



SJRPP SUBSTATION CONSTRUCTION SPECIFICATIONS

Chen Moore and Associates, Inc.

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I. GENERAL

1. Scope

This Specification document covers construction, installation, labor, equipment, and material requirements for the installation of the switchyard electrical equipment. The Contractor shall erect in place, test, and leave ready for service, the facilities shown on the Contract Drawings and herein specified. This document covers all aspects of construction of, and within, JEA electrical substations.

2. Order of Precedence

The following documents shall take precedence with 1) prioritized as most important.

1. Manufacturer Drawings and Specifications
2. JEA Approved Contract Change Orders
3. JEA Substation Construction Drawings
4. JEA Substation Construction Specifications

3. Codes and Standards

The installation covered by these Specifications shall conform to the practices set forth in the latest edition of the National Electrical Code (NEC) and the National Electrical Safety Code (NESC), unless otherwise specified in these Plans and Specifications.

4. Equipment and Materials

All Contractor-furnished materials, unless otherwise indicated, shall be new, of the first quality and of the proper type for use intended. When applicable, all materials will be in accordance with the latest published NEMA Standards and carry the approval of the Underwriter's Laboratories, or a similar nationally recognized testing agency (NRTL).

Owner-furnished items will be identified in the construction documents. The Contractor shall coordinate the receiving of the items with the JEA Project Representative. It is the Contractor's responsibility, unless otherwise specified, to furnish labor and equipment for loading, transporting, and off-loading the items at the job site.

All material and equipment stored on the substation site or other areas including Owner-furnished material and equipment shall be in the care, custody, and control of the Contractor. The Contractor shall be responsible for any necessary repairs or replacement of materials and equipment damaged, lost, or stolen while in the care and custody of the Contractor.

5. Electrical Clearances

All substation bus and equipment shall conform to the below electrical clearance requirements. Any deviation shall be approved of in writing by the JEA Project Representative as well as the responsible Engineer of the project. Any clearance violations shall be brought to the attention of the JEA Project Representative as soon as possible for correction.

System Voltage (kV)	Maximum Phase-to-Phase Voltage (kV)	BIL (kV)	Minimum Metal-to-Metal for Rigid Conductors (inches)	Centerline-to-Centerline Phase Spacing for Rigid Buses (inches)	*Minimum Phase to Grounded Parts for Rigid Conductors (inches)	**Minimum Clearance Above Grade [Between Bare Overhead Conductors and Ground for Personal Safety] (feet)	Minimum Between Bare Overhead Conductors and Roadways Inside Substation Enclosure (feet)	Minimum to Fence Horizontal (feet)
13.2	15.5	110	12"	24"	7"	9'	21'	10'
26.4	38	200	18"	36"	13"	10'	22'	10'
69	72.5	350	31"	60"	25"	11'	23'	12'
138	145	650	63"	96"	50"	13'	25'	14'
230	242	900	89"	132"	71"	15'	27'	16'
*ANSI C37.32, **NESC								

6. Safety

JEA Substation Safety/Access Training shall be required of all Contractor personnel if work is to be performed within any JEA Substation, even if de-energized. Proof of training must be available and presented to JEA before any personnel begin work for the first time and on demand if requested. All personnel are required to wear the proper PPE while in a substation or active construction site. Refer to JEA's Contractor Safe Work Practices Manual for more information.

7. As-Built Drawings

The Contractor shall prepare and maintain accurate, up to date Record (As-Built) Drawings for the entire duration of the project. These As-builts shall reflect all field changes, and be updated on a continuous basis. See Section IV, Project Record Documentation.

8. Subcontractors

All requirements of these Specifications shall apply to any subcontractors engaged by the Contractor. It is the Contractor's responsibility to ensure that all subcontractors are aware of and adhere to the Specifications at all times.

II. SUBMITTALS

1. General

1.1. Summary

1.1.1 This Section includes general requirements and procedures related to preparation and transmittal of Submittals to include Equipment and Material, Schedules, Packager's Drawings, Samples, Manuals, Methods of Construction, and Record Drawings to the JEA Project Representative (Engineer) for Approval.

- (a) Other requirements for submittals are specified under applicable sections of the Specifications, and Material and Equipment specified in the drawings.

1.2. Submittal Requirement

1.2.1 General

- (a) Submit each item or related group of items under separate cover or transmittal.
- (b) Furnish neat, legible, and sufficiently explicit detail to enable proper review for Contract compliance.
- (c) Show complete and detailed fabrication; assembly and installation details; wiring and control diagrams; catalog data; pamphlets; descriptive literature; and performance and test data.
- (d) Include calculations or other information sufficient to show comprehensive description of structure, machine, or system provided and its intended manner of use.
 - (i) With each submission, furnish Engineer specific written notation and justification of each variation in Contractor's Submittals from requirements of Contract Documents.
 - (ii) Fabrication, purchase or delivery of materials to the site, and installation of materials or Work performed before approval, or not conforming to approved submittals, shall be at Contractor's risk.
- (e) JEA's Project Representative's review and approval of submittals shall not relieve Contractor from responsibility for fulfillment of terms of Contract, unless Engineer has received specific written notice of each variation and has given specific written approval.
- (f) Contractor shall provide all ancillary equipment and material not specified to provide a complete and functioning system.
- (g) Contract Work, Materials, Fabrication, and Installation: Following approved submittals.

1.2.2 Process and Requirements.

- (a) Not later than 30 days after Notice to Proceed, submit written list of materials and equipment to be purchased, giving name, address, and telephone number of Supplier, Manufacturer, or processor.
 - (i) Submit updated material and equipment list when changes are made.
- (b) Coordinate and schedule submittals with construction schedule to JEA's Project Representative's.
- (c) With the first submittal, but not later than 30 days after Notice to Proceed, submit a complete submittal schedule, listing as near as practicable and by Specification Section number, submittals required and approximate date submittal will be forwarded.
 - (i) Schedule Submittals so that related equipment items are submitted at the same time.
 - (ii) JEA's Project Representative's may require changes to submittal schedule to permit concurrent review of related equipment.
- (d) To each submittal affix the following signed Certification Statement.
 - (i) "Certification Statement: By this submittal, we hereby represent that we have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and pertinent data and we have checked and coordinated each item with other applicable approved drawings and all Contract requirements."
- (e) Identification
 - (i) Submit identification data, as applicable, contained thereon or permanently adhered thereto:
 1. The Contract Number.
 2. Contract name and location.
 3. Submittal Numbers:
 - a. Number by specification section and paragraph followed by sequential number. Number format example is Section 4-2.3-01.
 - b. Resubmittals shall bear original submittal number and be sequentially lettered (Example Section 4-2.3-01A).
 4. Product identification.
 5. Drawing title, drawing number, revision number, and date of drawing and revision.
 6. Applicable Contract Drawing Numbers and Specification Section and Paragraph Numbers.
 7. Subcontractor's, Vendor's and/or Manufacturer's name, address and phone number.
 8. Contractor's Certification Statement.
 - a. Identify on transmittal letter all items included in the submittal. Include page and catalog item numbers for items submitted.
 - b. Highlight catalog, product data, or brochures containing various products, sizes, and materials to show particular item submitted.

- (f) Stamp Space: Blank space of approximately 2-1/2 inches high by 4 inches wide adjacent to the identification data to receive Engineer's status stamp.
- (g) Approval Process.
- (i) Follow submittal schedule provided to Owner's Project Representative. Representative will return submittal within 15 days.
- (ii) Submittals will be returned, marked with one of following classifications:
 - 1. APPROVED: Requires no corrections, no marks.
 - 2. APPROVED AS NOTED: Requires minor corrections. Items may be fabricated as marked without further resubmission
 - 3. REVISE AND RESUBMIT: Requires corrections. Resubmit entire submittal following original submission with corrections noted
 - 4. REJECTED: Items are not following Contract Document Requirements. Resubmit entire submittal meeting the Contract Documents Requirements.
- (iii) The Contractor shall be allowed up to three submissions (initial plus two resubmittals) of the same submittals for review. The Contractor shall bear all costs for reviews beyond three submissions

1.2.3 Electronic Submittals: PDF Format, as approved by Project Representative.

1.3. Submittals

1.3.1 Schedules: Submit project schedule, showing the following major milestones, to the Owner within seven (7) days of receiving Notice to Proceed (NTP).

- (a) Shop Drawing Submittal
- (b) Owner's Shop Drawing Review Period
- (c) Order Materials
- (d) Start of Construction
- (e) Testing and Commissioning
- (f) Construction Substantial Completion
- (g) Energization
- (h) Project Completion

1.3.2 Equipment Warranty and Certification Form

- (a) Submit "EQUIPMENT WARRANTY AND CERTIFICATION FORM" with the first submittal for all equipment and systems listed below. Submittals that do not include the required form(s) will not be accepted.
- (b) The form shall be duly executed by an authorized principal of the manufacturer.
- (c) The principal shall warrant and certify that the equipment, component, or system proposed meets or exceeds contract specifications, is suitable for its intended purpose and installation, and will provide satisfactory performance at the design criteria specified.

- (i) In the event that the manufacturer is not the supplier, an authorized principal of the supplier shall also execute the Equipment Warranty and Certification Form.

1.3.3 Shop Drawings

- (a) The Original submittal and each subsequent re-submittal required, submit electronically to the Owner's Project Representative. The Representative will return the reviewed submittal electronically.
- (b) Show types, sizes, accessories, and layouts, including plans, elevations, and sectional views; component, assembly, and installation details; and all other information required to illustrate how applicable portions of Contract requirements will be fabricated and/or installed.
- (c) In case of fixed mechanical and electrical equipment, submit layout drawings drawn to scale, to show required clearances for operation, maintenance, and replacement of parts. Include manufacturer's certified performance curves, catalog cuts, pamphlets, descriptive literature, installation, and application recommendations, as required. Submit together shop drawings for closely related items. Additional shop drawings and information required for electrical and mechanical equipment are listed in appropriate Specification Sections.
- (d) Manufacturer shall have on file certified drawing(s) containing above information approved by the Owner, and items furnished shall be as described on certified drawing(s). If Standard Details or Specifications change after certified drawings are approved, new submittals are required.

1.3.4 Catalog Data.

- (a) The Original submittal and each subsequent re-submittal required, submit electronically to the Owner's Project Representative. The Representative will return the reviewed submittal electronically.
- (b) Manufacturer's Catalog, Product, and Equipment Data: Certified and include material type, performance characteristics, voltage, phase, capacity, and similar data.
 - (i) Furnish wiring diagrams when applicable.
 - (ii) Indicate catalog, model, and serial numbers representing specified equipment.
 - (iii) Submit complete component information to verify specified required items.

1.3.5 Working Drawings.

- (a) The Original submittal and each subsequent re-submittal required, submit electronically to the Owner's Project Representative. The Representative will return the reviewed submittal electronically.

- (b) Submit working drawings as required for changes, substitutions, Contractor design items, and Contractor designed methods of construction. Requirements for working drawings are listed in appropriate Specification Sections or in Special Provisions.
- (c) Include with drawings calculations or other information to completely explain structure, machine, or system described and its intended use. Review or approval of drawings by Engineer shall not relieve Contractor from responsibility for fulfillment of terms of Contract. Contractor assumes risks of error, and Engineer shall have no responsibility.
- (d) Submit any required structural drawings and calculations sealed, dated, and signed by Professional Engineer registered in State of Florida and experienced in the work or discipline involved.

1.3.6 Method of Construction.

- (a) The Original submittal and each subsequent re-submittal required, submit electronically to the Owner's Project Representative. The Representative will return the reviewed submittal electronically.
- (b) When Engineer specifies or directs, submit proposed method of construction for specific portions of Work.
 - (i) Include detailed written description of phases of construction operation to fully explain to Engineer proposed method of construction.
 - (ii) If required by Specifications, submit working drawings to supplement description.
- (c) Engineer review will follow the process herein and shall not relieve Contractor from responsibility for fulfillment of terms of Contract. Contractor assumes risks associated with proposed method.
- (d) After review, submit requests for modifications in detail, including justification for them. Do not implement modifications prior to Engineer's review.

1.3.7 Manufacturer's Installation Recommendations.

- (a) The Original submittal and each subsequent re-submittal required, submit electronically to the Owner's Project Representative. The Representative will return the reviewed submittal electronically.
- (b) Furnish written detail for step by step preparation and installation of the materials and products, including recommended tolerances and space for maintenance and operation.

1.3.8 Record Drawings (As-builts).

- (a) Prepare and maintain record drawings for work performed. See Section IV Project Record Documentation.

1.3.9 Operation and Maintenance Manuals.

- (a) Furnish Operation and Maintenance Manuals for various types of equipment and systems, as required by Contract Documents.
- (b) Unless otherwise indicated, furnish a separate manual for each piece of equipment and system. If a manual contains other items or equipment, indicate where specified items are located in manual. Include in manual complete information necessary to operate, maintain, and repair specific equipment and system furnished under this Contract, and include the following specific requirements;
 - (i) Contents.
 - 1. Table of Contents and Index.
 - 2. Brief description of equipment/system and principal components.
 - 3. Starting and stopping procedures, both normal and emergency.
 - 4. Installation, maintenance, and overhaul instructions including detailed assembly drawings with parts list and numbers, and recommended spare parts list with recommended quantity, manufacturer's price, supplier's address, and telephone number.
 - 5. Recommended schedule for servicing, including technical data sheets that indicate weights and types of oil, grease, or other lubricants recommended for use and their application procedures.
 - 6. One copy of each component wiring diagram and system wiring diagram showing wire size and identification.
 - 7. One approved copy of each submittal with changes made during construction properly noted, including test certificates, characteristic curves, factory and field test results.
 - 8. For electrical systems, include dimensioned installation drawings, single line diagrams, control diagrams, wiring and connection diagrams, list of material for contactors, relays and controls, outline drawings showing relays, meters, controls and indication equipment mounted on equipment or inside cubicles, control and protective schematics, and recommended relay settings.
 - (ii) Material:
 - 1. Covers: Oil, moisture, and wear resistant 9 inches by 11-1/2 inches size.
 - 2. Pages: 60 pound paper 8-1/2 inches by 11 inches size with minimum of 2 punched holes 8-1/2 inches apart reinforced with plastic, cloth, or metal.
 - 3. Fasteners: Metal screw post or Acco metal strap type.
 - 4. Diagrams and Illustrations: Attach foldouts, as required.
 - 5. Legible Original Quality: Reproduced by dry copy method.
- (c) Copies:
 - (i) Submit preliminary electronic copies of manuals (via FTP site or email) for review and approval no later than date of shipment of equipment. Installation shall not begin until manuals are accepted by Engineer. Include in preliminary copies all items required under "Contents" above. Three copies will be marked and returned to Contractor.
 - (ii) Deliver 3 copies of finally approved manuals to Engineer before Engineer's inspections and tests.

2. Measurement and Payment

Providing for and complying with requirements in this Section will not be measured for payment, but cost will be considered incidental to Contract.

III. SURVEYING

1. General

1.1. Description

- 1.1.1 Professional Surveyor: Provide professional surveying and mapping work required for the execution of the Contract including, but not limited to, verification of existing survey data, construction layout, and production of the Record (As-Built) Drawings. All work shall be performed by a Surveyor that is licensed by the State of Florida as a Professional Surveyor and Mapper pursuant to Chapter 472, F.S.
- 1.1.2 Boundary Survey: Boundary survey, map, and report certified by a Surveyor and Mapper shall be provided meeting the requirements of Chapter 5J-17 'Minimum Technical Standards', FAC.

1.2. Requirements

- 1.2.1 The Contractor shall retain the services of a Professional Surveyor and Mapper licensed in the State of Florida, approved by JEA, to provide professional surveying and mapping services necessary for investigation and/or construction including, but not limited to, a control survey. An As-Built survey shall be created and maintained during construction. The Surveyor will identify control points (monuments and benchmarks noted on the drawings. The construction layout survey shall be established from the control points shown on the Construction Drawings. The control points shall be verified by the Contractor prior to start of construction. Surveyors shall be proficient with the latest versions of Bentley MicroStation Connect and AutoCAD. Electronic files for this project shall be in Bentley MicroStation Connect.

1.3. Submittals

- 1.3.1 Provide qualifications of the Surveyor and Mapper:
 - (a) The Registered Surveyor and Mapper who is proposed by the Contractor to provide services for this scope of work shall be acceptable to the JEA Project Representative prior to field services being performed.
 - (b) Submit name, address, and telephone number of the Surveyor and/or Mapper, as appropriate, to JEA Project Representative before starting survey or mapping work.
 - (c) Submit written acknowledgement from the Surveyor and Mapper stating that they have the hardware, software, training, knowledge, and ability to provide the scope of services in their agreement with the Contractor to fully comply with the requirements of this specification and the project requirements.
 - (d) Submit copies of current licenses and registrations.
- 1.3.2 Submit documentation verifying accuracy of survey work.

2. Survey Documents

- 2.1. The Surveyor and Mapper shall not copyright any of their work related to this project.
- 2.2. All work, in all forms, shall become the property of JEA.
- 2.3. The Surveyor and Mapper shall record elevation and coordinates (location) of all new and existing utilities, known and exposed, including, but not limited to, water, wastewater, reclaimed water, storm water, communication, fiber optic cable, electric, gas, and any other structures located within the limits of construction.
 - 2.3.1 Piping/conduit shall be measured to the centerline and to the top of the pipe (T.O.P) or conduit and at every change in direction or elevation.
 - 2.3.2 Slopes, where applicable, shall be recorded.
 - 2.3.3 Valve elevations shall be measured to the nut operator (not the extension).
 - 2.3.4 The top (T.O.D.B) and bottom (B.O.D.B) elevations of electrical duct bank shall be recorded.
 - 2.3.5 Provide existing grade shots along the centerline of the utility route.
- 2.4. The Surveyor and Mapper shall record, to three (3) decimal places, the elevation and location of all:
 - (a) Baseline Control Locational Accuracy
 - (b) Bench Marks
 - (c) Changes in Direction/Elevation
 - (d) Tract and Easement Corners
 - (e) Existing Utilities and Appurtenant Structures
 - (f) Project Fencing
 - (g) Cable Trench
 - (h) Substation Ground Grid by no less than one Elevation Shot (with coordinates) per 20 Linear Feet
 - (i) Electrical Buried Conduit or Duct Bank by no less than one Elevation Shot (with coordinates) per 20 Linear Feet
 - (j) Direct Buried Cable Splice Locations
 - (k) Direct Buried Primary or Secondary Cable by no less than one Elevation Shot (with coordinates) per 20 Linear Feet
 - (l) Directional Drills
 - (m) Bore and Jack Casings
 - (n) Clean Outs
 - (o) Manhole Rims
 - (p) Manhole Inverts
 - (q) Hydrants
 - (r) Pump Stations (Public & Private)
 - (s) Monitoring Wells
 - (t) Production Wells

- (u) Centerline of Pipelines – Location
- (v) Top of Pipelines - Elevations
- (w) Piping, at 25-feet Maximum Intervals
- (x) Oil/Water Separators
- (y) Meters
- (z) Meter Boxes
- (aa) Pull/Splice Boxes
- (bb) Equipment Pads (all four corners)
- (cc) Slabs on Grade
- (dd) Other Project Construction Features
- (ee) Waterline and Apparent Bottom of all Bodies of Water within project limits

2.5. The Surveyor and Mapper shall submit a certified survey in both hard and soft copy version. Soft copy versions shall be submitted in AutoCAD 18 format or later or Bentley MicroStation Connect format. CAD files shall be prepared using JEA standards. Hard copy versions are to be submitted in PDF format.

