Features:
      1) Lights: 6V ac lamps and integral transformer for operation for operation from 120V ac, unless otherwise noted.
      2) Lens Color: Color as specified under PANEL, STANDARD LIGHT COLOR AND INSCRIPTIONS, or as noted.
   d. Switch Features:
      1) Guard: Full guard with flush button, unless otherwise noted.
      2) Three-position Cylinderlock: Allen-Bradley 800T J44 (H-O-A) with one NO and one NC contact block (800-T-XA). When noted see Instrument List. All locks shall work from a single JEA-supplied key.
   e. Pushbutton and Switch Features:
      1) Guard: Full guard with flush button, unless otherwise noted.
      2) Operator: Black pushbutton, black nonilluminated knob on switch, unless otherwise noted.
      3) Boot: None, unless otherwise noted.
   f. Signal Interface:
      1) Contact Block:
         a) Type: Silver-coated butting, unless otherwise noted.
         b) Rating: 10 amps continuous at 120V ac or as noted.
         c) Sequence: Break-before-make, unless otherwise shown.

d) Arrangement: Normally open or normally closed as shown, or to perform the functions noted.
e) Terminals: Screw with strap clamp, unless otherwise noted.

g. NEMA Rating: NEMA 4X, corrosion-resistant.

7. Programmable Logic Controller System:
   a. General:
      1) Function: Used for process monitoring and control by emulating functions of conventional panel mounted equipment such as relays, timers, counters, cur-rent switches, calculation modules, PID controllers, stepping switches, and drum programmers.
      2) Type: Microprocessor based device programmable using ladder logic.
   b. Components: As shown on Drawings.
   c. Manufacturer:
      1) Siemens, 300 series.
      2) No exceptions.
8. Conductor Colors:
   a. 120V ac Control wiring: Red on hot side, white on neutral.
   b. 24V dc: Blue.
   c. Ground: Green.
   d. System Identification: Place a laminated guide to conductor colors within the enclosure.
9. Internal Wire Identification:
   a. Numbered and tagged at each termination.
   b. Wire Tags: Machine printed, plastic sleeves.
10. Internal Panel Lights and Service Outlets for Smaller Panels:
    a. Internal Panel Light: Switched 100-watt incandescent light.
    b. Service Outlet: Breaker protected 120-volt, 15-amp, duplex receptacle:

F. Factory Finishing:

1. Stainless Steel and Aluminum: Not painted.

2.04 ELECTRICAL TRANSIENT PROTECTION

A. General:

1. Function: Protect elements of CPS against damage due to electrical transients induced in interconnecting lines by lightning and nearby electrical systems.

2. Implementation: Provide, install, coordinate, and inspect grounding of surge suppressors at:
   a. Connection of ac power, analog signals and networks (e.g. Profibus DP) to CPS equipment panels.
   b. Surge suppressor for connection of antenna to radio will be supplied and field installed by others into CPS enclosure.
3. Construction: First-stage gas tube and secondary-stage bipolar silicon avalanche device separated by series impedance. Includes grounding wire, stud, and terminal.
4. Response: 5 nanoseconds maximum.
5. Recovery: Automatic.
6. Temperature Range: Minus 20 degrees C to plus 85 degrees C.

2.05 UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. Components: UPS and enclosure.

1. Enclosure: Provide with adequate clear space for UPS wiring.
   a. Type: NEMA 3R.
   b. Dimensions: Maximum width 30 inches, Maximum height 48 inches
   c. Materials: Type 304 stainless steel, unless otherwise noted.
   d. Metal Thickness: 14-gauge, minimum.
   e. Doors:
      1) Rubber-gasketed with continuous hinge.
      2) Stainless steel single handle, locking.
      3) Suitable for lock with 3/8-inch shank.
   f. Mounting Kit: Provided.
      1) Material: Same as enclosure
      2) Ingress Protection: Tested by Manufacturer to maintain ingress protection rating of enclosure.
      3) Function: Provides mounting tabs with predrilled hole for mounting to external frame.
2. UPS:
   a. General:
      1) Function: Provides isolated, regulated uninterrupted ac output power during a complete or partial interruption of incoming line power.
      2) Major Parts: Inverter, battery charger, sealed battery.
   b. Performance:
      1) Capacity: 50 percent spare capacity above computed maximum panel load.
      2) Input Power:
         a) 120 V ac single phase, 60-Hz, unless otherwise noted.
         b) Connections: Manufacturer’s standard, unless otherwise noted.