2.6. Quality Assurance

2.6.1 Survey Datum

2.6.2 The horizontal and vertical datum(s) shall be the North American Datum (NAD) 1983 and North American Vertical Datum (NAVD) 1988 respectively. Any exceptions must be approved by the Project Manager prior to the commencement of work.

2.6.3 JEA Project Representative will provide electronic files of the design drawings to be used as base files by the Surveyor and Mapper. The electronic files will be provided in Bentley MicroStation Connect (.dgn) format.

2.6.4 JEA Project Representative intends on making random spot checks to verify accuracy of all third party survey work. If more than 10% of the spot checks are found to be inaccurate, then Surveyor and Mapper must uncover all work performed to date and verify each point taken at their own expense. The Surveyor and Mapper is also responsible for the restoration of surfaces as part of this requirement.

2.6.5 Any item that was installed, but not recorded, during construction and is listed in table 2D above must be surveyed post-construction at the Contractor's expense. This includes the restoration of any and all finishes.

3. Survey Field Work

3.1. Locate, reference, and preserve existing horizontal and vertical control points and property corners shown on the Drawings prior to starting any construction. If the Surveyor and Mapper performing the work discovers any discrepancies that will affect the Project, the Contractor must immediately report these findings to the JEA Project Representative. All survey work shall meet the requirements as defined in Florida Administrative Code 5J-17.

- 3.2. Reference and preserve all survey pins/monuments during Construction. If survey pins/monuments are disturbed, it is the responsibility of the Surveyor and Mapper to reset the pins/monuments at the Contractor's expense.
- 3.3. All sanitary lines shall be located using invert elevations in the existing manhole structures on both sides of the desired sanitary line location. Invert elevations surveyed in the manhole structures shall be documented with 3 digits. The desired location that is estimated by interpolating the surveyed manhole invert elevations shall be documented with one digit and labeled "approx.". Mechanical means such as air lances, vacuum excavation, probing, etc. shall not be used to locate this utility.
- 3.4. If the monuments are disturbed, any Work that is governed by these monuments shall be held in abeyance until the monuments are reestablished by the Surveyor and Mapper and approved by JEA Project Representative. The accuracy of all the Contractor's stakes, alignments, grades, layout, and all other work are the responsibility of the Contractor.
- 3.5. The construction layout shall be established from the reference points shown listed on, or derived from, the Drawings. The accuracy of any method of layout shall be the responsibility of the Contractor or the Surveyor and Mapper or jointly. All construction layout staking shall be done such as to provide for easy verification of the Work.
- 3.6. The Surveyor and Mapper shall coordinate with existing project control points if they exist.
- 3.7. The Surveyor and Mapper shall locate and record all elements listed in table 2D as applicable.
- 3.8. Horizontal Directional Drill Support
- 3.8.1 Roles and Responsibilities shall be as follows:
- (a) The Surveyor and Mapper shall provide support to the Contractor's Horizontal Directional Drill Sub-Contractor.
 - (b) The Horizontal Directional Drill Contractor will be responsible for providing the electronic tracement of the installed facility.
 - (c) The electronic tracement for submittal purposes will be performed on the final reaming or pulling of the drill.
 - (d) The Surveyor and Mapper in conjunction with the Horizontal Directional Drill Contractor shall stake each directional drill a minimum of every 15 feet (where practical) or individual lengths of bore casing; whichever is the lesser distance. Each stake shall signify the depth of the drill at that location and shall be consecutively numbered and shown as as-built. Provide existing grade elevations at the same intervals and locations.
 - (e) Field location of data collection points used by the Contractor shall be coordinated with the Surveyor and Mapper for simultaneous field location so the Surveyor and Mapper can collect the corresponding horizontal location and finished ground elevation for mapping

purposes.

- (f) The submitted data must include depths/distance from baseline datum to the final installed facility/utility.
- (g) Every directional drill must be identified by a unique name or number and that referenced identifier will be on the corresponding map, profile and report.
- (h) The Contractor shall provide an As-Built Bore Log with corresponding grade elevations.

- 3.9. The Contractor shall not permanently conceal any work until required information has been recorded.

IV. PROJECT RECORD DOCUMENTATION

1. General

1.1. Description

The purpose of the Project Record Documents is to provide JEA with accurate information regarding all aspects of the Work, both concealed and visible and to ensure the Work was constructed in conformance with the Contract Documents. The Contractor shall prepare and maintain accurate, up to date Record (As-Built) Drawings for the entire duration of the project. These Record (As-builts) shall reflect all field changes and be updated on a continuous basis.

1.2. Definitions

- 1.2.1 Surveyor: Contractor's Surveyor that is licensed by the State of Florida as a Professional Surveyor and Mapper pursuant to Chapter 472, F.S.

1.3. Quality Assurance

- 1.3.1 Contractor shall delegate the responsibility for the maintenance of the Record Documents to one person on the Contractor's staff to provide consistency in the quality of the mark-ups.
- 1.3.2 Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of specifications and each sheet of Drawings and other documents where such entry is required to show progress and changes properly.
- 1.3.3 Make entries within 24-hours after receipt of information has occurred.

2. Maintenance of Documents

2.1. Owner Furnished Documents

- 2.1.1 Three (3) sets of full size (24-inch x 36-inch) drawings revised to reflect bid amendments will be provided by JEA Project Management prior to start of construction. One set of these drawings shall be used for the maintenance of as-built drawings. One (1) copy of the Plan Drawings will be provided in electronic format, these files shall be used for as-built survey.

2.2. Maintain at Job Site, and available for JEA Project Representative Review, one copy of each of the following as record documents:

- 2.2.1 Construction Contract, Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents.
- 2.2.2 Change Orders, Documented Verbal Orders, Directives, Bulletins and other written modifications to Contract.
- 2.2.3 Written instructions by JEA as well as correspondence related to Requests for Information (RFIs).
- 2.2.4 Approved Shop Drawings, Samples, product data, substitution and "or-equal" requests.
- 2.2.5 Field test records, inspection certificates, manufacturer certificates and construction photographs.
- 2.2.6 Paper copy of the Contract Drawings (one Blue-line set of prints) maintained as the Progressive As-Built Drawings.

- 2.2.7 Paper copy of the Contract Drawings (one Blue-line set of prints) of current Survey As-Built Drawings.

2.3. Adhere to the following guidelines for maintenance of record documents:

- 2.3.1 Store record documents in an organized, clean, dry location, (such as a construction field office), apart from documents used for construction purposes.
- 2.3.2 Provide files and racks for storage of record documents.
- 2.3.3 Maintain record documents in clean, dry, and legible condition.
- 2.3.4 DO NOT use record documents for construction purposes.
- 2.3.5 Record documents shall be available at all times for inspection by JEA's Project Representative and other authorized users.

3. Marking Devices

3.1. Provide fine ball-point red, green and blue pens, and yellow highlighter for marking. Markings shall comply with good drafting standards as follows:

- 3.1.1 Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes. Notes shall be written in clear legible block lettering.
- 3.1.2 Deletions (Green) - Over-strike deleted graphic items (lines), lettering in notes and leaders. Mark out items if not installed as shown.
- 3.1.3 Additions (Red) – Show additions or modifications to graphic items (lines), lettering in notes and leaders. Lettering for the changes shall be printed block lettering. Neatly Cloud the changes.
- 3.1.4 No Changes (Yellow Highlighter) – Trace all work installed without changes or deviations in yellow highlighter.
- 3.1.5 Lines drawn to indicate changes shall be done using a straight edge and curves to provide clear and clean lines.
- 3.1.6 Use the same symbols and follow as much as possible the same drafting standards used on the Contract Drawings.
- 3.1.7 Use frequent written explanations (in Blue) on markup drawings to describe changes. Do not totally rely on graphic means to convey the revision.
- 3.1.8 Wherever a revision is made, make the changes to related section views, details, legend, profiles, plans and elevation views, schedules, notes and call out designations, and mark accordingly to avoid conflicting data on all other sheets.
- 3.1.9 For deletions, cross out all features, data and captions that relate to that revision.

4. Recording

- 4.1. Label each record document "PROJECT RECORD" in 2-inch-high printed letters.
- 4.2. Keep record documents current.
- 4.3. Do not permanently conceal any work until the required information has been recorded.
- 4.4. Record Contract Drawings: Legibly mark Drawings as described above. The Contractor, for weekly submittals, shall electronically mark a set of drawings with the same marking colors as described above. The Contractor shall record:
 - 4.4.1 Depths of various elements of foundation in relation to survey datum.
 - 4.4.2 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - 4.4.3 Structural steel framing tolerances which deviate from referenced standards.
 - 4.4.4 Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - 4.4.5 Field changes of dimension and detail.
 - 4.4.6 Changes made by Revision Order, Directive, and other modification. Mark all areas on sheets affected by Contract Directives with a "cloud" and note with the Contract Directive number. Maintain binders with complete Contract Directives adjacent to Contract Drawings for convenient reference.
 - 4.4.7 Details not on original Contract Drawings.
- 4.5. Record Specifications and Addenda: Legibly mark up each Section to record:
 - 4.5.1 Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed. Strike-through manufacturers and products that were not used on the project.
 - 4.5.2 Changes made by Revision Order, Directive, and other modifications.
 - 4.5.3 Other matters not originally specified.
- 4.6. Shop drawings and samples: Maintain as record documents. Legibly annotate shop drawings and samples to record changes made after approval.
- 4.7. In addition to the requirements of this Article, comply with supplemental requirements of indicated mechanical, electrical, and equipment work.

5. Audit

- 5.1. Project record documents will be reviewed monthly by Owner's Representative, who will use the current completeness of the record documents in evaluating the monthly progress payment request.

6. Record Or “As-Built” Surveys

6.1. The Contractor shall engage the services of a Florida licensed land Surveyor to record the vertical and horizontal Record or “As-Built” survey locations of:

6.1.1 Underground utilities outside buildings including but not limited to storm drains; sanitary sewer; water lines and supply lines for fire hydrants; compressed air; fuel gas, fuel oil; electrical duct banks; and other underground utility systems.

(a) Maintain a separate and distinct set of documents for recording underground utility information. Identify and maintain this set separate from other record documents.

(b) It is the intent that the substantially accurate location of underground utility service lines be included in the survey and recorded on the drawings. Establish accurate horizontal locations, and vertical (depth) locations based on fixed datum from a permanent monument or monuments.

6.1.2 The Contractor is responsible to ensure that the Surveyor provides on-site survey while construction is in progress to allow for recording of the following:

(a) Elevations and coordinates shall be identified for the ends of all conduits or pipelines installed or used for construction, ends of all duct bank stub-outs, and all direct buried cable splice locations.

(b) Elevations and coordinates along the center line of pipelines, direct buried cable, buried conduit or duct bank by no less than one elevation shot per 50 linear feet and at any change of direction vertical or horizontal of underground utility length. Slopes shall be identified.

(c) All elevation shots shall be referenced to “top-of-pipe” (T.O.P.), “top-of-concrete-duct-bank” (T.O.D.B.), “bottom-of-concrete-duct-bank” (B.O.D.B.), “top-of conduit” (T.O.C.) or “top-of-electric-cable” (T.O.E.), as appropriate for the project.

(d) Manhole rings, slabs on grade, valve box rims, equipment pads, bridge slabs, bottom of bridge girders, surface body water levels and other project construction features shall be recorded by elevation and coordinates as “As-Built”.

(e) All existing structures, utilities, and features revealed during the course of construction shall be accurately located and dimensioned. Movement of such utilities or structures required by project installation shall be recorded as “As-Built”. This requirement shall apply whether the existing structure, utility or feature was shown on the original contract drawings or not.

6.2. Compliance of work shall be in accord with Minimum Technical Standards of Florida Administrative Code Chapter 5J-17,

7. Directional Drill “As-Built”

7.1. The directional drill as-built shall have sufficient data to accurately integrate the information into the project as-built, determine the actual utility construction location in relation to the utility design location, and permit an accurate field location and site marking, as required by Sunshine One Call of Florida, of the mapped directional drill.

7.2. Horizontal Directional Drill Contractor Responsibilities

7.2.1 The directional drill contractor will be responsible for providing the electronic tracking of the installed facility.

- 7.2.2 The electronic tracking for submittal purposes will be performed on the final reaming or pulling of the drill.
 - 7.2.3 The Contractor shall stake each directional drill a minimum of every 15 feet, (where practical) or individual lengths of bore casing; whichever is the lesser distance. Each stake shall signify the depth of the drill at that location and shall be consecutively numbered and shown as as-built.
 - 7.2.4 Field location of data collection points used by the contractor shall be coordinated with the surveyor for simultaneous field location so the surveyor can collect the corresponding horizontal location and finished ground elevation for mapping purposes.
 - 7.2.5 The submitted data will include depths/distance from finished ground to the final installed facility/utility.
- 7.3. Florida Surveyor Responsibilities
- 7.3.1 All submitted directional drill as-built surveys will be performed by a Florida licensed surveyor.
 - 7.3.2 The submitted As-Built Map will be in accordance to Florida Statutes, Chapter 61G17-6 (Minimum Technical Standards.)
 - 7.3.3 Every directional drill will be identified by a unique name or number and that referenced identifier will be on the corresponding map, profile and report.
 - 7.3.4 All horizontal and vertical survey control will be referenced to a recognized datum.
 - 7.3.5 The beginning and ending as-built stations will have referenced measurements and ties to the survey control.

8. Record Or “As-Built” Survey Drawing Format

- 8.1. The AutoCAD drawings files shall comply with the following standards:
- 8.1.1 The electronic files shall be formatted for AutoCAD type DWG files or self-extracting compressed data file to a DWG format.
 - 8.1.2 The drawing format shall not contain any “X- REFS” (external references) to other files.
 - 8.1.3 The drawing format will contain only AutoCAD Standard Font Files and Acad.mnu type menu references only
 - 8.1.4 Layer control shall be strictly followed. There shall be no frozen layers or turned off layers in the drawing files.
 - 8.1.5 Text from different layers shall not overlap. Colors and line types shall be “BY-LAYER”. Only AutoCAD standard fonts and line types shall be used.
 - 8.1.6 All coordinate and elevation numbers shall be limited to three decimal places.
 - 8.1.7 Text height shall be entered such that when the drawing is plotted to scale, the actual text height is no less than 1/8 inch. The plotting scale for the drawings shall be the same scale as the construction drawings.
 - 8.1.8 Drawings shall be plotted on 24 x 36 inch sheets. The areas on each sheet shall match the areas shown on the construction drawings.

9. Submittal

- 9.1. At the end of each week's work, make available As-Built information for Owner's Representative's review, documents shall contain up-to-date As-Built information for all concealed work indicated on the Drawings.
- 9.2. At completion of the Work, deliver one (1) full size hardcopy (blue-line) of As-Built Drawings and electronic files of the As-Built Record Drawings, Record Specifications, and other Record Documents, and one hardcopy Record Specifications to Owner's Representative. Accompany submittal with transmittal letter, in duplicate, containing date, project title and number, Contractor's name and address, title and number of each record document, certification that each document as submitted is complete and accurate, and signature of Contractor, or its authorized representative.
- 9.3. Contractor's failure to maintain Record Contract Drawings, As-Built Drawings, Record Specifications, or other record documentation, and make same available for Owner's Representative's review (minimum of weekly) shall be deemed cause to withhold payment of amounts otherwise due until such failure is remedied.

V. SITE WORK

This section covers the general requirements for the development of the substation site regarding earthwork and related work including paving, water/sewer piping, erosion control, and fencing.

1. General

1.1. Permits

The Contractor shall comply with all permit requirements accompanying these specifications and shall obtain additional permits, if required, at no additional cost to JEA. The Contractor shall be held liable for any fines and/or violations for failure to comply with required permits.

1.2. Transportation Standards

These specifications refer to all transportation regulations at local, state, and national levels.

The latest FDOT Standard Specifications can be found online at the following website:

<http://www.fdot.gov/programmanagement/Implemented/SpecBooks/>

1.3. Maintenance of Traffic

The Contractor shall follow the Maintenance of Traffic (MOT) plan adhering to all applicable DOT regulations.

2. Surveying

The Contractor shall engage the services of a State of Florida Registered Land Surveyor as described in Section III to perform the limits of construction, total clearing, and the structure staking. The Owner will provide the Contractor the contact information of the Surveyor used for the Design Contract Drawings. It is strongly recommended that the Contractor use the same Surveyor to perform survey services. The Contractor shall provide coordinates in the appropriate State Plan Coordinates (SPCS) and Zone (latest adjustment) for all new structures.

3. Erosion & Sediment Control

The Contractor shall provide erosion and sediment control measures conforming to current Land Development Procedures of the City of Jacksonville, Florida, for all land-disturbing construction activities. The Contractor shall erect silt fences around the entire jobsite in accordance with the applicable FDEP requirements and the Contract Drawings' requirements.

4. Clearing and Grubbing

The Contractor shall clear, grub, and dispose all obstructions to the work site area including: standing trees, brush, bushes, shrubs, stumps, vines and their associated root systems, wood structure and fencing, debris, and rubbish in accordance to this document and associated Drawings. The Contractor shall coordinate with the JEA Project Engineer and JEA Project Representative prior to clearing the job site.

4.1. Exceptions

If JEA determines certain obstructions are to remain (ie- certain trees), the Contractor shall protect these assets by providing a temporary fence or barricade at a sufficient distance and height to prevent damage to the target asset. The Contractor must receive approval by the JEA Project Manager prior to clearing obstructions located on the perimeter of the designated

clearing area. JEA may make adjustments based on actual site conditions.

4.2. Staking

The Contractor shall stake every 50 feet along the perimeter of the designated clearing area. The Contractor must receive approval by the JEA Project Manager of the stake out prior to the removal of any trees or shrubs.

4.3. Stump Removal Requirement

All stumps and roots larger than 2 inches in diameter shall be removed to a depth at least 2 feet below the existing ground surface, or new final grade, whichever is lower.

4.4. Service Requirements and Recommendations

The Contractor shall remove timber by logging and/or chipping. The Contractor may employ any practical means for performing the work. Acceptable practices include tractors and chains, bulldozers with brush hooks and rakes, and axe/chain saw.

Where applicable, JEA recommends the Contractor to push or pull trees and extract the roots all in one piece and push out the stumps of trees with the bulldozer blade.

4.5. Disposal

All rubbish such as tires, roofing materials, concrete, etc., resulting from clearing shall be considered property of the Contractor and shall be removed from the job site by the Contractor. The Contractor shall pay all fees for disposal of rubbish and/or other items related to clearing. No Burning will be permitted on the construction site, unless approved by the JEA Project Representative.

4.5.1 Solid Waste

The Contractor shall dispose of the following solid wastes if found on the property: anti-freeze containers, aerosol lubricant and solvent cans, rusted 55 gallon drums, automobile gasoline tanks and batteries, domestic trash, oil filters and containers, appliances, demolition debris, tires, concrete, roofing materials, boards, metal, soil piles, etc. All solid wastes shall be disposed in accordance with FAC 62-701 (Solid Waste/Construction and Demolition Debris), 62-710 (Used Oil and Used Oil Filters), 62-711 (Tires) and 62-730 (Hazardous Waste). Several of these materials (whole tires, appliances, batteries, oil filters, non-empty containers) are prohibited from disposal in permitted, non-hazardous solid waste landfills.

4.5.2 Liquid Waste

All liquid wastes discovered on-site shall be properly screened (sampled and analyzed) before developing a disposal plan. Containers may be required to be crushed or cut open to demonstrate that they are empty.

4.5.3 Asbestos

If asbestos is determined to be present, the Contractor shall follow proper precautions when removing and transporting the material (wet material, use Type C respirators, and transport in covered vehicle). Refer to the FDEP Asbestos Removal Program, Chapter 62-257 Florida Administrative Code and any other applicable government regulations. Notify the JEA Project Representative if asbestos is found.

4.5.4 Recommended Non-Hazardous Solid Waste Facilities

- Trail Ridge (Waste Management), Baldwin, FL

- Pecan Row (GeoWaste), Valdosta, GA
- Okeechobee Farms (Chambers), Okeechobee, FL
- Springhill Regional (Waste Management) Graceville, FL

5. Dewatering

The Contractor shall remove surface and ground water accumulated before subsurface excavation to prevent damage to adjacent properties, structures, utilities, and to provide a safe workplace. Subgrades shall be protected from softening, undermining, washout, and damage by surface or groundwater accumulation. The construction site shall be completely drained during periods of construction to keep soil materials sufficiently dry. Maintain dry soils by providing temporary ditches, swales, and other drainage features. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. Maintain the water level continuously at least two (2) feet below the working level until dewatering is no longer required.

5.1. Collection & Disposal

The Contractor shall collect and dispose surface and ground water encountered during construction and dispose of water as approved by the JEA Project Representative and as required by FDEP. Provide and maintain at all times during construction, ample means and devices with which to remove promptly and dispose of all water from every source entering the excavations or other parts of the work. Control groundwater and surface runoff flowing toward or into excavations to prevent sloughing of excavation slopes and walls, boils, and excavation uplift and heave to eliminate all interference with orderly progress of construction. Remove water by pumping or other suitable methods. Use filters on dewatering devices to avoid removal of fines from soil. Provide erosion protection at discharge locations to avoid erosion. Install dewatering system prior to the excavation reaching the groundwater in order to maintain the integrity of the in-situ material.

5.2. Noise Requirements

The Contractor shall utilize quiet pumps and socks, with noise deflectors installed around the pumps, to comply with all allowable night time local noise ordinances. Dewater by means which will ensure dry excavations and the preservation of the final lines and grades of bottoms of excavations.

5.3. Sock System

If dewatering is performed by use of a sock system, the Contractor shall completely grout fill the abandoned sock(s) upon completion of dewatering activities. Locations of all abandoned socks shall be indicated on Contractor submitted "as-built" drawings.

6. Excavation for Site

Perform excavation of every type of material encountered within the limits of the work to the lines, grades and elevations indicated on the drawings, and/or as required for foundation or other subsurface construction.

Excavate to indicated elevations and dimensions within a tolerance of plus or minus 0.1 foot, unless over- excavation is required. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction, and for

inspections.

Soil stockpiles should be located, constructed, and maintained to minimize unwanted changes in the natural moisture content of the excavated soils, i.e.: protect soils near optimum moisture from becoming too wet to be readily reused for backfill, or prevent soils drier than optimum from further drying. Stockpiles can be protected from saturation by sloping and compacting the surface and side slopes to promote rainfall runoff. If additional protection is required, cover stockpile with plastic membranes. Failure to protect stockpiled soil shall not be accepted as a reason to replace the material with imported fill materials at the Owner's cost.

Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials and obstructions. If excavated materials intended for fill and backfill include unsatisfactory materials and rock, replace with satisfactory soil materials as described herein.

Conduct excavation operations so that material outside the excavation limits is not disturbed or loosened. Restore material disturbed or loosened to its original condition.

6.1. Erosion Plan

Contractor shall adhere to the erosion and sediment control plans in the contract drawings, as well as provide erosion and sediment control measures conforming to current Land Development Procedures of the City of Jacksonville, Florida, for all land-disturbing construction activities.

6.2. Precautions

6.2.1 Safety

Contractor shall comply with all requirements of all applicable OSHA excavation safety standards and regulations. Contractor shall comply with all applicable trench safety standards. Contractor shall adhere to special shoring requirements, if any, of the state or other political subdivisions, which may be applicable to this project scope. For any project that contains a trench excavation deeper than four feet, the Contractor shall submit with his bid the cost of compliance with the applicable trench safety standards.

6.2.2 Sheet piling and Shoring

The stability of previously constructed structures and facilities shall not be impaired or endangered by excavation work. Previously constructed structures and facilities include both structures and facilities existing when the work under these specifications begins and structures and facilities already provided under these specifications.

Adequate sheet piling and shoring in accordance with OSHA regulations 29 CFR Part 1926 shall be provided to protect and maintain the stability of previously constructed structures and facilities and the sides of excavations and trenches until they are backfilled. Sheet piling, bracing, and shoring shall be designed and built to withstand all loads that might be caused by earth movement or pressure and shall maintain the shape of the excavation under all circumstances. Signed and Sealed drawings, prepared by a registered professional engineer licensed in the State of Florida, of all shoring details as required by OSHA shall be furnished to the Project Engineer before any excavation begins. When "sloping" of the sides of the excavation or trench is used in lieu of sheet piling or shoring the name of the "Competent Person" in charge for the Contractor shall be

submitted in writing to the JEA Project Representative, along with supporting documentation, before any excavation begins.

6.2.3 Depressions

Where depressions result from, or have resulted from, the removal of surface or subsurface obstructions, remove all debris and soft material as directed by the JEA Project Representative.

6.2.4 Over-Excavation

Backfill and compact all over-excavated areas as specified for fill below, and at no additional cost to the Owner.

6.2.5 Protection of In-Place Structures

Excavation likely to misalign, damage or impair the strength of structures already in place shall be made only after adequate protection has been provided. The Contractor shall repair any damage that occurs as a result of insufficient protection at no cost to the Owner. It is the responsibility of the Contractor to coordinate with the utility owners to adjust any utilities conflicting with the work under this contract at no additional cost to JEA. It is the Contractor's responsibility to locate all underground utilities prior to digging.

6.2.6 Underground Utilities

The Contractor shall determine the location of underground piping, conduit and cable before proceeding with the work. Should any utilities be encountered that were not expected, work in the area shall be halted and the Engineer notified immediately.

6.2.7 Classification

All material shall be unclassified and considered as excavation regardless of the material encountered and no additional compensation will be allowed because of difficulties met in removing such materials.

6.2.8 Muck and/or Organic Removal

Where muck or other soft material occurs, the Contractor shall remove such material by excavation to suitable foundation soil or to a depth designated by the Engineer and backfill in accordance with Section VIII. The Contractor is responsible for removal of a maximum of one (1) foot of the muck. Where the Engineer directs the removal of such material to a depth in excess of one (1) foot, the Contractor may submit a Contract Change Order request.

6.2.9 Contaminated Soils

No hazardous materials or contaminated soil are expected to be encountered during excavation. However, in the event contaminants are found, the Contractor shall dispose of them in accordance with Chapters 62-780, and 777, Florida Administrative Code (F.A.C.), the Florida Department of Environmental Protection (FDEP) "Mineral Oil Dielectric Fluid Emergency Response Protocol (April 2007)", and any other applicable federal, state, or local rules or regulations. The Contractor shall notify the JEA Contractor Administrator immediately upon contaminant discovery.

7. Excavation for Structures

All excavations shall end at in-situ materials satisfactory to the JEA Project Representative, regardless of the elevation shown on the plans. In the event unsuitable soil is encountered at the required elevation, the Engineer shall determine the depth of removal of such soil. Unless otherwise specified, the bottoms of all excavations shall be compacted to at least 100% of

maximum density per ASTM D 698 or 95% of maximum density per AASHTO T180. Prior to such compaction, the ground water shall be lowered to a depth of at least 2.0 foot below the bottom of the excavation.

Should ground water be encountered, Contractor shall be responsible for utilizing a dewatering system(s) to remove water from the excavations. JEA Environmental will obtain any necessary FDEP Dewatering Permit for the project. Contractor shall ensure that permit is onsite and comply with all monitoring requirements with documentation listed in FDEP Dewatering Permit for the entire time dewatering occurs on this project site.

Additionally, prior to any dewatering, Contractor shall apply for a St. Johns River Water Management District (SJRWMD) Generic Permit for Short Term Dewatering and comply with all SJRWMD requirements listed in Form No. 40C-22-0590-1. If the above requirements are not followed, the Contractor shall be held liable for any fines and/or violations incurred by JEA.

7.1. Payment for Extra Excavations

If extra excavation is authorized due to unforeseen, unsatisfactory soil conditions, an adjustment in contract price will be allowed. Extra depth of footings or fill due to error in excavation shall be at the Contractor's expense. All additional excavations shall be approved in writing by the JEA Project Representative prior to start of work. Any excavation performed without prior authorization is at the Contractor's risk.

7.2. Footings

To minimize differential settlement, it is essential that earth surfaces upon which footings will be placed be compacted to the approval of the JEA Project Representative and in accordance with the compaction requirements established in this section of these specifications. Excavate to the established lines and grades. Cut off bottoms of excavations level, and remove all loose soil. Where soft spots are encountered, remove all defective material and replace with lean concrete (flowable fill) or suitable backfill at no additional cost to the Owner.

7.3. Slabs

When undercutting of slabs is required in order to remove unsuitable material, the excavation shall be backfilled to the required elevation and compacted.

7.4. Trenches

The trench shall be of sufficient width and depth below the proposed final grade to ensure that all conduit spacing is maintained per the details on the Drawings.

Trench excavation shall be accomplished so as to ensure the conduit may be laid on a firm, undisturbed, native earth bed. In the event excavation below the required elevation is made, bedding material is to be placed and compacted so as to bring the excavation to grade.

Accurately shape trench bottoms so that the pipe or utilities are in continuous and uniform contact with either undisturbed soil or bedding material as shown on the Drawings. Do not backfill any trenches until all joints are made, required tests are performed, pipe encased as

necessary, and Owner approval is granted to proceed.

7.5. Backfill for Structures

Backfill shall be deposited in layers not exceeding six (6) inches in thickness and shall be compacted to a density of not less than 100% of the maximum density per ASTM D 698 or 95% of maximum density per AASHTO T180. No backfill shall be placed against masonry or concrete walls and piers until the structure has been in place five days or until permission has been given by the Engineer. When backfilling against masonry walls, each side shall be backfilled simultaneously to prevent excessive stress.

8. Site Fill

All soil for fill shall be of a quality acceptable to the Engineer and shall be free from roots, rubbish or other extraneous material.

8.1. Soil Investigation

The Owner may share a geotechnical exploration report used for design and study purposes only. The Owner does not assume any responsibility with respect to the sufficiency or accuracy of the borings, or of the interpretations made thereof. There is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations are representative of those existing throughout the site, or any part thereof, or that unforeseen developments may not occur. The Contractor shall make an inspection of the site to determine the conditions under which the work is to be performed and may obtain additional core borings, if deemed necessary.

8.2. Soil Testing

The Contractor shall employ an independent laboratory approved by the JEA Project Representative to do all soil testing of proposed borrow material to be used for site fill. The Contractor must submit an electronic test report, in PDF format, to the JEA Project Manager. The report shall include the following tests:

- 1) AASHTO T88: Particle Size Analysis of Soils
 - Three (3) additional Particle Size and Permeability tests shall be performed on truck loads of fill material randomly selected by the JEA Project Representative. If any of the truck loads tested does not comply with the A-3 group of AASHTO M145 containing less than 5% fines, the material shall be rejected, and the Contractor shall perform six (6) additional sets of tests on material in place. Any material in place that does not comply with the A-3 group of AASHTO M145 containing less than 5% fines shall be removed and replaced with acceptable material at no additional cost to the Owner. The Contractor shall pay for all of the above testing.
- 2) AASHTO T215: Permeability of Granular Soils (Constant Head)
- 3) At least one of the following compaction tests:
 - AASHTO T191-61: Standard Method of Test for Density of Soil in Place by the Sand-Cone Method
 - ASTM D1556-74: Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
 - ASTM D2167-77: Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
 - ...at the following locations:

- Ten (10) tests per layer of site fill at locations determined by the JEA Project Representative for site compaction.
- One (1) test under each of ten (10) foundations as selected by the JEA Project Representative. Compaction tests shall be made no sooner than one day before the placing of a succeeding layer of fill or the pouring of a foundation, as the case may be. The intent of the time stipulation is to minimize the loss of compaction due to moisture loss after the compaction test has been made.

8.3. Site Fill Inside Rock Yard

The site fill material for the rock yard shall be sand with less than 5% fines similar to materials classified in the A-3 group as shown in AASHTO M145.

No fill material for the rock yard shall be placed until receipt of a Letter of Certification from an independent testing company stating that the fill material is in compliance with the A-3 group of AASHTO M145 containing less than 5% fines.

Fill shall be placed in successive layers of not more than twelve (12) inches in thickness, loose measure. Each layer shall be compacted to a density of at least 95% of the maximum density as determined by AASHTO T99. The top underlying twelve (12) inches shall be compacted to 98% of maximum density as per ASTM D-1557. Elevations after final grading shall be within 0.1 foot above or below plan dimensions.

Material: All soil for fill (if required) shall be of a quality acceptable to the JEA Engineer and shall be free from roots, rubbish or other extraneous material. The fill material shall be sand-clay or sand-silt mixture similar to materials classified in the A-2 or A-3 group as shown in AASHTO M145. At least the top nine (9) inches of the site shall be stabilized with a mixture of three (3) inches of lime rock and six (6) inches of sand, compacted to 98% of maximum density as per AASHTO T99. Borrow, where necessary, shall be provided from sources off the site in areas provided by the Contractor. The borrow pit shall be available for inspection by the Engineer.

Placement: Embankments shall be constructed true to lines, grades and cross sections shown on the plans. Fill shall be placed in successive layers of not more than twelve (12) inches in thickness, loose measure. Each layer shall be compacted to a density of at least 95% of the maximum density as determined by AASHTO T99 except that the final 9 inches of stabilized fill shall be compacted to maximum density as per AASHTO T99. Elevations after final grading shall be within 0.1 foot above or below plan dimensions.

No fill material shall be placed until receipt of a Letter of Certification from an independent testing company stating that the fill material is in compliance with the A-2 or A-3 group of AASHTO M145.

8.4. Site Fill Outside Rock Yard

The fill material for areas outside the rock yard shall be sand similar to materials classified in the A-3 group as shown in AASHTO M145. Fill shall be placed in successive layers of not more than twelve (12) inches in thickness, loose measure. Each layer shall be compacted to a density of at least 95% of the maximum density as determined by AASHTO T99 except that the final 9 inches of stabilized fill shall be compacted to maximum density as per AASHTO T99. Elevations after

final grading shall be within 0.1 foot above or below plan dimensions.

8.5. Embankments

Embankments shall be constructed true to lines, grades and cross sections shown on the plans.

8.6. Borrow

Borrow, where necessary, shall be provided from sources off site. The borrow pit shall be available for inspection by the Engineer.

9. Stabilization & Rocking

9.1. Triax Geogrid and Filter Fabric System

Tensor TriAx TX140 geogrid shall be placed over filter fabric on all areas to be rocked and shall develop the structural support previously attained with limerock stabilization which is now only allowed under impervious surfaces.

Filter Fabric and TriAx TX140 Geogrid: The exposed subgrade soils shall be lined with a soil stabilization geotextile nonwoven filter fabric. The filter fabric shall be Mirafi 140N or approved equal, which shall be installed as per manufacturer's instructions and precautionary statements. Once the filter fabric is in place on all areas to be rocked, Tensor TriAx TX140 Geogrid shall be placed on top of the filter fabric as detailed in the plan drawings. After the filter fabric and TX140 geogrid are in place and secured per manufacturer requirements, then the rock can be placed as directed in the plan drawings.

9.2. Aggregate Fill

Aggregate fill (rock) shall be washed blue/gray limestone or granite (natural). All rock shall be a gradation equal to Size #5, as shown in AASHTO M43 or ASTM D448 (Note: Size #57 will not be acceptable). The Contractor shall submit a sample and sieve analysis of the aggregate for approval before proceeding with the rocking. Before placement of the aggregate, the subgrade shall be dressed and compacted.

A representative list of suppliers is:

Supplier Name	Location	Phone Number
Conrad Yelvington	Daytona Beach, FL	(904) 767-5500
Conrad Yelvington	Jacksonville, FL	(904) 358-6740
Vulcan Materials	Birmingham, AL	(205) 877-3086

10. Herbicide

Prior to spreading aggregate in the substation area, the Contractor shall have the area treated with DuPont Krovar I DF for selective control of weeds. Substation area shall be defined as the structure area and areas between the pavement and the fence. Areas outside of the fence where rock is to be installed shall not be treated. Application shall be by a licensed pesticide applicator in accordance with the manufacturer's instructions and precautionary statements. Personal protective equipment recommendations on the MSDS shall be strictly followed. Federal, State

and local regulations regarding handling, transportation and spills shall be observed by the Contractor.

11. Water and Sewer

11.1. General Requirements

The work of this section includes construction of water supply and sewage disposal facilities to serve the substation.

11.2. Water Supply

Water supply will be by means of a tap to the existing water main as shown on the plans. Contractor shall install necessary fittings and equipment to attach to water main for a complete water service to the site.

11.3. Water Piping

Underground Supply Line: Underground supply line to Control House shall be PVC 1120, Schedule 80, conforming to the latest edition of the following standards:

- Pipe: ASTM D1785
- Fittings: ASTM D2466
- Solvent Cements: ASTM D2564

The supply line shall have a minimum cover of 2'-6" unless shown otherwise on the drawings.

Riser at Control House: Riser pipe at Control House shall be copper tubing, Type K, in accordance with ASTM B88.

Interior Piping at Control House: Water distribution piping inside the Control House shall be copper tubing, Type L, in accordance with ASTM B88.