3) Output Power:
   a) 120 V ac single phase, 60-Hz, unless otherwise noted.
   b) Connections: Manufacturer's standard, unless otherwise noted.
4) On-line Efficiency: 85 percent minimum, unless otherwise noted.
5) Backup Runtime:
   a) Full Load: 9 minutes minimum, unless otherwise noted.
   b) Half Load: 20 minutes minimum, unless otherwise noted.
6) Continuous no-break power with no measurable transfer time.
7) Sine-Wave Output Voltage Total Harmonic Distortion (THD): Plus or minus 6 percent or less.
8) Input Voltage Range: Plus 15 percent, minus 20 percent.
9) Output Voltage Regulation: Plus or minus 3 percent nominal.
10) Operating Temperature: 0 degrees to 40 degrees C (32 degrees to 104 degrees F).
11) Operating Relative Humidity: 5 percent to 95 percent without condensation.
12) Lightning and Surge Protection:
   a) Pass lightning standard IEEE C62.41 Categories A and B tests.
   b) 2000 to 1 attenuation of input spike.

c. Features:
   1) Enclosure: Tower, unless otherwise noted.

d. Manufacturers and Products: Refer to JEA provided Bill of Material in Supplement 2, Sheet 1 of 4 of this section.

2.06 SOURCE QUALITY CONTROL

A. Factory Demonstration Tests: Demonstrate to JEA that CPS panels and assemblies included in these tests conform to related Submittals and requirements specified.

PART 3 EXECUTION

3.01 FACTORY DEMONSTRATION TEST (FDT)

A. Unwitnessed Factory Test (UFT):

1. Scope: Inspect and test each control panel to ensure it is operational, ready for FDT.
2. Location: CPS Manufacturer's Factory.

3. Integrated Test:
    a. Interconnect and test CPS.
    b. Exercise and test all functions.
    c. Provide stand alone testing of smaller CPS panels.
    d. Simulate inputs and outputs for primary elements, final control elements, and CPS panels excluded from test.

B. Factory Demonstration Tests (FDT):

1. Scope: Test the CPS panel to demonstrate that it is operational and meets JEA's requirements. Test shall be witnessed by JEA.
2. Location: CPS Manufacturer provided facility within 100 miles of JEA headquarters in Jacksonville, Florida.
3. Tests shall include:
    a. Inspection of panel and components.
    b. Verification of all circuits: Provide a test panel with switches, 4 to 20 ma sources and indicating lights. Prewire test panel to CPS enclosure and label test panel devices. Provide a test program for the PLC. Standard supplier shall provide a test procedure for this portion of factory testing.
        1) No testing of radio communications required.
    c. JEA verification of software function: No test procedure required for this testing. Provide JEA 1 day in factory for testing of JEA's application software. Prewire test panel to CPS enclosure and label test panel devices. If the JEA desires to do associated testing, JEA will provide Profibus DP slaves for testing of Profibus networking.
4. Correct deficiencies found in CPS enclosure and complete prior to shipment to Site.
5. Failed Tests:
    a. Repeat and witnessed by JEA.
    b. With approval of JEA, certain tests may be conducted by CPS Manufacturer and witnessed by JEA as part of FDT.
6. Make following documentation available to the JEA at test site both before and during FDT:
    a. All Drawings, Specifications, Addenda, and Change Orders.
    b. Master copy FDT procedures.
    c. List of equipment to be tested including make, model, and serial number.
    d. Shop Drawings hardware Submittals for equipment being tested.

C. Functional Testing:

1. Scope: Test the CPS panel to demonstrate that it is operational and meets JEA's requirements. Test shall be witnessed by JEA.
2. Location: JEA well site within JEA service area.
3. Tests shall include:
   a. Verification of all circuits:
      1) Test pump and limit switch interface circuits by actual operation of well pump.
      2) Test power status by removing power.
      3) Test motor over temperature by testing temperature input to starter; not by jumpering starter output signal.
      4) Verify that analog inputs are received and scaled correctly.

3.02 SUPPLEMENTS

A. The supplement listed below, following "END OF SECTION," is part of this Specification.

1. Supplement 1, JEA Prepared Standard "SCADA Panels for Water Supply Wells."

END OF SECTION

SCADA PANELS FOR WATER SUPPLY WELLS

08-21-2008

JEA

JACKSONVILLE, FLORIDA

Work to be completed includes engineering, fabrication, testing, and documenting for complete control panels as specified in this document and on the Drawings.