11.4. Sanitary System Piping

Drain, Waste and Vent Piping: Drainage piping and fittings within the Control House shall be PVC plastic drain, waste and vent pipe and fittings, Schedule 40, in accordance with ASTM D2665, and shall be NSF-DWV approved. Applicable commercial standard is CS-272-65.

Sewer Piping: Sewer piping shall be PVC pipe and fittings, in accordance with ASTM D3034, SDR 35.

11.5. Installation of Copper Water Piping

Copper water tubing shall be installed using soldered or sweated joints, which shall be made with approved fittings. Surfaces to be soldered or sweated shall be cleaned bright. The joints shall be properly fluxed and made with lead free approved solder. Joints in copper water tubing shall be made with the appropriate use of brass or wrought copper water fittings, properly soldered or sweated together. Joints shall be watertight for the pressure required by test.

11.6. Water Valves

Water valves shall be installed in accessible places and shall be located as follows: (1) main shut-off valve just outside the building on the service branch; (2) on the supply line as shown on the drawings; (3) shut-off valve on each supply to each fixture not provided with compression stop or with other auxiliary shut-off valve. All shut-off valves shall be bronze with soldered ends and shall be Class A, and Type I, II or III in accordance with Federal Specification No. WW-V-54b. Angle,

check and globe valves, if used, shall be bronze valves, Class A, in accordance with Federal Specification No. WW-V-51b; check valves shall be Type IV.

11.7. Drain, Waste, and Vent Pipe Installation

Drain, waste and vent piping shall be installed according to Appendix A1 of ASTM D2665 for PVC DWV Pipe and Fittings. Plumbing vents exposed to sunlight shall be protected by shielding or lightweight insulation.

11.8. Underground Service Line and Sewer Pipe Installation

Underground service line and sewer pipe shall be laid on an unyielding foundation after suitable excavation has been accomplished for uniform bearing under the full length of the barrel of the pipe and not by wedging up or blocking any portion of the pipe. Final grade shall conform accurately to that shown on the drawings. Just before jointing the pipes, the mating ends shall be thoroughly cleaned. Trenches shall be kept free of water until the pipe jointing material has set. The Contractor shall take all necessary precautions to prevent floatation of the pipe cause by flooding of the trench.

Installation of underground water and sewer lines shall conform to all Duval County Public Health Unit regulations.

Tests: The following tests shall be made by the Contractor, and all defects indicated by the tests shall be corrected by the Contractor.

- Sanitary Piping: Before the installation of any fixture, the ends of the system shall be capped and all lines filled with water to the roof and allowed to stand for sufficient time to inspect the joints. After the fixtures are set, a smoke or equivalent test shall be made using an approved apparatus.

11.9. Water Piping Sterilization

All water pipe shall be thoroughly sterilized prior to being placed in service. Sterilization shall be in accordance with Specification AWWA C601 (latest revision), "Standard for Disinfecting Water Mains."

11.10. Plumbing Fixtures

Lavatory: Wall-Hung Lavatory shall be American Standard, Model 0346.421, Vitreous China, modified to omit hot water trim and furnish with C.P. hole cover.

Water Closet: Water closet shall be American Standard Cadet Pro, Chair Height Elongated Toilet. Model: 3517A.101. (Toilet shall be installed with the rim at ADA height, 17" – 19".) Toilet Tank shall be American Standard, Cadet Pro, 4188A.104. Toilet seat shall be Elongated Heavy Duty Plastic, Bemis Model 1655CT.

Eye/Face Wash Head & Shower: Eye/Face Wash Head (wall mounted) shall be installed in the location shown on the drawings. Unit shall be Model SE-693-SSH, with p-trap as manufactured by the Speakman Co. Contractor shall furnish and install a sign, mounted on the wall above the

eye/face wash head. The sign shall be plastic, with one- inch white letters on a red background, and shall read "Eye Wash - Emergency Use Only."

Hose Bibbs: Anti-Siphon, 3/4", Quarter Turn, Brass Lead-Free Ball Valve.

11.11. Sewage Disposal Facilities

11.11.1 Septic Tank and Drain Field

Sewage disposal shall consist of a septic tank, dosing tank and drainfield. Sewage system shall include all associated piping and equipment for a complete installation as shown and detailed on the plans. The Sewage Disposal System shall conform to all Duval County Public Health Unit regulations.

11.11.2 Lift Station

See Water and Sewer drawings for lift station requirements.

11.12. Permits, Certifications, and Laws

The Contractor shall, at his own expense, procure all permits and licenses required by County, State, and Federal laws for lawful performances of the required work in connection with the water supply and sewage disposal facilities of these documents.

12. Paving and Drainage

12.1. Scope

The work specified in this Subsection consists of constructing a substation roadway with 1-1/2 inch asphaltic concrete surface on a 6 inch limerock or granite base and stabilized subgrade. The work also includes installation of drainage facilities.

12.2. Paving

All workmanship, materials, equipment and plant shall be in accordance with the applicable sections of the Florida DOT Standard Specifications for Road and Bridge Construction, Latest Edition, and referred to hereinafter as Standard Specifications. The sections of the above mentioned specifications which are applicable are listed below. Additional compensation for adjustment of quantities due to extra thickness of base construction or extra application of materials will not be made.

Muck Removal: Muck or other unsuitable material shall be removed and the excavated area backfilled. See Subsection [Excavation For Site](#).

Stabilization: The top 12 inches of the subgrade shall be stabilized (Type B) to a Granite or Limerock Bearing Ratio (LBR) of 40 in accordance with Section 160 of the Standard Specifications. The stabilized area shall be compacted to 98% of the maximum density as determined by FM 1-T 180, Method D (FDOT 2014 Spec Book (Standard Specifications), Page 206, Section 200-7.2.1).

Base Course: A granite or limerock base course shall be constructed in accordance with Section 200 of the Standard Specifications and shall be compacted to 98 percent of maximum density as determined by FM 1-T 180, Method D (FDOT 2014 Spec Book (Standard Specifications), Page 206, Section 200-7.2.1).

Prime Coat: Materials and method of application for the prime coat shall conform to Section 300 of the Standard Specifications.

Asphaltic Concrete Surface: The surface course shall be FDOT Type S-P-12.5 asphaltic concrete structural course for Traffic Level A in accordance with Section 320,330 and 334 of the Standard Specifications.

Plant, Methods, and Equipment: The plant and methods of operations for preparing all plant-mixed hot bituminous mixtures for surface courses and bases, and the requirements for the equipment to be used in the construction of the pavements and bases shall be in accordance with Section 320 of the Standard Specifications.

General Construction Requirements: The general construction requirements for all plant-mixed hot bituminous pavements and bases shall be in accordance with Section 330 of the Standard Specifications.

12.3. Testing

The stabilized subgrade shall be tested for density and LBR, and the base course tested for density at approximately 200 foot intervals. Density tests may be performed using AASHTO T191-61 or ASTM D2922. The Contractor shall employ, at his expense, an independent testing laboratory to do all testing for pavement. Two (2) copies of all test reports shall be submitted to the JEA Project Engineer.

12.4. Inverted Crown

As part of the stormwater management design, the outer paved substation roadways have been designed with an inverted crown for the purpose of conveying stormwater runoff to catch basins. It is imperative that the roadway paving meets the inverted crown slopes as shown on the plans. The interior paved access roads will have a normal crown peaking in the middle of the paved interior access roads. The Contractor shall use proper paving equipment to accomplish the above.

Culverts: Contractor to obtain the Engineer's approval of the method of controlling line and grade during culvert installation. Use a method that allows rapid checking of the previously laid sections. Maintain line and grade on sections previously set. The Engineer will consider sections which do not retain the plan line within 0.10 foot or grade within 0.10 foot during laying of subsequent sections, as not having been laid to line and grade. Take up and relay sections not to line and grade without additional compensation.

12.5. Drainage Facilities

All drainage facilities shall be constructed in accordance with the Contract Drawings, City Standard Specifications, and City Standard Details or FDOT Design Standards of the most current year for any index number referenced. JEA will obtain a Stormwater Management Permit from St. Johns River Water Management District. All drainage facilities are to be placed to the nearest tenth of a foot except for the stormwater control structure which by law has to be accurate to

the hundredth of a foot.

Drain Pipe: Storm Drain pipes shall be Class V Reinforced Concrete Pipe or PVC DR-18, bell and spigot, in accordance with AWWA Standard C-900 can be used for pipes 12 inches or smaller, as indicated on the plans.

PVC: PVC pipe shall conform to ASTM D1785, Schedule 80.

Inlets: Reinforced concrete storm inlets shall be Types "C", "D", "E" or "H" as indicated on the drawings, and shall be constructed in accordance with Plates D-207, D-208 and D-209 of the City Standard Details.

Inlet Grates: Grates for storm inlets shall be traffic bearing in accordance with Plate D-304 of the City Standard Details.

Mitered End Sections: Reinforced concrete mitered end sections shall be constructed in accordance with Plate D- 435 of the City Standard Details or as shown on the plans.

13. Fencing

13.1. Specifications

Tolerance: Standard mill tolerances shall be used for all framework members and chain-link fabric.

Height: The total height of the substation perimeter fence shall be nine (9) feet above grade when erected. In the case of installations of additional fence components to existing substations, the height of the new fence components shall match existing, unless directed otherwise by the project engineer or field representative.

Style: The substation perimeter fence shall be the three-barb wire style in strict accordance with the specifications. Any suggested change or deviation from the specifications or any detail in which the product or service of any bidder differs from that specified shall be fully covered in a letter accompanying the bids.

Zinc Coating (Galvanizing): All fabric, posts, and fittings used in the construction of this fence shall be hot-dipped galvanized according to the following ASTM Standards:

- Fabric: ASTM A392, Class 2. (minimum of 2.0 oz. coating per square foot of surface).
- Posts, Rails and Gate Frames: ASTM F1083. (minimum of 1.8 oz. coating per square foot of surface).
- Fittings: ASTM F626, pressed steel type. (minimum of 1.2 oz. coating per square foot of surface).

13.2. Materials

Fabric: The fabric shall be galvanized steel chain-link 96 inches high, No. 9 gauge wire woven in a 2 inch mesh. Selvages of the fabric shall have a twisted and barbed finish.

Fabric Connections: The chain link fabric shall be securely fastened to all terminal posts using

3/16" x 3/4" tension bars and heavy 11 gauge tension bands. There shall be one band for each foot in the height of the fence. The fabric shall be fastened to all intermediate posts with 9 gauge tie wires, spacing not to exceed fourteen (14) inches; ties to top rail not to exceed 24 inch spacing.

Bottom Tension Wire: The bottom tension wire shall be No. 7 gauge galvanized spring coil or crimped wire stretched taut from terminal post and securely fastened to each intermediate post six (6) inches above the grade line. Tension wire shall be attached to the fence fabric with galvanized hog rings every twenty-four (24) inches.

Barbed Wire: Furnish three lines of high strength galvanized steel barbed wire which is to be of the four-point pattern composed of two strands of 15-1/2 gauge line wires with barbs spaced on approximately 5-inch centers.

PVT Slats: Dark green PVT slats shall be installed for full height of all fence fabric along the entire perimeter fence line unless indicated otherwise. PVT slats shall be 1-1/8" wide, 9 gauge, flat tubular plastic extrusions as manufactured by Patrician Products, 100 Frank Road, Hicksville, NY 11801, Telephone: (516) 937-3580.

13.3. Framework

Intermediate Posts: The intermediate posts shall be 2-1/2" o.d. hot-dipped galvanized steel pipe weighing 3.65 pounds per lineal foot or heavier.

Terminal Posts: All end, corner, and pull posts shall be hot-dipped galvanized steel pipe three (3) inches o.d. standard weight pipe, nominal weight 5.79 pounds per lineal foot.

Gateposts: Posts for swing gates shall be hot-dipped galvanized standard weight pipe of the following nominal sizes and weights for each leaf:

- Gate leaf up to six (6) feet wide: 2-7/8 inches o.d., weight 5.79 pounds per lineal foot.
- Gate leaf over six (6) feet to thirteen (13) feet wide: four (4) inches o.d., weight 9.1 pounds per lineal foot.
- Gateposts shall be equipped with tops so designed to exclude moisture from the post.

Post Spacing: Posts shall be evenly spread in the line of fence no farther apart than ten (10) feet on center.

Post Settings: The perimeter fence posts shall be of sufficient length to extend thirty-six (36) inches into concrete footings.

Top Rail: The top rail shall be 1-5/8" o.d., standard weight pipe, weighing 2.27 pounds per lineal foot, hot-dipped galvanized, provided with couplings approximately every twenty (20) feet. Couplings are to be outside sleeve type at least seven (7) inches long. The top rail is to pass through the line post tops and form a continuous brace from end to end of each stretch of fence. The top rail shall be securely fastened to the terminal posts by heavy pressed steel brace bands and malleable rail end connections.

Braces: Brace pipe shall be the same as top rail and shall be installed midway between the top

rail and the ground and extend from the terminal post to the first adjacent line post. Braces shall be securely fastened to posts by heavy pressed steel and malleable fittings, then securely trussed from line post to base of terminal post with a 3/8" truss rod and tightener.

Intermediate Post Tops: Intermediate post tops shall be of pressed steel or malleable iron base. When barb wire is specified, the base is to include pressed steel extension arms to accommodate the number of barbs specified. The three-barb style is to extend at a 45o angle outward from the fence line. The barb wire arms shall support a minimum of 400 pounds vertical dead load from tip of arm.

Gate frames shall be two (2) inches o.d. standard weight pipe, weight 2.72 pounds per lineal foot. Gates may be fabricated using welded construction of heavy pressed steel or malleable corner fittings securely riveted. All construction shall be in a workmanlike manner performed by personnel experienced in the trade. Gates shall be properly braced to eliminate any possible sagging condition. Hinges shall be of sufficient strength and design to permit easy and trouble-free operation. All gates shall be equipped with a positive type latching device with a means for padlocking. All drive gates shall be equipped with center plunger rods, catch and semi-automatic outer catches to secure gates in open position. Gates shall be surmounted by three (3) strands of barbed wire, supported vertically one above the other. Top strand to match adjacent barbed wire. All cantilever gates shall have gate rollers UHMW with stainless steel shafts with roller guards. All cantilever gates shall have hard rubber nose wheel carriers ASM-DB-IND 12 inches x 8 inches with gate latch/catch. Contractor shall submit details for all proposed gates to Project Engineer or field representative for approval.

13.4. Installation

Installation shall be made in a workmanlike manner by skilled mechanics experienced in erection of this type fence. The fence shall be erected on line and to grade as provided by Owner.

All posts are either cast in top of the retaining wall or shall be set in concrete foundations at a minimum depth of thirty-six (36) inches below rock. Diameter of the foundation shall be a minimum of nine (9) inches, except for gateposts on which the minimum diameter shall be three times the outside diameter of the gatepost. Concrete shall have a minimum strength of 2500 psi. All foundations shall extend approximately one (1) inch above grade and shall slope away from the post to provide for proper drainage. The fabric and barb wire shall be stretched to proper tension between terminal posts and securely fastened to the framework members. The bottom of the fabric shall be held as uniformly as possible at a height not exceeding 1-1/2" to finished grade.

13.5. Grounding

See Subsection Fence Grounding.

13.6. Clean-Up

Upon the completion of the installation, all debris created by the installation shall be removed from the premises of the Owner or disposed of as directed by his agents.

14. Grassing

A stand of grass shall be established on all areas as shown on the Drawings plus any other areas where the existing grass is disturbed by construction activity exclusive of paved or rocked areas. Grass shall be established by seeding, seeding and mulching or by sodding as noted on the drawings. The work shall include maintaining the grassed areas until final acceptance of the project.

14.1. Materials and Construction Methods

The following section of the most current edition of Florida DOT Standard Specifications shall govern the materials and construction methods used by the Contractor for Grassing.

Performance Turf: 570

In lieu of the type of fertilizer called for in the Standard Specifications, the fertilizer shall be 6-6-6, fifty (50) percent organic applied at the rate of 20 pounds per 1000 square feet.

14.2. Maintenance

The Contractor shall, at his expense, maintain the grassed areas in a satisfactory condition until final acceptance of the project.

14.2.1 Work Included

- Watering, weeding, cultivating, spraying and mowing necessary to keep the grassed areas in a healthy growing condition and to keep these areas neat and attractive throughout the maintenance period.
- Provide equipment and means for proper application of water to those areas not equipped with an irrigation system.
- Filling, leveling and repairing of any washed or eroded areas, as may be necessary.

14.2.2 Replacements

- At the end of the maintenance period, all grassed areas shall be in a healthy growing condition.
- During the maintenance period, should the appearance of any grass indicate weakness and probability of dying, immediately replace that area of grass without additional cost to the Owner.
- Replacements required because of vandalism or other causes beyond control of the Contractor shall be paid for by the Owner.

14.2.3 Restoration

- The Contractor shall, at his expense, restore any vegetative areas damaged during construction to conditions that existed prior to the project. The Contractor will be required to restore area to proper grade, properly amend soil and install vegetation that matches surrounding and/or pre-existing conditions. Contractor shall water area as necessary to permanently establish new vegetation.

VI. CONCRETE

This section covers the general requirements for installation and testing of concrete at JEA substations.

1. Concrete Installation

All concrete work shall be governed by this section unless modified by other sections within this document.

1.1. Applicable Standards

- ACI 318 (latest revision) "Building Code Requirements for Reinforced Concrete."
- ACI 301 (latest revision) "Building Code Requirements for Structural Concrete."
- ACI 306 (latest revision) "Recommended Practice for Cold Weather Concreting."
- ACI 305 (latest revision) "Recommended Practice for Hot Weather Concreting."
- ACI 613 (latest revision) "Recommended Practice for Selecting Proportions for Concrete."

1.2. Material Requirements

Material	For Drilled Piers	For Others
Cement	Portland Cement, Type 1 (ASTM C150) Low Alkali, Max. of 0.6% equivalent Na_2O	Portland Cement, Type 1 (ASTM C150)
Fine Aggregate	Sand (ASTM C33)	Sand (ASTM C33)
Coarse Aggregate	** Gravel, crushed stone, or slag (ASTM C33)	Gravel, crushed stone, or slag (ASTM C33)
Water	Potable water, clean and free from injurious amounts of oils, acids, alkalis, organic materials, or other delirious substances	Potable water, clean and free from injurious amounts of oils, acids, alkalis, organic materials, or other delirious substances
* Must conform to the standard in parenthesis () ** Coarse aggregate shall be tested for potential alkali reactivity according to ASTM C-289; reactive aggregate will not be permitted.		

1.3. Concrete Proportioning

The concrete mix design for the class of concrete specified shall be prepared and submitted to the JEA Project Engineer for approval. No concrete shall be placed without prior JEA approval of the mix design.

Composition: The concrete shall be composed of Portland cement, fine aggregate, coarse aggregate and water. The ingredients shall be proportioned to produce a dense, workable concrete, free from voids. The concrete shall be designed in accordance with applicable ACI

standards to attain the properties of strength, slump and rate of hardening required by these specifications.

Maximum Size of Coarse Aggregate: Maximum size of coarse aggregate shall not be larger than 3/4 the minimum clear spacing between the reinforcing bars.

Strength and Slump: The following are the minimum compressive strength and slump ranges for the various types of concrete construction:

Type of Construction	Compressive Strength 28 Days, (psi)	Slump
Footings, Slabs on Grade, Bond Beam, and Lintel	3000	3±1
Headwalls and Drop Inlets	3000	5±1
Paving	3000	3±1
Curb and Gutter, Ditch Pavement	2500	3±1
Drilled Piers	4000	7-9

All slump tests shall be in accordance with ASTM C143 and shall be performed by the Contractor as directed by the JEA Project Representative. See subsection [Concrete Testing](#).

1.4. Air Content

The air content in the concrete shall be maintained in accordance with the following requirements:

Maximum Size Coarse Aggregate (in.)	Air Content by Volume (%)
1 ½	3±1
¾ or 1	4±1
¾ or ½	5±1

1.5. Admixtures

Air entrainment shall be produced by the addition of an air-entraining admixture meeting the requirements of ASTM C260. Air entraining cement will not be permitted. If required, an approved water reducing retarder may be used in the proportions recommended by the manufacturer.

1.6. Proportioning of Ingredients

Proportions, including water-cement ratio, shall be established on the basis either of laboratory trial batches or of field experience with the materials to be employed. The mix design together with supporting data shall be submitted to the Engineer for approval. The Engineer may, at his discretion, require only a letter from the concrete supplier indicating compliance with the specifications in lieu of submission of a mix design.

1.7. Reinforcing Steel

Reinforcing Bars: Reinforcing bars shall conform to ASTM A615, ASTM A616 or ASTM A617, Grade 60. Grade 40 for #5 bars and smaller, where applicable.

Welded Wire Fabric: Welded wire fabric shall conform to ASTM A185. Welded wire fabric shall not be used for drilled piers.

Shop Drawings: Shop drawings for fabrication and placing of the reinforcing steel and accessories

shall be submitted to the JEA Project Manager for approval.

Cleaning and Bending: Metal reinforcement at the time concrete is placed shall be free from loose, flaky rust, loose scale, mud, oil or other coatings that will destroy or reduce the bond. All bars shall be bent cold. Details of hooks and bends for reinforcement shall be in accordance with ACI 318.

Placing Reinforcement: Metal reinforcement shall be accurately placed and adequately secured in position by concrete or metal chairs and spacers. After being placed, the reinforcing bars shall be maintained in a clean condition until they are completely embedded in the concrete. Reinforcing steel shall be handled and placed in accordance with ACI 318.

1.8. Embedded Items

All sleeves, inserts, anchors, ground rods and other embedded items shall be placed prior to concreting. Anchor bolts shall be set to the exact horizontal dimensions shown. The Contractor shall provide adequate protection for all threaded sections of the anchor bolts above the surface of the concrete. Any threaded section of the anchor bolts above the surface of the concrete which becomes damaged or encrusted with concrete during and/or after pouring shall be returned to their original threaded condition at no cost to the Owner. Apply cold galvanizing after re-threading and again after setting structures in their final position.

1.9. Mixing and Delivery of Concrete

Mixer: Unless otherwise authorized, the mixing of concrete shall be done in a batch mixer of approved AGC type or in ready-mix equipment conforming to ASTM C94. The volume of the mixed material for each batch shall not exceed the manufacturer's rated capacity of the mixer.

Mixing Time: The concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged. For job-mixed concrete, the mixer shall be rotated at the speed recommended by the manufacturer and mixing shall be continued for at least one and one-half (1-1/2) minutes after all materials are in the mixer. For mixers larger than one cubic yard capacity, the minimum mixing time shall be increased 15 seconds for each additional 1/2 cubic yard of concrete or fraction thereof.

Delivery: A ticket or time slip shall accompany each batch, showing the time of the batching of the cement and the amount of water that can be added on site. Each batch of concrete shall be delivered to the site of the work and discharged completely within 90 minutes after addition of the cement to the aggregates. Exceptions to this 90 minute time limit will be permitted only upon special permission from the JEA Engineer. The production and delivery of ready-mixed concrete shall be such that not more than 20 minutes shall elapse between the depositing of successive batches of concrete in any monolithic unit of concrete.

Cold Weather Batching: When the temperature is below 40°F or is likely to fall below 40°F during the 24-hour period after placing, adequate equipment shall be provided for heating the concrete materials. No frozen material or materials containing ice shall be used. Temperatures of the

separate materials, including the mixing water, when placed in the mixer, shall not exceed 140°F. When placed in forms, the concrete shall have a temperature of between 50°F and 90°F.

Addition of Water: Indiscriminate addition of water to increase slump shall be prohibited. When concrete arrives at the site with slump below that suitable for placing, water may be added only if neither the maximum water- cement ratio nor the maximum slump is exceeded. The concrete supplier must submit, at the time of delivery of each batch of concrete, a signed letter stating the maximum amount of water that may be added to the entire load of concrete in the truck. This will be a one time addition of water. The letter must also state that addition of the specified amount of water will not affect the design requirements of the approved concrete mix design. Acceptance of this by JEA does not relieve the Contractor from meeting the design specifications required herein. If addition of water results in a failure of any test of any kind of the concrete placed, the Contractor shall remove and replace the concrete at no cost to JEA.

Any addition of water above that permitted by the limitation on water-cement ratio must be accompanied by a quantity of cement sufficient to maintain the proper water-cement ratio.

1.10. Forms

Installation: Forms shall conform to the shape, lines and dimensions of the members as called for on the plans, shall be substantially free from surface defects and sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain position and shape.

Removal: Forms shall be removed in such a manner and at such a time as to insure the complete safety of the structure. Form work for drilled piers and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations. In no case shall the supporting forms or shoring be removed until the members have acquired sufficient strength to safely support their own weight and the load thereon.

Footings: Earth cuts may be utilized for forms provided the sides are stable at time of placing.

Chamfers: Exposed corners of columns, beams and piers shall be chamfered $\frac{3}{4}$ ".

1.11. Placing of Concrete

Preparation of Equipment and Place of Deposit: Before placing concrete, all equipment for mixing and transporting the concrete shall be cleaned; all debris and ice shall be removed from the spaces to be occupied by the concrete and all reinforcement shall be thoroughly cleaned of ice or other coatings. Water shall be removed from the place of deposit before concrete is placed unless otherwise permitted by the JEA Engineer.

All reinforcement, forms, fillers and ground with which the concrete is to come in contact shall be free from frost. Concrete shall not be deposited during rain unless adequately protected and, in any case, preparations shall be on hand to protect newly placed concrete from rain until it has hardened sufficiently so that it will not be damaged.

Conveying: Concrete shall be conveyed from the mixer to the place of final deposit by methods

which will prevent the separation or loss of the materials. Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete at the delivery end and without separation of the materials.

Placing: No concrete shall be placed until the JEA Engineer or JEA Project Representative has inspected forms, reinforcing and conditions incidental to the pour. Concrete shall be deposited as nearly as practicable in its final position to avoid separation due to re-handling or flowing. All concrete shall be thoroughly consolidated by suitable means during placement and shall be thoroughly worked around the reinforcement and embedded items and into the corners of forms.

1.12. Finishing

Patching: Immediately after stripping forms, all defective areas shall be patched with mortar similar to the concrete mix. Proprietary compounds for patching may be used provided they are used in accordance with the manufacturer's recommendations.

- Major defective areas, including those resulting from leakage of forms, excessive honeycomb, large bulges and large offsets at form joints shall be chipped away to expose sound material and the surfaces that are to be patched shall be coated with an epoxy-polysulfide adhesive. The patching mortar shall be pressed in for a complete bond and finished to match adjacent areas.
- Minor defective areas, including honeycomb, air bubbles, holes resulting from removal of ties and those resulting from leakage of forms shall be patched with grout without resorting to chipping.

Finishing: After patching, finish exposed-to-view surfaces as follows:

- Standard Finish: Trim remaining bulges and offsets to remove fins and form blemishes, and dress rough edges. Rub with carborundum and water as necessary to achieve this finish. The result should be a solid concrete surface in a true and accurate plane.
- Rubbed Finish: In addition to the work required for a "standard finish," rub all the surfaces with carborundum and water to provide the hereinafter specified results. Wood grain pattern from wood forms need not be removed but shall be rubbed to provide uniformity of surface. Smooth surfaces resulting from overlaid plywood and metal shall be rubbed to remove the glaze. The result should be a solid concrete surface in a true and accurate plane, having a uniformly rubbed finish and free of glazed areas.

Areas to be finished as described above:

- Rubbed Finish: Control house bond beam surfaces.
- Standard Finish: All other exposed-to-view surfaces.

1.13. Finishing of Uniformed Surfaces

General: Grade and screed the surfaces to the exact elevation or slope shown or required. After screeding, tamp the mixture thoroughly to drive the coarse aggregate down from the surfaces and apply the finish below.

Float Finish: Finish the surface with a wood or machine float to a true and uniform plane with no coarse aggregate visible. Dusting to absorb surface water will not be permitted.

Broom Finish: Finish the surface with a wood or machine float to a true and uniform plane with no coarse aggregate visible. In addition, lightly broom the surface to make skid resistant. Dusting to absorb water will not be permitted.

Finish Schedule: Apply indicated finish as scheduled below:

Foundation	Trowel	Broom	Float
Control House	X		
Transformer		X	
Circuit Breaker		X	
All Others			X

1.14. Joints

Construction joints shall not be permitted except in the locations shown on the plans. All reinforcing steel and welded wire fabric shall be continued across joints. Bond shall be obtained by either the use of an approved adhesive or by roughening the surface of the concrete in an approved manner.

Isolation Joints shall be provided to separate concrete slabs from columns, footings or walls. There shall be no connection across the joint by reinforcement, keyways or bond. Joints shall be filled with preformed joint filler material conforming to ASTM D994 and sealed with a material compatible to the joint filler.

Control Joints made of pre-molded joint material shall be installed in floor slabs to allow for contraction caused by drying/shrinkage. Joints shall be spaced at a maximum of 20 feet with the joint spacing chosen so that the panels are approximately square. Depths of control joints shall be one-fifth the slab depth.

1.15. Curing and Protection

Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures, and shall be maintained with minimal moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete. The approved practices of cold weather and hot weather concreting are those outlined in ACI 306 and ACI 305, respectively.

1.16. Vapor Barrier

All floor slabs on grade or fill shall be waterproofed with one ply of polyvinyl chloride (PVC) 6 mils

thick. The PVC sheet shall be laid on the subgrade after it has been dressed and compacted. Joints shall be lapped six inches and sealed continuously with a pressure-sensitive tape, especially made for this purpose, or with an approved water-resistant adhesive. PVC sheets shall be turned up four (4) inches at walls, columns, and all other items projecting above the slab. Before concrete is placed, the sheets shall be carefully inspected and all punctures shall be patched with the pressure-sensitive tape or additional plies of strips of PVC sheeting laid down on approved adhesive.

2. Drilled Pier Installation

For purposes of this specification, a drilled pier shall be defined as a foundation element constructed by excavating a circular shaft in the soil which subsequently is filled with concrete, reinforcing steel and anchor bolt cage as required.

It is not the intent of these specifications to unnecessarily restrict the contractor in his construction methods, techniques or equipment. However, methods, techniques or equipment herein specified are considered necessary to provide adequate pier installation. Deviations from these techniques or equipment may be made only if approved by the JEA Project Representative in advance. All work shall be done and completed in an acceptable manner in accordance with best modern practices for construction of drilled pier foundations, notwithstanding any omissions from the specifications or drawings.

2.1. Familiarization

Prior to all work of this section, the Contractor shall become thoroughly familiar with the site, the site conditions, and accessibility to all drilled pier locations.

2.2. Installation Personnel

The Contractor shall have a minimum of four (4) years of experience in reinforced concrete drilled pier installation. References must be provided upon request by JEA Engineer. Drilled piers shall be installed by personnel experienced in this rotary excavation and pouring operation. In addition to the familiarity which the contractor may have with the process, the key operating personnel must have had prior experience in drilled pier installations, preferably relevant to anticipated subsurface materials, water conditions, shaft sizes and special techniques required.

2.3. Pier Alignment and Dimensions

All drilled piers shall be installed from the ground surface as existing. The maximum variation of the center of any pier from its design location shall be three inches (3"), and no pier shall be out of plumb more than one percent (1%) of its length. All piers shall be at least as large in diameter as shown on the Drawings. Tolerance of top elevation shall be plus one inch (1"), minus three inches (3"). If these tolerances are exceeded, proper additional construction (including costs of engineering and redesign) as required by the Engineer shall be provided without additional cost to the Owner.

2.4. Excavation

Shafts for piers shall be either drilled or augured by the use of a combination of power driven rotary type rig and bits or augers of a size and type to excavate the required diameter and depth as specified on the drawings.

Removal of materials from the shaft shall be by the use of the auger or a drilling mud slurry re-circulated from a sump through the hollow drill stem back up the open shaft and into the sump. Excavated material shall be disposed of in a manner subject to the approval of the Owner.

2.5. Drilling Mud

Commercially produced drilling mud should be compatible with existing soil conditions at the construction location. If salt or brackish water is used to mix the drilling fluid, or if a salt or brackish formation is to be penetrated by the drilled shaft, an attapulgate clay or "salt-gel" shall be used as the mineral additive. In an acid environment, it may be necessary to neutralize the drilling fluid and/or use bentonite as the mineral additive. Bentonite shall not be left in the excavated shaft longer than 8 hours

The drilling fluid must be maintained above the natural water table at all times and must have a viscosity or consistency capable of maintaining a stable excavation. Shaft depth should be measured upon completion of the initial cleaning process and again immediately prior to pouring concrete. If there is six inches (6") or more difference, the shaft must be re-cleaned. In addition to measuring the hole depth just prior to placing concrete, a sample of the drill fluid, two feet (2') above the bottom of the shaft should be obtained. If the concrete pouring time will be less than 45 minutes, the fluid density may be a maximum of 85 pcf as measured by a mud density balance. If the concrete pouring time exceeds 45 minutes, the fluid density shall be 80 pcf or less. If it can be demonstrated that there is no sand precipitation from the 85 pcf fluid after 45 minutes, the heavier fluid density will be allowed.

The responsibility for obtaining the sample of drilling fluid and determining the specific gravity will be the Contractor's and will be observed by the JEA Project Representative. The method of obtaining the sample and determining the fluid specific gravity or density will be subject to approval by the owner.

2.6. Temporary Casings

Temporary casings will be required at locations where the soil will not stand without support, or where, because of ground water conditions, sloughing of the sides of the piers may seriously delay or endanger the satisfactory completion of excavation and placement of concrete. The Contractor shall have immediately available for use on the job an ample supply of casings for each size which may be required and shall provide additional amounts, if required, to ensure orderly progress of the work. The casings shall be of such strength and rigidity as to maintain the required excavation lines and to resist crushing due to hydrostatic and/or earth pressure. All temporary casings shall be removed as concrete is placed or immediately thereafter, and in such a manner as to prevent sloughing material from dropping to the bottoms of the piers or falling on top of freshly placed concrete.

2.7. Permanent Casings

When piers penetrate very soft strata, the contractor may use corrugated metal pipe as forms to maintain the shape of the pier through these layers. The inside diameter of the casing shall be at least the nominal shaft diameter. Insertion into the excavated hole shall not unduly disturb side walls. When such casings are utilized, they shall not be removed, but shall remain in place.

2.8. Reinforcing

Reinforcing steel shall be the lengths and sizes shown on the drawings and shall conform to the requirements of the subsection Concrete except as modified below.

The pier reinforcement shall be assembled as a cage above ground and sufficiently braced to enable placing of the cage into the pier hole as a unit, without deforming, twisting or bending.

The contractor shall provide guides on the outside of the reinforcing cage to allow the cage to be centered in the open shaft. The guides shall be of such size and design as to be able to furnish the concrete cover for the reinforcing steel as shown on the drawings. Guides shall be placed in sufficient quantities to stabilize the reinforcing cage during concrete placement. A sample of the guide shall be submitted for approval.

2.9. Concrete

Except as modified below, concrete shall conform to the requirements of the subsection [Concrete](#).

Concrete shall be placed as soon as practicable after completion of excavation and installation of reinforcing and in a manner that will not cause segregation of materials.

When holes cannot be kept free of groundwater, concrete shall be placed by the use of a tremie pipe. The diameter of the tremie pipe should be as large as possible, but not greater than 1/3 the diameter of the shaft being poured. Drilled shafts less than thirty (30) feet deep may be poured with either a bottom sealed or traveling plug tremie. The traveling plug must be sufficiently tight so as to prevent the mixing of the drill fluid and concrete. The reinforcing steel cage shall be in place before any concrete is placed in the tremie. With the tremie on the bottom of the shaft, the tube shall be filled to the top extending above the ground. The filled tremie shall be picked up approximately one (1) foot off the bottom of the shaft to allow the weight of the concrete to displace the seal at the bottom of the tremie. During this initial pouring operation, the tremie is not to be pulled to such a height so as to clear the surface of the concrete already placed in the shaft. All concrete shall be poured through the now open tremie, with care taken to maintain a sufficient head of concrete to completely displace all drilling mud and suspended cuttings of material and to provide sufficient pressure so as to prevent reduction in pier diameter by earth pressure on the fresh concrete. The concrete in each pier shall be overpoured sufficiently to assure that clean, uncontaminated concrete is present at the top of the shaft.

During concrete pouring operations through the tremie, should the surface of the concrete in the pier be breached by the tremie, the tremie tube shall immediately be withdrawn from the hole, resealed and inserted below the surface of the concrete and pouring operations resumed. It may be necessary during large pours to replace the original long tremie with a shorter one. The replacement tremie should be sealed and inserted at least one hole diameter. Should the Engineer deem it necessary, when a breach occurs (and contamination is suspected), the Contractor shall retrieve the reinforcing steel cage, re-drill the shaft to reopen the hole, and begin the concreting operations from the bottom of the pier shaft.

Temporary casings shall be withdrawn as the concrete is deposited. A sufficient head of concrete shall be maintained to insure that no extraneous material enters the concrete and that necking has not occurred. An initial jerk of 2 to 4 inches will be permitted to start the lift; thereafter, while being removed from the pier hole, the casing must be kept plumb and must be pulled with a smooth vertical motion, without jerks.

The concrete along the full length of the anchor bolts shall be vibrated if the Engineer so directs.

Under certain circumstances, construction joints in pier shafts may be permitted. Prior approval must be obtained from the Engineer. Any such construction must be accomplished under dewatered conditions using approved ACI procedures, and must be properly recorded in the drilled pier report.