The first enclosure is to be fabricated and tested to JEA's satisfaction at the manufactures facility. Then it shall be installed in the field and tested to verify that the panel is 100% to satisfaction. Any modifications resulting from JEA's field testing will be incorporated into the panel. The drawing will then be modified and then the production of the remaining panels can begin once the drawings are approved by JEA.

SHOP/DRAWINGS/ AS BUILTS:

Prior to assembly of MCC panel, the panel supplier shall submit 3 sets of full shop drawings and a computer diskettes containing as-built diagrams/ schematics and operations and parts manuals to JEA for review and approval (AutoCAD format).

The drawings shall include complete bill of material, front panel view, sub panel layouts and shall be designed and manufactured to JEA standards. Three (3) computer diskettes containing complete panel As-Built wiring diagrams and Operational & Maintenance data shall be provided to JEA in AutoCAD format and paper format. Complete electrical installation drawings shall also be provided by JEA in AutoCAD format and paper format.

Components:

All Automation components such as PLC must be Siemens and parts specified in the Bill of Material.

The General components such as Power Supply, UPS, Circuit Protection and others may be substituted only for an equivalent device.

Terminals:

The clamping system shall consist of a one-piece "self-locking" hardened spring steel yoke, and corrosion proof Chromate plating. The clamping yoke design shall assure a high contact force and integrity of the connection under all conditions of vibration, mechanical shock, thermal expansion and adverse atmospheric conditions. Retightening of the clamping screw will not be required due to the integral self-locking design. The pullout force shall be a minimum of 6 times that specified in VDE 0611. The current bar and clamping yoke shall have traverse grooves to increase the force required for conductor pull out and "Gas tight" connection. The voltage drop also shall remain virtually unchanged. Gas tightness will be per DIN 41640, part 76.

WIRING:

Type and Identification:

All wire (#12 AWG and smaller) shall be color coded and using the table below. Wire type shall be Hook-Up/Lead tinned copper # 18 AWG stranded minimum: BELDEN – 35612 Hook-Up Lead-UL AWM Style 3173-XL-DUR or equal.

120 VAC (Unswitched Hot)	Black
120 VAC (Dry Contacts)	Red
120 VAC (Neutral)	White

120 VAC (Switched Hot)	Red
24 VDC	#18 AWG Orange
0 VDC -	#18 AWG Brown

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 (Panduit) or JEA approved equal. Pass & Seymore "Legrande" will no longer be acceptable.

MOUNTING HARDWARE:

All components shall be mounted using stainless steel machine screws. All mounting holes shall be drilled and tapped. The use of self tapping screws shall not be acceptable.

UL LABELS:

The entire control system shall bear a UL 508 serialized label "Enclosed Industrial Control Panel". The use of the label "Industrial Control Panel Enclosure" without the UL508 serialized label is not acceptable. For applications involving hazardous locations a UL 913 serialized label shall also be applied. (Note: only for those applications.)

DOCUMENTATION:

All documentation provided with the electronic devices is to be inserted in a binder and left in the door of the enclosure.

The Contractor shall provide three (3) copies of the manufacturer's field start-up report before final payment is made.

NAMEPLATES:

All components shall be labeled using a laser screen Mylar nameplate. The nameplate shall be a laminated two part system using black letters on a white 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 laminate or plastic engraved legend plates will not be accepted.

Field Quality Control:

Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in installation and start-up of the equipment specified under this section. The manufacturer's representative shall provide technical direction and assistance to the Contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained herein. The following minimum work shall be performed by the Contractor under the technical direction of the manufacturer's service representative.

1. Inspection and final adjustments.

2. Operational and functional checks of controllers/starters and spare parts.

WARRANTY:

The Panel Manufacturer shall supply to JEA a three (3) year unconditional warranty after completion or acceptance of MCC Panel. The warranty shall include materials and installation and shall constitute complete replacement and delivery to the site of materials and installation of same to replace defective material or defective workmanship with new materials/workmanship conforming to the specifications. The Panel Manufacturer shall also be responsible to ensure that Component Manufacturer's Warranty which exceeds the Panel Manufacturer's three (3) year warranty is honored.

SERVICE:

The manufacturer or representative shall provide two hour on site emergency service for the first 12 months after commissioning. The manufacturer shall stock replacement components locally for emergency replacement as needed.

START UP:

The manufacturer or representative shall be present for start up at time designated by JEA.