2.10. Checking Completed Piers

If the engineer has reason to suspect that the concrete was breached by the tremie, or that the pier, for any other reason, may contain extraneous material or otherwise fail the specifications, he may order the pier cored for inspection and/or testing. If the core recovery and/or test results indicate non-compliance with the specifications, the Contractor shall bear the expense of the investigation and/or testing and shall also, at no cost to the Owner, install proper additional construction as required by the Owner. Should the investigation and/or testing indicate compliance with the specifications, the Owner shall bear the cost of such investigation and/or testing.

2.11. Reports

A complete report of each pier installed shall be prepared by the Contractor. This report shall contain all dimensions, location of pier, elevation of bottom and top as actually poured, measured amount of concrete placed in each pier hole, and any other pertinent data. All cavities encountered should be clearly indicated. All lengths of permanent and/or temporary casings should be clearly shown. All unusual conditions shall be clearly described.

This information shall be submitted to the JEA Project Representative as soon as possible for review of conditions encountered.

2.12. Extra Compensation

It is the Contractor's responsibility to familiarize himself with the site and subsurface conditions before submitting his proposal. Ignorance of conditions will not be accepted as the basis of a claim for additional compensation.

Payment for extra concrete due to overdrilling will not be made.

3. Concrete Testing

3.1. Testing Requirements

The Contractor shall employ a JEA approved independent laboratory to prepare and perform all concrete testing. The Contractor must submit two copies of test reports to the JEA Project Manager. The report shall include the following tests for each partial/full truckload of concrete:

- 1) One of the following Air Content tests:

- ASTM C173/C173M *Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method*
- ASTM C231/C231M *Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method*
- 2) ASTM C143/C143M *Standard Test Method for Slump of Hydraulic-Cement Concrete*
- 3) ASTM C39/C39M *Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens*
- 4) ASTM C31/C31M *Standard Practice for Making and Curing Concrete Test Specimens in the Field*
- 5) ASTM C172/C172M *Standard Practice for Sampling Freshly Mixed Concrete*

Specific test requirements include:

- Four (4) cylinders shall be made in accordance with ASTM C31 and ASTM C172 and tested within the duration listed below:
 - Cylinder 1 at the 7th day
 - Cylinder 2 at the 28th day
 - Cylinder 3 at the 28th day
 - Cylinder 4 held in reserve
- The 28-day strength shall be the average of the two cylinders tested. The strength level of the concrete will be considered satisfactory if the average equals or exceeds the required f'c.
- Additional tests may be approved by the JEA Project Manager if the required compressive strength is not met.

3.2. Failed Testing

If compressive tests fail to meet the requirements of this document then the Contractor, at their expense, may request approval to perform the following strength test:

- 1) ASTM C42/C42M *Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete*

If the concrete still does not meet the requirements of this document then the Contractor, at their expense, shall remove and replace the concrete. The JEA Project Manager may, at his/her discretion, allow the concrete to remain in place.

VII. MEDIUM/HIGH VOLTAGE (4KV-230KV)

This section covers the general and specific requirements for the installation or addition of the substation's medium and high voltage (4kV-230kV) equipment and associated materials. The Contractor shall install such equipment as shown on the Drawings and herein specified. The Contractor shall furnish all materials that are not furnished by the Owner per the Drawings. All equipment shall be under the care and custody of the Contractor while on the job site.

The Contractor shall provide dry storage containers for all materials that must be stored in dry locations. Tarps and covers placed on top of materials that are located outdoors does not qualify as dry storage.

1. Switchyard Structures

The Contractor shall receive, off-load, store, and perform an inventory check for all structures delivered to the job site, including those furnished by the Owner. The JEA Project Representative shall be notified of any damage or errors found. The Contractor shall repair minor damages and correct minor errors at the instruction of the JEA Project Representative. As-builts shall be marked accordingly. Such corrections shall include but not limited to the following: reaming misaligned holes, punching new holes, and clipping or punching support angles as required.

Approximately 100 punched holes shall be considered minor modifications. All modifications shall be cold galvanized with $\geq 90\%$ zinc to resist corrosion.

1.1. Assembly

The structures are fabricated for bolted field assembly. Mounting holes for equipment have been included in the fabrication of the structures. The Contractor shall install all substation structures as indicated in the Drawings.

Assembly of the structures shall be in accordance with the Manufacturer's assembly drawings, unless otherwise specified.

1.2. Aluminum Structures

The Contractor shall provide and install a bit-u-mastic coating for the bases of all aluminum structures which come into direct contact with concrete foundations.

1.3. Mounted Equipment

Any equipment mounted on the structures by the Contractor (e.g. AC panels, outlet boxes, etc.) shall be mounted utilizing galvanized or stainless steel materials and hardware. Whenever practical, the Contractor shall mount the equipment to the structures using non-penetrating methods such as back-to-back unistrut. All holes drilled to mount such equipment shall be cold galvanized with $\geq 90\%$ zinc to resist corrosion.

2. Lightning Masts

Erection of the lightning masts shall be in accordance with the Manufacturer's assembly drawings.

3. Power/Auto Transformers

The Owner shall be responsible for delivery and offloading of the power/auto transformers onto the foundation pad. The Contractor shall have the site and foundations ready by time of delivery by coordinating with the JEA Project Manager. The Contractor shall repair minor damages at the instruction of the JEA Project Representative.

3.1. Receiving

The Contractor shall prepare the site to accommodate the transformers prior to the scheduled delivery date. This includes:

- Transformer pad acceptable compressive strength.
- Transformer pad is clear of debris.
- Adequate working space for receiving and assembling.
- Access to temporary power. Typically 3-phase AC power for heaters.
- Temporary or permanent installed ground conductors for immediate grounding of transformer.

3.2. Assembly

The Owner shall be responsible for assembly of the power/auto transformer including bushing, radiators, and oil filling. In no instance is a Contractor's employee or agent to enter a transformer manhole unless accompanied by the JEA Project Representative and only after suitable oxygen analysis has been conducted on the internal equipment environment, and all OSHA requirements for confined space entry are met. The Contractor shall install temporary grounds to the high-side and low-side bushings, if not done so after assembly is completed.

3.3. Installation

After the transformer has been assembled, the Contractor shall install the primary and secondary jumpers, conduits, control and power cables, and grounding as shown on the Drawings. See subsection [Transformer Grounding](#) for grounding requirements.

3.4. Labeling

The Contractor shall label the transformers with Rust-oleum spray (#7777-830) flat black based on the Single-Line Drawing. The labels shall be with a block stencil with six (6") inch high letters and placed approximately at eye level on the right-hand side of the cabinet door and (3) three other locations as instructed by the JEA Project Representative.

4. Circuit Breakers

All high and medium voltage circuit breakers will be furnished by the Owner. The Contractor shall receive, off-load, and store the equipment in accordance with the Manufacturer's instructions. The Contractor shall repair minor damages at the instruction of the JEA Project Representative.

4.1. Receiving

The Contractor shall complete the following before and after receiving the circuit breakers:

- Provide an approved foundation pad or cribbing location.

- Provide circuit breaker with temporary power. Typically 1-phase AC power for heaters.
- Install temporary or permanent ground conductors for immediate grounding of equipment, including bushings.

4.2. Assembly

The Contractor shall be responsible for minor assembly items such as support legs and control panel doors per the Manufacturer's instructions. Electrical clearances shall conform to the latest edition of the NESC. The Owner shall be responsible for vacuum drying, oil filling, or gas filling.

4.3. Installation

The Contractor shall install the jumpers, conduit, control and power cables, and grounding as shown in the Contract Drawings. See subsection [Equipment Grounding](#) of this Specification for grounding requirements.

4.4. Labeling

The Contractor shall label the circuit breakers with Rust-oleum spray (#7777-830) flat black based on the Single-Line Drawing. The labels shall be with a block stencil with six (6") inch high letters and placed approximately at eye level on the right-hand side of the cabinet door and (3) three other locations as instructed by the JEA Project Representative.

5. Air Switches

High and medium voltage air break disconnect switches will be furnished by the Owner. The Contractor shall receive, off-load, and store the equipment in accordance with the Manufacturer's instructions. Contractor shall repair minor damages at the instruction of the JEA Project Representative.

5.1. Assembly & Installation

The Contractor shall be responsible for full assembly and installation of the air switches, operating mechanism components, motor-operators, and load-break devices per the Drawings and Manufacturer's instructions. The switches shall be adjusted to conform to NESC and ANSI/NEMA requirements. All operating handles shall align such that the mechanism may be locked in the "OPEN" or "CLOSE" position. Where required, the Contractor shall install all associated control and power cables.

5.2. Switch Inspection and Acceptance

The Contractor shall make all final adjustments to the switches, including blades and contacts, until accepted by the JEA Project Representative. The Contractor shall assist with all testing, checkouts, and approvals.

5.3. Labeling

The Contractor shall label the air switches based on the Single-Line Drawing with reflective stickers provided by the Owner. The labels shall be applied at a location approved by the JEA Project Representative.

6. Instrument Transformers & Surge Arresters

High and medium voltage instrument transformers and surge arresters will be furnished by the

Owner . The Contractor shall receive, off-load, and store the equipment in accordance with the Manufacturer's instructions. The Contractor shall repair minor damages at the instruction of the JEA Project Representative.

6.1. Assembly & Installation

The Contractor shall be responsible for assembling instrument transformers and surge arresters per the Contract Drawings and Manufacturer's instructions. The Owner shall be responsible for oil filling instrument transformers as required. The Contractor shall install the jumpers, conduit, control cables, and grounding as shown in the Drawings. See Testing section below for items that shall be tested prior to installation.

6.2. Testing

The Owner shall test all metering-purpose instrument transformers and all arresters prior to installation by the Contractor. Contractor shall coordinate with JEA to deliver & pick-up the equipment at JEA Meter Shop located at JEA Commonwealth Service Center.

The Owner shall test all other instrument transformers after installation by the Contractor.

7. Station Service Transformers

The Owner shall be responsible for furnishing the station service transformers from JEA storeroom. The Contractor shall transport, off-load, and store the equipment in accordance with the Manufacturer's instructions. The Contractor shall repair minor damages at the instruction of the JEA Project Representative. The Contractor shall install the transformers per the Contract Drawings.

8. Insulators, Bus, & Connectors

The Owner shall be responsible for furnishing the insulators, bus, and connectors as shown in the Drawings. The Contractor shall receive, off-load, and store these materials in accordance with the Manufacturer's instructions. The JEA Project Representative shall be notified of any damage or errors found.

8.1. Installation

The Contractor shall install insulators, bus, conductor, bus supports, connectors, and all other fittings as indicated on the Drawings. The minimum clearance between bus and overhead conductors of different phases and from conductors to ground shall be as indicated on the Drawings.

8.2. Aluminum Welding Requirements

The welding process and all welding operators shall be qualified in accordance with the most recent Aluminum Association Aluminum Construction Manual, "Specifications for Aluminum Structures", Section 7/2/4 (Qualification of Welding Procedure and Welding Operators).

All joints to be welded shall be free of moisture and hydrocarbons. Degreasing shall be done with a non-toxic solvent. Sufficient time must be allowed for the evaporation of the solvent prior to welding. Wire brushing with a stainless steel wire brush should be employed after solvent cleaning to remove all oxide films, water stains, etc.

All aluminum welds shall be by the gas metal-arc (MIG) or the gas tungsten-arc (TIG) welding process. The working area should be substantially draft-free and protected from atmospheric contamination.

All welds shall be made with clean metal and the completed weld shall have a smooth finish and shall indicate good fusion with the parent metal.

All connections shall be checked for the proper edge penetration and alignment before, during, and after the weld is made. The cross-sectional area of the weld should not be less than that of the smallest member being joined.

To repair a defective weld, the defective portion must be entirely removed. The area to be repaired should be re-cleaned as in Section 7.3.2 above and the weld made in a manner similar to the original.

Tack welding should be used to prevent misalignment of the members being joined during the welding process.

8.3. Connector Corrosion Mitigation

Tinned connectors shall be installed when a copper to aluminum connection is made. Transition pads are available in the JEA storeroom as an alternative. To mitigate corrosion of dissimilar metals the copper component shall be installed below the aluminum component.

If Owner furnished connectors do not meet this requirement, Contractor shall immediately inform JEA Project Representative.

8.4. Bolts and Washer Requirements

Contractor shall provide hardware required to complete assembly and electrical connections.

Hardware for bus connections and electrical joints shall be stainless steel hex head bolts and nuts, grade 316. Under both the bolt head and the hex nut, provide one 1-1/4" 316 stainless steel flat washer and one 1-1/8", 2500-3500lb rated 301 stainless steel Belleville compression washer.

9. Capacitor Banks

9.1. Capacitor Bank

The Owner shall furnish the capacitor banks and associated equipment.

The Contractor shall receive, off-load, and store the equipment and accessories in accordance with the Manufacturer's instructions.

Prior to offload, the Contractor shall perform a thorough visual inspection of all Capacitor Bank components to verify there was no damage during shipping. If components have been damaged, the Contractor shall immediately notify the JEA Project Representative. Offloading shall not proceed until the Project Representative can inspect the damages.

Once the Contractor begins offload of the equipment, any subsequent damage shall be the Contractor's responsibility to correct, repair, or replace.

VIII. LOW VOLTAGE (600V)

This section covers the general and specific requirements for the installation or addition of the substation's low voltage (<600V) equipment and associated materials. The Contractor shall install such equipment as shown on the Drawings and herein specified. The Contractor shall furnish all materials that are not furnished by the Owner per the Drawings.

1. Substation Yard Lighting

1.1. Perimeter Lighting Poles

The Contractor shall install JEA furnished perimeter lighting poles and mounting bracket arms. Contractor shall provide conduit, wiring, and light fixtures, in locations as shown on the Drawings.

1.2. Switchyard Lights

The Contractor shall install JEA furnished lighting fixtures and mounting brackets on the lightning probe poles and on the takeoff structures complete with conduit, wiring, and switches, in locations as shown on the Drawings.

2. Auto Transfer Switch

Contractor shall install JEA furnished Automatic Transfer Switch. The Contractor shall provide stainless steel Unistrut channels and stainless-steel mounting hardware as required to mount the transfer switch. See Contract Drawings for location and additional details. If required to install on substation structure provide stainless-steel mounting hardware as required. Drilling holes into existing steel structures should be avoided. If unavoidable, apply cold galvanizing compound with $\geq 90\%$ zinc for protection after drilling.

The Contractor shall install and terminate all cabling and program the transfer switch controller to the correct electric service settings.

3. Outdoor Electrical Panels and Enclosures

The Contractor shall furnish the switchyard electrical panels and enclosures as shown on the Drawings. The Contractor shall also furnish the internal circuit breakers, ground bus, and associated hardware as required.

The Contractor shall install all new AC electrical panels as shown on the Drawings. The Contractor shall also furnish and install the stainless-steel Unistrut channel and stainless-steel mounting hardware as required to mount the panel to the structure mounting brackets.

The Contractor shall be responsible for installing the main and branch circuit breakers in all yard panels. The main breakers and branch circuit breakers shall be conventional bolt-on type circuit breakers rated in accordance with the Drawings.

The Contractor shall provide appropriate termination lugs for the service cables.

The Contractor shall be responsible for securely mounting switchyard electrical panels to the substation structures. Mounting brackets may have been incorporated into the structure design. The Contractor shall furnish and install stainless steel Unistrut channels and stainless-steel

mounting hardware as required to mount the electrical panels, cabinets, and junction boxes to the structure mounting brackets. Should any alteration or modification be necessary for the mounting of electrical panels, the Contractor shall submit details of the proposed alteration to the JEA Project Representative in writing for approval prior to installation.

3.1. Labeling

The Contractor shall provide and install all labeling of all newly installed electrical panels in the switchyard.

The front outside cover shall be labeled as shown on the Conduit Plan or Low Voltage Drawing. The paint shall be Rust-oleum spray on #7777-830, flat black. The labels shall be with a block stencil with three (3") inch high letters. The labeling shall be applied, at approximately eye level, centered on the cover.

The Contractor shall apply electrical labels to the branch circuits as shown on the Contract Drawings. The label should be adjacent to the corresponding breaker.

The Contractor shall clearly fill out the manufacturer-provided circuit directory index with a ball-point pen. The index shall be stored inside the panel.

4. Station Service Metering

4.1. Three Phase Service

The Contractor shall be responsible for installing three phase CTs and JEA Revenue Meter in accordance with JEA Electric Service standards and as shown on the Contract Drawings.

The Owner will furnish three (3) CTs (item# METCT00#) and one (1) meter socket (item # METSO007). The Contractor shall supply all other materials needed to complete the service metering.

The CTs, CT cabinet and meter socket/enclosure shall be grounded in accordance with the NEC and local inspection authority requirements. Cabinet shall be capable of being sealed and/or locked by the JEA meter shop.

Conduits entering CT cabinet from point of service shall be marked "Line" and conduits leaving CT cabinet to Main Breaker Panel (MBP) "Load".

CT#3 to contain the high leg, marked with orange phasing tape and be the bottom-most CT in the CT cabinet.

5. Switchyard Receptacles

5.1. Standard Items

Receptacles		
Item	Manufacturer	Part Number
<u>120V Weather-proof standard duplex receptacle box and cover*</u>	Crouse-Hinds (Eaton)	WRLD1

240V Truck Receptacle, Type SCA*	Thomas & Betts/Russellstoll	3323-78
Vacuum Recp		3324 ***
<u>60A, 600V, 2P, 3W, Single-Phase Electrical Pin & Sleeve Power Connector</u>	Thomas & Betts/Russellstoll	DF6207FRAB0
<u>60A, 600V, 3P, 4W, 3-Phase Electrical Pin & Sleeve Power Connector</u>	Thomas & Betts/Russellstoll	DF6407FRA
* Or approved equal		

The Contractor shall furnish and install the yard receptacles and the vacuum pump receptacles as shown on the Contract Drawings. Installation and wiring of each receptacle shall be in accordance with the Drawings. Details for mounting the switchyard receptacles (if applicable) are included in the Drawings.

6. Switchyard Relay Boxes

The Contractor shall furnish and install the bus differential boxes, potential transformer fuse boxes, terminal blocks, fuse blocks, test switches, and heaters as specified in the Contract Drawings.

The Contractor shall securely mount the switchyard relay boxes to the substation structures. Mounting brackets may have been incorporated into the structure design for most of these boxes. The Contractor shall furnish and install stainless steel Unistrut channels and stainless steel mounting hardware as required to mount the relay boxes to the structure mounting brackets. Details for mounting and wiring the switchyard relay boxes (if applicable) are included in the Drawings. Should any alteration or modification be necessary for mounting the relay boxes, the Contractor shall submit details of the proposed alteration to the JEA Project Engineer for approval prior to installation.

7. Temporary Station Service

If adequate facilities are not available, the Contractor shall install and maintain a temporary station service facility for new construction and additions to existing stations.

The Contractor shall be responsible for following standard permitting and application procedures to obtain the construction service. Where the installation of a power transformer or auto transformer is required, the construction service shall be 3-phase.