SECTION 44 42 56.03
VERTICAL TURBINE PUMP

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Iron and Steel Institute (AISI): Type 1045 Carbon Steel.
2. American Water Works Association (AWWA): E101, Vertical Turbine Pumps-Line Shaft and Submersible Types.
3. ASTM International (ASTM):
   a. A48, Standard Specification for Gray Iron Castings.
   b. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   c. A276, Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
   d. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
   e. B148, Standard Specification for Aluminum-Bronze Sand Castings.
   f. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
4. Institute of Electrical and Electronics Engineers (IEEE): 112, Standard Test Procedure for Polyphase Induction Motors and Generators.
5. National Electrical Manufacturer's Association (NEMA): MG 1, Motors and Generators.

1.02 DEFINITIONS

A. Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards and of AWWA E101, American National Standard for Vertical Turbine Pumps.

1.03 SUBMITTALS

A. Action Submittals:

1. Make, model, weight, and horsepower of each equipment assembly.
2. Certification that Contractor has read and is in compliance with JEA Standard Specification for Rotating Machinery Acceptance.
3. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.

4. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over the entire operating range of the pump, from shutoff to maximum capacity. Indicate separately the impeller trim, head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the guarantee point.
5. Pump maximum downthrust or upthrust in pounds.
6. Detailed Shop Drawings showing the equipment dimensions, size, and locations of connections and weights of associated equipment.
7. Power and control wiring diagrams, including terminals and numbers.
8. Complete motor nameplate data, as defined by NEMA, motor manufacturer, and including any motor modifications.
9. Factory finish system and color chart.
10. The pump manufacturer shall provide a signed letter certifying that the column pipe and line shafting have been supplied by the pump manufacturer.
11. The Contractor shall submit the results of the field measurements of the well casing flange as described in paragraph 3.02.A.
12. The pump manufacturer shall submit a statement confirming that there are no critical speeds in the operating range of the pump and motor.

B. Informational Submittals:

1. Performance Test Reports.
2. Manufacturer's Certification of Compliance that the factory finish system is identical to the requirements specified herein.
3. Special shipping, storage and protection, and handling instructions.
4. Manufacturer's printed installation instructions.
5. The Contractor's proposal to conduct the field performance tests, obtain measurements and the qualifications of the personnel that will be performing the tests.
6. Manufacturer's Certificate of Proper Installation.
7. Suggested spare parts list to maintain the equipment in service for a period of 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
8. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
9. Operation and Maintenance Data: As specified Section 01 78 23, Operating and Maintenance Data.
10. Procedure for conducting the functional and performance testing.

PART 2 PRODUCTS

2.01 GENERAL

A. Augmentation well pump shall be vertical line shaft turbine type with an electric vertical hollow shaft motor, operating at a nominal 1,800 rpm. The pump shall be water lubricated type suitable for raw water service in a vertical groundwater well. The pump and well water will be initially disinfected by chlorination after installation in accordance with AWWA Standards, and periodically thereafter.

B. All materials and coatings used in the manufacture shall conform to NSF 61 as required by the Florida Department of Environmental Protection, Chapter 62-555 Permitting, Construction, Operation and Maintenance of Public Water Systems.

C. Operating conditions and required flow and pressure performance requirements are provided in the attached Pump Data Sheet.

D. For unit responsibility, the pump manufacturer shall be responsible for supplying the bowl assembly, column, lineshaft, discharge head, wellhead companion flange and motor. No exception will be allowed to this requirement unless an item is furnished by the Owner.

E. Final selection of the pump performance point has not been completed at the time of Bid. Refer to the attached pump and motor data sheets for assumptions to select a pump, column, discharge head and motor to provide a bid price.

F. Acceptable Manufacturers:

1. Goulds Pumps.
2. Peerless Pump.
3. National Pump Company.
4. American Marsh.

2.02 PUMP, MOTOR, AND ACCESSORIES

A. Discharge Head:

1. The discharge head shall be made of high-grade cast iron, ASTM A48 Class 30. A fabricated steel discharge head will be allowed provided that (1) access to the wellhead is maintained as shown on the wellhead flange and access port arrangement detail in the Drawings and (2) the manufacturer can demonstrate that the discharge head, well companion flange, and motor are stiffened sufficiently to ensure that there no critical speeds in the operating range of the pump.