The Contractor's service is to be metered and shall comply with JEA requirements for meter can, weatherhead, and disconnect.

The Contractor shall provide the necessary conduit, cable, entrance head, meter, disconnect switch, panels, outlets, etc. to sufficiently supply electric service to the field office, construction outlets, and permanent low-voltage receptacles for station check-out.

The Owner will provide the distribution lateral, temporary span poles and distribution transformers as required for the construction station service. The Contractor shall be responsible for furnishing and installing secondary conductors and raceway to the transformers as required.

The Owner will be responsible for the total metered electric charges of the construction service during the term of the Construction Contract.

The Contractor shall provide a 200A disconnect in a NEMA 3R enclosure to run conduit and cables to the permanent station service facilities for use in equipment check-out by the Owner.

The Contractor shall furnish and install conduit to the cable trench, or permanent facilities, and install single conductor 4/0 RHW cable to the ATS or AC panels (as required). This requirement is in addition to the Contractor's service and shall be provided as soon as the low-voltage equipment is in place (see Section VII, Subsection 2, for Sequence of Work).

NOTE: Termination of the permanent station service transformers to the ATS or low-voltage electrical panels shall not be performed until after the temporary service has been disconnected.

The Contractor shall remove any temporary construction service poles and the construction service once the substation is energized and the permanent station service is in operation. Additionally, the Contractor shall apply for removal of the service drop and transformer bank.

Where there is existing station service available, and JEA service requirements are met, the Contractor shall be allowed to utilize the station service for construction A.C. at no cost.

8. Low Voltage Cables

8.1. Furnish, Delivery, Storage

The Owner shall furnish all control cable and fiber optic cable to the Contractor unless specified in the Drawings. The Contractor shall locally transport, off-load, and store the materials in accordance with the Manufacturer's instructions.

The Contractor shall provide all other cables listed in the Cable Schedule. Estimated lengths and cable specifications are given for each cable run. The Contractor will be responsible for providing actual quantities required.

The Contractor shall provide ring type compression terminals. They shall be used at both ends of all control cables and wiring. They shall be non-insulated, tin-plated, barrel-type with brazed seam and sized for the wire being terminated.

8.2. Installation

The Contractor shall pull and terminate all cables listed in the Cable Schedule. If work site is an energized site then the JEA Project Engineer shall direct the Contractor on responsibilities. All control cable, CT cable, PT cable, and communications cable runs shall be continuous. Splices shall NOT be permitted.

Splices made in non-control cable should be avoided. When necessary, splices shall conform to all applicable NEC and NESC standards.

The Contractor is responsible for providing the Owner with accurate "As Built" revisions of the Cable Schedule, Conduit Schedule, and related Drawings.

8.3. Grounding of Shielded Cable

A terminal block has been provided at the top of each relay control panel for terminating the ground conductor of each shielded control cable. Each ground conductor from the shielded cables will land individually on a terminal space, and be identified with its appropriate cable name. The Contractor shall provide amp type Termi-foil connectors for jumper connections between the control cable shields to the panel ground terminal block. The jumper wire size shall be a stranded #10 AWG.

All cable shields shall have a single point of ground at control house relay panels only.

8.4. Interconnection Drawings

The control cable Interconnection Drawings will be supplied at a later date by the Owner to show all terminations of the cables as listed on the Conduit and Cable Schedules.

The Contractor shall be responsible for terminating all cables listed on the Conduit and Cable Schedules. The Contractor shall also be responsible for the termination of any jumpers on terminal blocks in the equipment or on the control panels that may be shown on the Interconnection Drawings.

The Bid shall be based on the assumption of a termination at both ends of every conductor in each cable of the Cable Schedule and an additional fifty (50) #10 cables with 500 total terminations between panels and/or control house equipment. For bidding purposes, these jumpers may be assumed to be Class B multi-conductor cables running between panels, including termination.

If required, the Owner will terminate all cables to existing control panels which are energized. The Contractor shall pull cables to these panels, fan ends, install terminals, and leave ample cable for making terminations.

8.5. Control Panels

All cables pulled to the control panels shall have adequate length to reach the floor of the panel and back to the top of the relay panel or RTU. The insulation jacket shall then be stripped back to the top of the panel and all cables terminated without cutting individual wires.

8.6. Labeling

The Contractor shall provide and install labels on all newly-installed cables. Labels shall be Dymo ½" flexible nylon labels, with black text, white background, part # 18488. Other label types must be approved by the JEA Project Representative.

The cable's label shall correspond to the Cable # as shown on the Cable Schedule.

All cables are to be labeled at both ends and near the conduit where entering and leaving the cable trench.

The labels shall be placed at a location visible to the average worker. The ends of the label shall be wrapped, with the text still visible, with black electrical tape to further secure the label.

IX. GROUNDING

This section covers the general requirements for the installation of the ground grid system at JEA substations.

1. General

1.1. Scope

This section covers the general and specific requirements for the installation or addition of the substation grounding system. The Contractor shall install the ground grid system as shown on the Contract Drawings and herein specified. All equipment, structures, fencing, gates, and buildings shall be connected to the main ground grid.

1.2. Furnish, Delivery, and Storage

The Contractor shall furnish and install all the grounding materials unless otherwise specified in the Contract Drawings. All materials shall be approved by the JEA Project Engineer. The Contractor shall store these materials in accordance with the Manufacturer's instructions.

1.3. Wire Sizes and Requirements

JEA has standardized on wire sizes for the substation ground system. All ground wires shall be bare and free of any insulation unless otherwise specified. Materials mentioned within this Grounding section shall refer to the table below:

Equipment	Size	Wire Description
<ul style="list-style-type: none">• Main Ground Grid• Cable Trench	19#8 AWG	Copperweld, Soft Drawn w/ 40% Conductivity
<ul style="list-style-type: none">• Power/Auto Transformer (Neutral Only)	500 kcmil	37 Stranding, Concentric, Soft or Medium-Hard Drawn
<ul style="list-style-type: none">• Power/Auto Transformer (Tank Only)• Steel Structures• Instrument Transformers• Station Service Transformers• Switch Operating Platforms• Lightning Masts• Surge Arresters• Capacitor Bank Stands• 	7#5 AWG	Copperweld, Soft Drawn w/ 40% Conductivity
<ul style="list-style-type: none">• Metal Enclosures• Junction Box Chassis• Yard Panel Chassis	#4 AWG	Copperweld or bare stranded copper
<ul style="list-style-type: none">• Static Wire	3#6 AWG	Alumoweld
<ul style="list-style-type: none">• Fence	#4 AWG	Copperweld
Note: Control House Equipment grounding will be addressed in the Control House Section.		

Legacy Grounding Designs: In cases where existing substations have different grounding designs, the Drawings will specify the wire requirements.

1.4. Below-Grade Connection Requirements

JEA has standardized to exclusively use nVent ERICO Cadweld Exothermic Connections for all below-grade connections to the main ground grid. The connections shall be made with the Cadweld Plus System with the corresponding molds and electronic control unit for weld metal ignition. This includes cable to ground rod connections. All materials, including molds, shall be new and free of defects. A single mold shall not be used more than 50 times or past the manufacturer's recommendation.

1.5. Dissimilar Metal Requirements

Buried ground cables shall not be installed adjacent to buried steel pipes or structural steel, except where a connection is required for grounding purposes. If unavoidable, the metal shall be painted with a heavy coating of bitumastic paint or the ground wire enclosed in nonmetallic conduit. A good connection shall be made by removing paint prior to making the connection to ensure sufficient electrical contact.

2. Main Ground Grid

2.1. Main Ground Grid Cable

The main ground grid shall be constructed with 19#8 Copperweld stranded bare copper cable, unless otherwise specified in the Drawings. The cables shall be installed in the locations indicated on the Contract Drawings and at the depth specified (typically 18 inches below compact earth).

The cables shall be laid in continuous lengths with minimal to no splicing required. Horizontal lapped connections shall be made to avoid splicing at grid connection points.

The Contractor shall notify the JEA Project Representative of any damaged ground grid cables before, during, and after installation so the cables may be replaced. Where the Contractor is at fault for the damage the cables shall be repaired at the Contractor's expense and as directed by the JEA Project Representative.

2.2. Ground Rods

JEA has standardized to exclusively use Nvent Erico 8 foot long, 5/8" inch diameter copper-bonded steel threadless ground rods with a plating thickness of 10 mil. Compression couplers shall exclusively be used to extend the total depth of the ground rod. The Contractor shall strictly follow the manufacturer's installation procedure and use their required tools and equipment. <https://www.erico.com/>

Rods will be specified by either the depth or resistance required. Details for ground rod connections (if applicable) are included in the Contract Drawings.

The Contractor shall make a resistance reading of each ground rod prior to its connection to the station ground grid and report these readings to the JEA Project Engineer for verification of the ground grid design. Connection of the rod to the station ground grid shall be made, only after Owner approval, utilizing the Cadweld exothermic process.

Where the installation of ground rods are only specified by resistance, the Contractor shall furnish and install rods to 32' feet. If specified resistance has not been achieved after 32' feet

then the Contractor shall report this to the JEA Project Engineer and install as directed by the Engineer.

All ground rods shall maintain a minimum earth cover as specified on the Drawings (typically 18 inches below compact earth).

No ground rods shall be installed under paved roadway areas.

2.3. Ground Wells

The Contractor shall install ground wells as shown in the Drawings.

3. Transformer Grounding

Transformer Tank: The Contractor shall connect the transformer tank to the ground grid in two (2) locations at diagonal opposite corners using 7#5 Copperweld, unless otherwise specified in the Drawings.

Lightning Arresters: There shall be as direct and straight of a connection as practical from the tank to the earth side of the projecting lightning arresters. Typically this connection is installed by the transformer manufacturer with an insulated cable or copper bus bar. The transformer may be designed to use the tank as the conductive path from arrester to earth.

Neutral-grounded-wye Transformers: The Contractor shall connect the neutral bushing of any wye-connected power transformer or autotransformer directly to the station ground grid using 500kcmil bare copper wire. The neutral ground conductor shall extend continuously and be connected to the station ground grid in two (2) places using the connection process specified. The two (2) connections shall be made to the same ground grid run and shall be placed approximately three (3') feet apart.

4. Switch Grounding

Contractor shall install requires all a metal grounding platform below the switch operating device.

Contractor shall provide visible metal grounding platform below all switch operating handles. The platform shall be located on top of the rocked surface and bonded to the operating handle with 7#5 copper-clad-steel wire. The wire shall be visible and extend from the operator platform to the parallel ground clamp that also connects the switch structure to the ground grid. A flexible copper braid shall be installed to the operating pipe and connected to the same parallel ground clamp. Details for grounding the operator platform (if applicable) are included in the Contract Drawings.

Every switch structure shall be connected to the station ground grid in at least two (2) locations, as shown on the Drawings. One (1) switch structure ground conductor shall be installed as specified above.

Grounding switches shall have an additional continuous ground conductor from the blades to the station ground grid. This conductor shall be routed on the structure column opposite of the operating mechanism to facilitate complete grounding of the switch structure. The operating pipes for both the line and ground switches shall be connected by flexible copper braid as specified above.

5. Equipment Grounding

The Contractor shall be responsible for connecting electrical equipment such as circuit breakers, station service transformers, potential transformers, instrument transformers, surge arresters, electrical panels, junction boxes, etc., directly to the station ground grid as shown on the Drawings.

Electrical equipment shall be furnished by the Owner, unless otherwise specified. The Contractor shall be responsible for installing the equipment ground conductor on the side of the structure designed to accommodate the ground conductor.

The Owner shall furnish all above grade ground connectors necessary to connect the equipment to the station ground grid. The Contractor shall furnish the 7#5 Copperweld grounding conductor and all other material, equipment, and labor necessary to complete the connection of the electrical equipment to the station ground grid.

The Contractor shall install the equipment ground conductor such that the continuity of the conductor from the equipment to the station ground grid is maintained as much as practical.

6. Structure Grounding

The Contractor shall be responsible for connecting all steel structures directly to the station ground grid as shown on the Contract Drawings.

The structures are furnished by the Owner and are designed to accept the ground connectors provided. The Contractor shall be responsible for installing the structure ground conductor on the proper side of the structure to facilitate the connection of the structure to the station ground grid.

The Owner will furnish all above grade ground connectors and 7#5 Copperweld necessary to connect the structures to the station ground grid. The Contractor shall furnish all other material, equipment, and labor necessary to complete the connection of the steel structures to the station ground grid.

The Contractor shall install all structure ground conductors such that they conform to the structure and foundation.

Structures must be grounded to the station grid within the same working day the structure is erected.

7. Cable Trench & Control House Grounding

The Contractor shall install the cable trench and control house grounding as specified and shown on the Drawings. The Contractor shall furnish the 19#8 Copperweld conductor necessary to ground the cable trench and control house to the station ground grid and all other required material and labor to complete the installation.

The Contractor shall install the cable trench and control house ground conductors. The ground conductor shall run the entire length of the cable trench and connect to the station ground grid at all points of intersection. Two (2) ground conductors shall be brought into the control house through the cable trench and attached to the outside of the cable tray. The Contractor shall furnish and install 19#8 Copperweld cable clips on one side of the cable trench to support the

ground conductor.

Connection of the ground conductor to the cable tray shall be made utilizing Burndy Type GC2929CT connection or approved equal. The ground conductor shall be secured to the cable tray at each cable tray fitting or at intervals not exceeding four (4') feet throughout the length of the tray. Provide ground wire lugs and hardware (as required). The cable tray shall NOT be used as a ground path.

Control house equipment, including electrical panels shall be connected to the control house ground by means of Anderson Type K3 connector or approved equal.

Where a reinforced concrete floor is installed in the control house, the Contractor shall bond the control house slab reinforcement to the ground grid to provide equipotential surfacing as shown on the Drawings. Metal floor decking within modular buildings should be bonded internally by the manufacturer, with connections to the grid on the exterior of the building at the points designated.

8. Fence Grounding

The Contractor shall connect the chain link fences to the station ground grid as specified and as shown on the Drawings. Details for grounding the fence and fence gates, if applicable, are included in the Contract Drawings.

The Contractor shall connect the fence to the station ground grid at every gate post, every corner post, and intermediate posts at convenient intervals, no more than forty (40') feet apart. The fence and gate posts shall be connected to the station ground grid using 7#5 Copperweld conductors.

The Contractor shall furnish #2 AWG copper conductor and connectors as required to complete the fence grounding. The conductor shall attach to the post with a minimum of three (3) clamp connections and be woven into the fence fabric between these connections to terminate on each strand of barbed wire.

Each personnel and equipment swing gate shall have a perimeter ground conductor of 19#8 Copperweld connected to the station ground grid. This conductor shall extend approximately three (3') feet beyond the gate swing, both inward and outward, unless property restrictions prevent the exterior extension.

Each swing gate leaf shall be connected to the gate post with a copper welding cable, as specified on the Drawings. The copper welding cable and exothermic weld connections shall be furnished by the Contractor. The Contractor shall connect the welding cable directly to the post and the post grounding conductor.

The Contractor shall furnish and install the grounding system as shown on the Drawings for the substation lift and/or sliding entrance gates.

9. Capacitor Bank Grounding

9.1. Ungrounded Wye Capacitor Banks

Capacitor banks installed on distribution medium voltage bus shall be installed ungrounded as shown on the manufacturer's drawings and the Contract Drawings. A single phase PT shall be

installed on the neutral bus to monitor the neutral to ground voltage rise on the bank. No other ground connections will be made to the capacitor bank neutral bus.

10. Yard Finish Rock

Yard Finish rock covering is an important part of safety within the substation. Where applicable, substation yard shall be covered with a minimum depth of 4" inches of washed rock as specified on the Drawings. The substation shall not be energized until rock covers all necessary areas. If energization is absolutely necessary then all uncovered areas shall clearly marked with barriers and warning signs that address the safety hazards. See [Rocking](#) subsection and the Drawings for more details.

X. RACEWAYS

This section covers the general requirements for the installation of raceways, including conduits and cable trenches at JEA substations. The Contractor shall furnish and install all raceways and associated materials as shown in the Drawings and as specified herein. See Section [Control House](#) for raceways installed in the Control House.

1. Below-Grade Conduit

All below-grade conduits and fittings shall be UV resistant Schedule 40 PVC and conform to *UL 651 Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings*.

1.1. Depth

All conduits for low voltage (600V and below) conductors and cables shall be installed at 18" minimum below finished subgrade (compact earth) elevation, unless otherwise specified. The area shall be backfilled and compacted to the same density as surrounding area.

1.2. Elbow Radius

All conduits shall have standard radius elbows that conform to the *UL 651* standard. Field bends will not be permitted.

1.2.1 Exception

The JEA Project Representative may approve field bends when necessary. Field bends shall be made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending equipment identified for that purpose. The radius of the bends shall comply with the NEC.

2. Above-Grade Conduit

All above-grade conduits and fittings shall be UV resistant Schedule 40 PVC and conform to *UL 651 Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings*. The Contractor shall form all above grade conduits to conform to the surfaces of the foundations and structures. The conduit should be routed to mitigate tripping hazards.

2.1. Elbow Radius

All conduits shall have standard radius elbows that conform to the *UL 651* standard. Field bends will not be permitted.

2.1.1 Exception

The JEA Project Representative may approve field bends where necessary. Field bends shall be made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending equipment identified for that purpose. The radius of the bends shall comply with the NEC.

2.2. Caps

Slip-on PVC caps or duct seal shall be installed on any conduits openly exposed to the environment to prevent water and pest intrusion.

2.3. Bell Ends

Bell ends shall be installed at end of conduits to mitigate damage to cables.

3. Cable Trench

The Contractor shall submit the Manufacturer's layout drawings to the JEA Project Engineer for approval. The Contractor shall install the cable trench system by following the Manufacturer's instructions.

3.1. Site Work

The trench base shall be set only on firm, compacted earth, sand, or gravel mix, at an elevation such that the top of the wall will be two (2") inches above final grade (top of crushed rock). Place geotextile fabric the full length of the trench excavation, overlapping a minimum of two (2') feet at each joint of fabric. The fabric shall cover the bottom and both sides of the cable trench to top of compacted grade. Geotextile fabric shall be Mirafi 140N. Place a minimum four (4") inches of bedding sand in the trench to form a level bottom, just covering the bottom of the section members.

3.2. Protection during Installation

The Contractor shall protect the trench against entrance of construction debris, rock, and earth during the construction and after placing of the sand bedding. The trench shall be cleaned out of any such foreign material prior to placing control cables and just before final placing of covers.

3.3. Conduit Installation Requirements

The conduit shall penetrate through the open bottom of the trench and extend at least 1" inch above the sand (from the bottom of the exposed conduit hole). The conduits shall be angled 45 degrees toward the control house and include a bell end.

3.4. Road Crossing Trench

When transitioning from a pedestrian rated trench to road crossing trench, raise the road crossing trench higher to align the base with the pedestrian trench.