2. The discharge head shall be manufactured and provided by the pump manufacturer. The outlet shall be abovegrade, flanged, and sized to meet the flanged discharge piping diameter as listed in the operating conditions.
3. A Type 316 stainless steel nameplate with the pump serial number, pump model number, operating conditions, bowl data and impeller data stamped into it shall be attached to the head with noncorrosive fasteners.
4. The stuffing box shall be made of cast iron with Type 316 stainless steel split-type packing gland, studs, and nuts, and furnished with five rings of graphited synthetic fiber packing. The bearing shall be bronze, Type C89835 or equal. A rubber slinger shall be furnished with the stuffing box for securing to the shaft above the packing gland to protect the motor from excess spray. The head shall have a threaded connection in the stuffing box location for connecting a drain pipe.
5. Discharge head base shall be provided with an appropriate wellhead companion flange, see mechanical detail Wellhead Flange and Access Port Arrangement in the Drawings. The wellhead companion flange shall be threaded for the column pipe diameter as listed in the operating conditions.
6. Discharge head shall be configured to allow for direct attachment to the wellhead flange and access port assembly (shown on the process mechanical details) with a watertight gasketed connection.
7. Discharge head baseplate shall be equipped with bolt holes which match the diameter, number, and placement of the wellhead companion flange and access port assembly. The spool piece between the well casing and discharge head shall be ASTM A53 carbon steel Schedule 40.
8. The pump shall be furnished with a two-piece top shaft. The head shaft passing through the stuffing box shall be made of Type 416 stainless steel meeting ASTM 582. It shall be precision ground, balanced, and polished with a surface finish better than 40 rms. Its length shall be sized to accommodate the length of top column pipe plus the height of the head through the stuffing box, so that the couplings are easily accessible at the head and the first column pipe joint.

B. Column Assembly:

1. Column pipe shall be furnished in sections not exceeding a nominal 10 feet, connected by threaded sleeve coupling, of nominal diameter listed in the operating conditions supplement.
2. The top and bottom sections shall not be more than 5 feet in length.
3. Column shall be manufactured of ASTM A53 Grade B steel pipe, Schedule 40 (Standard) for nominal diameters 10 inches and less.
4. The column pipe ends shall be threaded, 8 threads per inch with 3/16-inch taper per foot thread and faced parallel to butt against the centering spiders so the assembled sections are accurately aligned.

5. Lineshaft shall be made of Type 416 stainless steel meeting ASTM 582. It shall be precision ground, balanced, and polished with a surface finish better than 40 rms. Each shaft length shall be straight, not exceeding 0.005 inch out in total indicator reading per 10-foot section.
6. Lineshaft diameter shall be a minimum 1-3/16-inch.
7. Lineshaft shall be furnished with a stainless steel coupling for section of shaft. Couplings shall be machined from solid stainless steel bar and have left hand threads that will tighten during pump operation. The threads of the lineshaft and coupling shall be compatible. Couplings shall be Type 410 stainless steel.
8. Bearing retainers (spiders) shall be furnished for each column and shaft section. The spiders shall be made of Type 304 or 316 stainless steel or ASTM C95800 Nickel Aluminum Bronze and designed to drop in the column couplings and be retained by the butted ends of the column pipe.
9. Shaft bearings shall be a cutlass neoprene rubber retained in the spider by a shoulder on each end of the bearing, designed for water lubricated operation with the appropriate shaft diameter.
10. The pump manufacturer shall provide a signed letter certifying that the column pipe and line shafting have been supplied by the pump manufacturer. Column and line shafting provided by suppliers or contractors other than the pump manufacturer will not be acceptable.

C. Pump Construction:

1. Bowl assembly shall consist of flanged type bowls constructed of close grained cast iron conforming to ASTM A48 Class 30. The bowls shall be free of blow holes, sand holes, or other faults and accurately machined and fitted to close tolerances, and capable of meeting or exceeding the hydrostatic pressure ratings of the Hydraulic Institute.
2. The intermediate bowls shall have enamel lined waterways for maximum efficiency and wear protection. All intermediate bowls shall be of identical design for interchangeability. A discharge bowl shall be sized and threaded to connect the bowl assembly to the discharge column.
3. The discharge bowl and all intermediate bowls shall be fitted with Vesconite HiLube composite sleeve bearings by VescoPlastics.
4. The suction bowl shall be provided with nonsoluble grease packed bronze bearing. A bronze sand collar shall be provided to protect this bearing from abrasives in the pumping fluids. The bearing housing shall have sufficient opening at the bottom for easy removal of the bearing.
5. The bowls shall be assembled using all Type 316 stainless steel bolting.
6. A stainless steel nameplate with the operating conditions and bowl and impeller date stamped into it shall be attached to the bowl with noncorrosive fasteners. An additional stainless steel nameplate shall be furnished loose for use by JEA.

7. Impellers shall be constructed of either Type 304 stainless steel or ASTM C95500 Nickel Aluminum Bronze. No silicone bronze alloy impellers shall be allowed.
8. Impellers shall be free from defects and accurately cast, machined, filed, and polished for premium efficiency and minimum vibration. Impellers shall be balanced to grade G6.3 of ISO 1940 as a minimum.
9. Impellers shall be secured to the bowl shaft with tapered split Type 316 stainless steel bushing (collets).
10. The bowl shaft shall be constructed from Type 416 stainless steel meeting ASTM 582. It shall be precision ground, balanced, and polished with a surface finish better than 40 rms.
11. The pump shall be tested by the factory after trimming and assembly and a curve of the operating conditions including flow, head, efficiency, and horsepower shall be plotted and submitted to the Engineer for approval prior to shipping any materials. The test shall be a nonwitnessed test, but JEA reserves the right to reject the test and witness any retesting at its own cost.

D. Suction Bowl Strainer: A suction strainer shall be furnished with the pump assembly. It shall be made of Type 316, or 316L stainless steel and threaded to the suction bowl. The cone strainer shall have a free area of at least four times the flow area of the suction pipe.

E. Pump Motor: Refer to Specification 26 20 00, Low Voltage AC Induction Motors as detailed in the Drawings.

2.03 FACTORY FINISHING

A. Discharge Head (Interior and Exterior), Pump Bowl (Interior and Exterior) and Suction Bell (Interior and Exterior).

1. Surface preparation SP5 White Metal Blast Cleaning.
2. Manufacturer’s standard NSF 61 certified fusion bonded coating.

B. Column Pipe, Interior and Exterior: Do not provide coating on column pipe.

C. Wellhead Flange and Access Port Arrangement Assembly, Interior and Exterior.

1. Surface preparation SP5 White Metal Blast Cleaning.
2. Polyamidoamine Epoxy, Tnemec Series N141 applied at 2 coats at 4.0 to 6.0 MDFT per coat.

D. Motor.

1. Surface preparation SP10 Near-White Metal Blast Cleaning.
2. Polyamide High Build Epoxy. Two coats at 4.0 to 6.0 MDFT per coat.
3. Top Coat: Aliphatic Acrylic Polyurethane, Tnemec Series 1095 applied at 2.5 to 5.0 MDFT.
4. Finish Color: Submit color chart for Owner selection.
5. Provide a sufficient quantity of the top coat paint for field touchup.

2.04 SOURCE QUALITY CONTROL

A. Factory Testing: Certified factory tests of pumping unit will be required. The factory test of the pumping unit shall produce at a minimum the following information:

1. HQ curve.
2. Impeller trim diameter.
3. Shaft brake horsepower curve.
4. Water to water efficiency (pump efficiency).

B. Factory Test Report: Include test data sheets, curve test results, performance test logs, certified correct by a registered professional engineer or factory test facility manager.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's field services technicians instructions.

B. Connect suction and discharge piping without imposing strain to pump flanges.

C. Orient discharge head to accurately mate with discharge piping

D. Anchor Bolts: Accurately place using equipment templates. Use new neoprene flange gasket.

3.02 FIELD QUALITY CONTROL

A. Confirm Well Casing Flange with Pump Manufacturer: The Contractor shall conduct field tests to confirm the well casing flange is level and plumb and meets the requirements of the pump manufacturer within 20 days from NTP. The precision of the field measurements to determine the well casing flange level shall be as recommended by the pump manufacturer.

1. If the well casing flange does not meet the pump manufacturer's requirements, perform the following:
   a. Notify the Engineer and Owner immediately.
   b. Submit modifications to the Wellhead Flange and Access Port Arrangement Assembly to compensate for the well casing flange level to provide a sufficiently level base for the pump discharge head.
2. If the well casing flange meets the pump manufacturer's requirements, submit a confirming statement with the pump Shop Drawing.

B. Field Testing: After installation of the pump is completed, except for final connection to the water transmission line, the entire assembly will be subject to field testing. Field testing will be performed to verify mechanical performance and stated guaranteed efficiencies of the pump.

C. The installation contractor shall install the pump in accordance with the manufacturer's field services technician's instructions. The manufacturer's field service technician shall be present during the entire time the pump is installation and subsequent performance testing.

D. The Contractor shall submit for review and approval, the means by which it is proposed to conduct the tests, obtain measurements and the qualifications of the personnel that will be performing the tests.

E. The field functional and performance tests shall be witnessed by the Engineer and Owner.

F. The initial test will be performed at the expense of the Installing Contractor. Test results shall be submitted to the Engineer for review.

G. Test results shall be submitted to the Engineer for review. Should field test results reveal inefficiencies less than the Guaranteed Efficiency the Contractor shall be assessed damages or the equipment will be rejected and replaced at the Contractor's expense. All costs for manufacturer's services shall be borne by the Contractor.

H. Functional Test: Conduct on each pump.

1. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
2. Vibration Test:
   a. Test with unit installed and in normal operation, and discharging to the connected piping systems at rates between low discharge head and high discharge head conditions specified.
   b. Shall not develop vibration exceeding the limits specified in Hydraulic Institute Standards 9.6.4. The vibration measurement locations and directions shall be as shown on Figure 9.6.4.2.3.1 for a VS3 configuration.
   c. If unit exhibits vibration in excess of limits specified, adjust or modify as necessary. Unit that cannot be adjusted or modified to conform as specified shall be replaced.

I. Performance Test: Conduct on each pump.

1. A step test shall be conducted in the presence of the Owner and Engineer.
2. The step test shall include a minimum of four steps.
3. The duration of each step shall be as required to obtain steady and reliable test data. The following data shall be measured and recorded during each step of the test:
   a. Flow Measurement: Measured by flow instrumentation.
   b. Pressure: Owner's pressure gauge, or as approved by the Engineer.
   c. Operating Temperature: Monitor bearing areas on pump and motor for abnormally high temperatures
   d. Water level shall be measured by level instrumentation or Engineer approved instrumentation.
   e. Measure phase to phase volts and amp draw at the motor control center using an ammeter provided by the Contractor.

3.03 FIELD FINISHING

C. Discharge Head Assembly, Exterior.

1. As described on the Process Mechanical General Notes in the drawings, PAINTING AND PROTECTIVE COATINGS, System No 5.
2. Finish Color: Submit color chart for Owner selection.

D. Wellhead Flange and Access Port Arrangement Assembly, Exterior.

1. As described on the Process Mechanical General Notes, PAINTING AND PROTECTIVE COATINGS, in the drawings, System No 6.
2. Finish Color: Submit color chart for Owner selection.

1.02 SUPPLEMENTS

A. The supplements listed below, following "END OF SECTION," are part of this Specification.

1. Supplement 1, Pump Data Sheet.
2. Supplement 2, Induction Motor Data Sheet.

END OF SECTION

NASSAU WELL #3 PUMP DATA SHEET
VERTICAL TURBINE PUMP

Project: Nassau #3 Wellhead

Pump Mfr.: Goulds, Peerless, National or American Marsh

Owner: JEA

Size & Type:

Service: Raw Water Well Pump

No. Stages:

Pump Name: Nassau Well #3 Pump

Serial No.:

Equip. Tag Number(s): NA3-P-1-1-1

Model No.:

No. Pumps Required: 1

Drive Type: ☒ Constant ☐ Adjustable

LIQUID	OPERATING CONDITIONS	SERVICE CONDITIONS
Name: Raw Water	Capacity (U.S. gpm):	Temp (°F): Max _____ Min _____
Pumping Temperature (°F):	Normal 1000 Rated gpm	Rel. Hum (%): Max _____ Min _____
Normal 75 Max 85 Min 65	Total Dynamic Head (ft):tbd	Altitude (ft):
Specific Gravity @ 70 °F: 1.0	Suction Lift (psig):	☐ Indoor ☐ Heated
Vapor Pressure (psia):	Max _____ Rated _____	☒ Outdoor ☐ Unheated
Viscosity (CP) @ _____ °F:	Submergence (min. ft.):	Will Pump be Submerged?
pH: 7.6	NPSH Available (ft):	☒Yes ☐No
Corrosion/Erosion/Abrasion Caused by:		Area Classification:
H_2S		Other:
Remarks:	Remarks: Pump setting depth is (tbd) ft btoc	Remarks:

PERFORMANCE REQUIREMENTS (manufacturer to supply missing data)

Proposal Curve No.:	Min. Continuous Flow (gpm):	NPSH Required (ft water):
Pump Speed Range (rpm): 1800	Max. Head (ft):	3% Head Drop
Efficiency (%): 80 Min	Max. Power (BHP):	Suction Specific Speed:
Rated Power (BHP):		Factory Testing:
		☒Required ☐Not Required

Remarks: For Bidding purposes assume a design pumping rate of 1,000 gpm, 6-inch discharge flange, 100-feet of 6-inch diameter column pipe, 100-feet of 1-3/16- inch diameter shaft, and 40-hp motor.

Equipment Tag Number(s): NA3-P-1-1-1

PUMP CONSTRUCTION DETAILS (manufacturer to supply missing data)

Nozzles

	Size	Rating	Facing	Location
Suction	6-inch			
Discharge	6-inch			

Miscellaneous Connections

	Size	Location
Drain		
Vent		
Pres. Gauge		
Warm Up		

Casing Mount:

☐ Vertical

☐ Vertical Barrel

Impeller Type:

☐ Open ☒ Closed

Impeller Diameter (in.):

Rated _____ Max _____ Min _____

Max. Allowable Pressure (psig):

At 60°F: _____

At Norm. Pump. Temp.: _____

Pump Shaft Dia. (In.): _____

Column Size (In.): 8 in

Lineshaft Type:

☒ Open ☐ Enclosed

Min. Lineshaft Size (In.): 1-3/16

Hydro Test Pressure (psig): _____

Field Testing: ☐ Not required

☒ Required, functional and performance

Max Bowl Size (in.) _____

No. of Stages: _____

Packing Mfr: _____

Type _____

Size/No. Rings _____

API Class Code _____

Manufacturer _____

Model _____

Manufacturer Code _____

Bearings (Type/No.):

Bowl _____

Lineshaft _____ Pump Shaft _____

Intermediate _____ Guide _____

Head Shaft: _____

Lubrication Type:

☐ Grease ☐ Oil

☒ Pumped Liquid

Coupling:

Manufacturer _____

Type _____ Model _____

Driver Half-Coupling Mounted by:

☐ Pump Mfr. ☐ Driver Mfr.

☐ Purchaser

Gland Type/Material: _____

Gland Plate Taps Required:

☐ Quench ☐ Flush
☐ Drain ☐ Vent

MATERIALS (manufacturer to supply missing data)		
Bowl: _____	Impeller: _____	Shaft: _____
Bowl Wear Rings: _____	Impeller Wear Rings: _____	Shaft Sleeve: _____
Column: _____	Bowl Bearing: _____	Discharge Head:
Remarks: _____	Head Shaft Bearing: _____	Type _____
_____	Lineshaft Bearing: _____	Material _____
ADDITIONAL REQUIREMENTS		
Sole Plate Suction Strainer		
_____		
_____		

INDUCTION MOTOR DATA SHEET

Project: Nassau #3 Wellhead

Owner: JEA

Equipment Name: Nassau Well 33 Pump

Equipment Tag Number(s): NA3-P-1-1-1

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 75 hp

Voltage: 460VAC

Phase: 3

Frequency: 60Hz

Synchronous Speed: 1,800 rpm

☒ Thermal Protection: T-Stat

☒ Space Heater: 120 volts, single-phase

Guaranteed Minimum Efficiency at Full Load: 94.1 percent

Guaranteed Minimum Power Factor at Full Load: 86.0 percent

Service Factor (@ rated max. amb. temp.): ☒ 1.0 ☒ 1.15

Enclosure Type: Open weather protected - Type 1

☐ Multispeed, Two-Speed: _____ / _____ rpm

Winding: ☐ One ☐ Two

Mounting Type: ☐ Horizontal ☒ Vertical

☒ Vertical Shaft: ☐ Solid ☒ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down _____

☒ Adjustable Speed Drive: Part 31; NEMA MG 1

Operating Speed Range: 50 to 100% of Rated Speed

☒ Variable Torque

☐ Constant Torque

Special Features:

Motor shall be inverter Duty rated for use with an Adjustable Frequency Drive.

Motor housing/enclosure to be painted both inside and out with oxide primer and chemical duty paint such as used on U.S. Motors' brand CORRO-DUTY.

Service Factor shall be 1.15 full voltage / 1.00 Inverter Drive

Motor nameplate must state Inverter Duty Rated.

DRAWINGS
(BOUND SEPARATELY)