3.5. Cable Riser to Control House Transition

The wall opening for the cable riser's entrance into the control house shall be sealed with 1/4" thick aluminum plates on inside of the wall. The exposed area where the cables rest shall be sealed with fiberglass insulation.

3.6. Tools

The Contractor shall provide the Owner with a new set of Manufacturer's cover removal tools as well as the tools used during construction. The Contractor shall deliver these tools to the JEA Project Representative.

3.7. Ground Wire

A 19/#8 AWG bare copperweld ground wire shall be provided by the Contractor along the full length of all trench sections using manufacturer's standard ground wire clips. This wire shall be connected to the substation below grade ground grid at each point where it crosses a ground grid conductor using Cadweld exothermic welds.

4. Labeling

The Contractor shall provide and install stick-on labels on all newly installed conduits at both ends. The label shall have black text with a white background. The text shall correspond to the conduit # as shown on the Drawings. The labels shall be placed and reasonably sized to be visible by the average person.

XI. CONTROL HOUSE

This section covers the general requirements for the installation of control houses at JEA substations.

1. Foundation

See Section III. Concrete.

1.1. Floor Sealing

Interior concrete floor slab, including the battery room, shall be dustproofed and sealed with a sealer similar or equal to Sherwin Williams Tile-Clad High Solids Epoxy Color shall be haze gray. The sealer shall be installed and finished in strict accordance with the manufacturer's directions. The sealer shall be installed in two coats, where the second coat is installed after all floor-mounted equipment is installed.

The JEA Project Representative shall be present during applications.

2. Masonry

2.1. Scope

This Subsection covers all masonry work required in construction of the Control House shown on the drawings. Concrete work accomplished in conjunction with masonry construction, such as concrete lintels, shall be governed by [Section III Concrete](#) of these specifications.

2.2. Design and Construction

The design and construction of concrete masonry structures shall be in accordance with "Building Code Requirements for Masonry Structures" (ACI 530-88/ASCE 5-88, latest revision) and "Standard Building Code" of the Southern Building Code Congress International (1997 Edition, latest revision).

2.3. Materials

The materials used in masonry construction shall meet the following specifications unless otherwise noted.

Concrete Masonry Units: Block shall conform to ASTM C90 Grade N-I. Moisture content at time of installation shall not exceed 35% of total absorption. All units shall be uniform in color and texture, of standard sizes, and of the shapes required for the construction intended. All units shall be kept dry during storage on the job and shall be dry when laid in the walls and partitions.

Cementitious Materials:

- Portland Cement - Type I, II, or III of ASTM C150
- Masonry Cement - ASTM C91
- Hydrated Lime - Type S of ASTM C207
- Quicklime - ASTM C5_

Aggregates:

- Fine aggregates for grout and mortar: ASTM C144

- Coarse aggregate for grout, maximum size No. 8 of ASTM C404

Water: Water used shall be clear and free from injurious amounts of oils, acids, alkalies, salts, organic materials, or other substances that may be deleterious to mortar, grout and any metal in the wall.

Admixtures: Accelerators, retarders, and other admixture materials shall not be used in mortar or grout unless reliable data are provided to demonstrate that the admixture has no adverse effect on the properties of the mortar. Any admixtures used shall conform to ASTM C494.

Masonry Anchors and Reinforcements: All wall reinforcing and tie system shall be Dur-O-Wal truss or approved equal. Rods shall be minimum 9 gauge and hot-dip galvanized after fabrication in accordance with ASTM A116 Class 3 coating (0.8 oz./s.f.).

2.4. Mortar and Grout

Proportioning: Grout shall be proportioned to meet the requirements of ASTM C476. Mortar shall be proportioned in accordance with ASTM C270 for Type N mortar.

Mixing: All materials should be mixed in a mechanical mixer for a minimum period of 5 minutes, after all the materials are in the mixer, with the amount of water required to produce the desired workability. Mortar that has stiffened from evaporation may be retempered to workable consistency by adding water and remixing thoroughly. All mortar shall be used within 2-1/2 hours of the initial mixing.

2.5. Laying Concrete Block Units

Workmanship: All masonry work shall be laid out carefully and accurately. All work shall be performed by first- class masons thoroughly experienced in the trade. All lines, vertical and horizontal, shall be straight and true and all walls shall be plumb, true, clean and smooth.

Laying: All units shall be laid in running bond with the vertical joints occurring at mid-points of the units above and below, and aligned vertically. Concrete block must not be wetted before laying, but must be kept dry to prevent shrinkage. Horizontal and vertical mortar joints shall be uniform and not wider than 3/8 inch thick. All exposed joints shall be tooled concave.

Cold Weather: No masonry construction shall be permitted in freezing weather unless suitable means are provided to heat materials. No antifreeze ingredients shall be used. Masonry shall be protected against freezing for at least 48 hours.

Intersecting Walls and Corners: At corners, walls shall be tied together in masonry bond. When masonry bond is not practical at intersecting walls and partitions, ties shall be provided as specified below.

2.6. Masonry Reinforcing and Anchorage

Horizontal reinforcing shall be built into every other block course starting 16 inches above the footing or slab and ending with the last mortar joint. In addition, reinforcing shall be installed in

the first 2 mortar joints above and below all openings, extending at least 24 inches beyond each side of the opening. Anchors for intersecting partitions shall be factory made "T" sections placed at 16 inch intervals vertically. Reinforcement shall be so placed as to assure a 5/8 inch mortar cover on the exterior face of walls and 1/2 inch cover on interior faces. Side rods shall be lapped at least 6 inches at splices.

2.7. Setting of Metal Work

All flashing, anchors, ties, bearing plates, bolts, etc., shall be set at the correct elevation, true and level, in full beds of mortar. Masonry shall be brought to bear against anchors to prevent slippage. Anchors and similar work shall be completely covered with mortar or grout. Pressed steel frames shall be filled with mortar as the work progresses.

2.8. Cleaning

All exposed masonry shall be cleaned with solvents of a brand and mixture recommended by the concrete block manufacturer. The cleaning shall be done in accordance with the solvent manufacturer's printed directions.

Exposed concrete block may be cleaned without solvents provided the resulting surfaces are suitable for painting and the original texture of the units is not altered.

2.9. Lintels

All openings wider than 16 inches shall have lintels. Lintels shall bear a minimum of 8 inches at each end. Where masonry lintel blocks are used, units shall be filled with 3,000 psi concrete and reinforced with a minimum of 2 No. 4 bars. Concrete and reinforcing shall meet the requirements of Section [Site Work - Concrete](#).

3. Roof

3.1. Scope

This Subsection covers construction of the Control House roof system composed of precast prestressed concrete hollow core slabs, rigid insulation and modified bitumen roofing.

3.2. Hollow Core Slabs

Manufacturer shall be a firm specializing in providing prestressed concrete products and services of the types specified herein and on the plans. The manufacturer shall have at least three (3) years experience in manufacturing, transporting and erecting precast/prestressed concrete decks. The manufacturer's plant shall be a member of the Prestressed Concrete Institute's Plant Certification Program. Design of the precast/prestressed hollow core slabs shall be performed by a Professional Engineer registered in the State of Florida, and qualified by education and/or experience to perform the design.

3.2.1 Materials

- Portland cement, Type I, II or III, shall conform to ASTM C-150.
- Lightweight aggregates shall conform to ASTM C-330.
- Concrete shall be zero slump.
- All concrete shall be produced by the prestressed concrete manufacturer at a central batching plant.
- Prestressing steel wire shall be high tensile, three strand, 5/16" diameter stress relieved wire

(250 ksi) in accordance with ASTM A-416.

3.2.2 Fabrication

Prestressed concrete slabs shall be fabricated in one single operation with a smooth top and bottom. Slabs with a 4 foot nominal width shall be machine extruded using zero slump concrete. All slabs shall be free of honeycombing and uniform chamfers. The slab must be within the following tolerances:

Description	Tolerances
Full Width Units	± 1/4"
Saw Cut Units	± 1/2"
Length	± 1"
Thickness	± 1/4"
Deviation from Square	± 1"

3.2.3 Testing

At least four (4) test cylinders shall be made for each day's production. Testing shall conform to the applicable provisions of PCI MNL-116 Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products.

3.2.4 Submittals

Shop drawings shall be submitted for approval, showing identifying marks of each unit, holes over 100 square inches and anchorage details.

3.2.5 Erection

Prestressed concrete units shall be erected into final position under the supervision of a representative of the manufacturer. The units shall be aligned, leveled, and anchored prior to grouting keyway joints.

3.2.6 Grouting

Keyways between units shall be cleaned and filled with grout. Grout that may have seeped through keyways to areas below shall be removed before hardening. Tops of grouted joints shall be screeded adequately smooth to prevent any unevenness that might interfere with the placing of roofing.

3.2.7 Wood Nailers

Continuous wood nailing strips shall be provided at all locations such as eaves and roof edges for nailing of flashings and the like and to act as a stop for the insulation. Nailers shall be pressure treated with a water-borne preservative such as Wolman salts or with penta applied in a liquified petroleum gas carrier such as the Cellon Process. Oil based preservatives such as creosote are not acceptable.

3.2.8 Built-Up Roof

Built-up roof system, to include insulation, flashing and sheet metal and modified bitumen roofing, shall be in accordance with The Johns Manville Company. A Johns Manville 2FID SBS Modified Bitumin roofing system with a 20-year NDL warranty shall be installed. JEA has standardized on this system and will not accept other alternatives. Installation shall be by a Johns Manville Company approved roofing contractor. All required procedures and inspections shall be closely followed.

3.2.9 Gutters and Downspouts

All gutters and downspouts, where shown on the drawings, shall be 24 gauge aluminum. Gutter and downspouts are to be 5" x 5" with 6" cover plates at splices. All splices and ends are to be soldered. Provide aluminum ferrules and aluminum spikes at 4'0" o.c. for mounting gutter to wood blocking. Aluminum flashing is to run down into gutter. Provide aluminum straps 8'0" apart attached into masonry for mounting of downspouts. Gutters are to be installed per The Johns Manville Company specifications and details.

4. Doors

4.1. Doors and Frames

The Contractor shall furnish and install:

- All doors along with frames and hardware as called for on the drawings.
- Hangers, bars, plates, angles, nuts, screws, clips, cushions, brackets, lugs, fastenings, and all other required parts and accessories for complete units which may be required to complete the work in this Subsection.

The Contractor shall furnish all hardware as specified in the Hardware Schedule. The Contractor shall supply one locking cylinder to allow him access to the Control House during construction. Upon completion of construction, the Contractor will remove his locking cylinder and replace with Owner furnished cylinder.

4.1.1 Fiberglass Doors with Aluminum Frames

Special Lite Fiberglass Reinforced Polyester Door System (FRP) with Aluminum Frame or JEA approved equal

Features:

1. FRP skin - 0.12" thick
2. Class "C" exterior skin
3. Uses Corbin Russwin ML2000 mortise lockset – JEA standard
4. Hinges – 4.5" butt, continuous and offset pivots
5. 6063-T6 aluminum alloy door perimeter extrusions
6. Frame – 6063 -T6 hardened aluminum alloy
7. Options – fire rated and hurricane resistant
8. Core – water blown polyurethane foam.

Note: Contractor shall coordinate with the JEA Project Representative and comply with JEA Facilities Standards Manual.

4.2. Metals (General)

Metals used in this section shall be free from defects impairing strength, durability or appearance, and shall be of best commercial grade for their particular function and situation in structure and location.

4.3. Erection and Workmanship

Frames shall be installed by the Contractor in correctly prepared openings according to the

manufacturer's recommended installation instructions. They shall be set plumb, square and level in correct alignment with floors, ceilings, walls and other work. They shall be securely anchored and completely ready for operation. To produce a watertight job, all joints between frames and masonry shall be tightly caulked and neatly painted. Excess caulking materials shall be removed. It shall be the Contractor's responsibility to protect frame members from harm during construction.

All doors are to remain in original cartons until ready for installation. This will protect the finish and facings from the pitting corrosion action of plaster, concrete, cement, or other highly alkaline materials.

Like metals in contact or metals in contact with unlike metals, where necessary to prevent corrosion by electrolytic action and other causes, shall be effectively insulated.

Anchors, bolts, and other fastenings into masonry shall be as per manufacturer's recommendations. Except as detailed, no member shall project beyond the normal face or planes of wall line.

4.4. Adjustments Upon Completion

Upon substantial completion of the work of this Subsection, the Contractor shall go over all his work and put it in first-class condition. He shall adjust and condition all movable and fixed parts and make good any loose or damaged work and put hardware in proper operating condition.

4.5. Templates

The door manufacturer shall be furnished templates by the hardware supplier and extreme care and precision shall be used in the hardware layout and mortising so as to assure an accurate fit to frames.

4.6. Shop Drawings

When laying out shop drawings, the Contractor shall carefully verify all conditions at the site of operations, and shall promptly report to the JEA field representative any variation or digression from contract document affecting his work, that proper and prompt adjustment may be made on the shop drawings or otherwise.

Provide necessary symbol key seating plans for easily and quickly identifying units and parts and assigning to their proper locations in the building.

4.7. Finish Hardware

Hardware shall be free from defects affecting appearance and serviceability. Working parts shall be well fitted and smooth working without unnecessary play. All items of hardware shall be delivered to the building site in sufficient time in advance of its requirement for use for inspection prior to installation. All items of finishing hardware shall be placed in separate packages and definitely numbered and marked for each opening for which it is intended. Hardware for application to metal shall be made to standard templates. Template information shall be furnished to door and frame fabricators and all other trades requiring same, in order that they may cut, reinforce or otherwise prepare in the shop, materials for the reception of

hardware.

4.7.1 Installation

Install finishing hardware and adjust for intended operation. Cover doorknobs and other surfaces while the area is being finished. Clean paint from all exposed surfaces thoroughly before the building is turned over to the Owner. Hinges shall be located 10 inches from the top of the door, 10 inches from the bottom of the door and other hinge(s) centered between the top and bottom hinges. Where locations of knobs are not indicated on the drawings, they shall center 39 inches above the floor.

4.7.2 Hardware Schedule

Hardware shall be provided by the Contractor per the JEA Facilities Specifications. If a copy of these specifications are needed, contact the JEA Project Representative.

4.7.3 Lock Guards

If required, stainless steel lock guards shall be installed. Lock guards shall be manufactured by Lock Guard Manufacturing Company and available from George P. Coyle & Sons, Inc., Jacksonville, Florida (904- 356-4821).

5. Windows

The Contractor shall furnish and install two (2) fixed-pane windows as manufactured by Kawneer Products, and distributed by All Purpose Glass and Mirror, 5555 W. Beaver Street, Jacksonville, Florida. Windows shall be Model designation IR501; with 1-5/16" overall glass, which is impact resistant, laminated insulated and tinted. Window frames shall be Bronze in color. Windows shall face towards the substation yard.

6. Painting and Finishing

6.1. Materials

All paint materials shall be delivered to the job in their original unbroken packages. For the various paints to be used, the Contractor shall submit for approval specification data in accordance with the paragraph for same, both as covered in "General Conditions." All paint shall be applied in strict accordance with the manufacturer's printed instructions. All paint materials shall be the manufacturer's first quality for the type specified. Approved manufacturers are:

- Sherwin Williams

6.2. Colors

The final colors and finish shall be determined by site conditions and requirements. The contractor shall coordinate with the Project Representative for final color and finish. The following colors are provided for bidding purposes.

Description	Color
Interior Ceilings	White
Outside Walls	SW6133 – Muslin
Inside Walls	SW6126 – Navajo White
Doors	SW6129 – Restrained Gold
Epoxy Floors	Haze Gray

6.3. Workmanship

All finish surfaces shall be smooth, even and free from defects and shall show even coatings.

Paint shall be applied to dry surfaces only and no succeeding coat of paint shall be applied until the preceding coat is thoroughly dry.

Paint shall be thoroughly worked into all joints, crevices and open spaces. There shall be a perceptible difference in the shades of successive coats of paint. All freshly painted surfaces shall be adequately protected.

6.4. Finish Painting

6.4.1 Exterior Wall

Exposed surfaces, including entryway ceiling, shall receive a paint application as follows:

- Number of coats of paint per manufacturer recommendation of Sherwin Williams BLOXFIL 4000 to which has been added one (1) quart of Sherwin Williams Exterior Masonry Paint color SW6133 per gallon of Blox Fill.
- Two (2) finish coats of Sherwin Williams Acrylic Exterior Flat Masonry Paint No. 2210 Wonder-Guard color No. SW6133.

6.4.2 Interior Wall

Exposed surfaces shall receive a paint application as follows:

- Two (2) coats of Sherwin Williams BLOXFIL 4000 to which has been added one (1) quart of Sherwin Williams Interior Vinyl No. 506 color No. SW6126 per gallon.
- One (1) coat of Sherwin Williams ULTRA-HIDE PVA Interior primer-sealer 1030 tinted to color No. SW6126.
- One (1) coat of Sherwin Williams DEVSHIELD 4328 color No. SW6126.

6.4.3 Interior Ceiling

Interior ceiling of Control House (underside of concrete roof slabs) shall receive a paint application as follows:

- One (1) coat of Sherwin Williams BOND-PREP Interior/Exterior Waterborne Pigmented Bonding Primer 3030 (White).
- One (1) coat of acrylic white.

6.5. Caulking

Caulking compound shall be furnished and applied at all locations indicated on the drawings and where required to close joints and similar openings. The compound shall be silicone or polysulfide type produced by a manufacturer regularly engaged in the manufacture of caulking compounds.

6.6. Cleaning

Upon completion of the work, paint, caulking compound, etc., shall be cleaned from all surfaces for which the material was not intended for application. All damaged places shall be touched up and the job shall be left in a first-class workmanlike condition. Particular attention shall be given to surface areas which have been sprayed with paint to see that all dust from spraying operation is thoroughly removed.

6.7. Touch-Up Paint

Provide one (1) extra gallon of each color to be used for touch-up. The extra gallon must come from the same batch as the original paint.

7. Heating and Air Conditioning System

7.1. Heat Pump System

The Contractor shall furnish and install the whole heat pump system as shown in the Drawings.

7.1.1 Safety Disconnect Switch

Each unit shall have the following disconnect switches installed:

- Indoor Unit: Square D 240VAC, 60-Amp, 2-P, non-fusible, NEMA 1 heavy-duty disconnect safety switch
- Outdoor Unit: Square D 240VAC, 60-Amp, 2-P, non-fusible, NEMA 3R heavy-duty disconnect safety switch Connection between condensers and safety disconnect switches shall be liquid-tight flexible conduit.

7.1.2 Air Handler

The Contractor shall furnish and install the air handler inside the Control House in the location shown on the Drawings and at a distance of two (2) feet above the floor. The Contractor shall furnish and install all structural steel supporting members, as well as all fasteners necessary for a secure mounting of the unit. The Contractor shall then install the conduit and cables between the handler and the indoor disconnect safety switch.

7.1.3 Condenser

The Contractor shall furnish and install the outdoor condenser unit outside the Control House in the location shown on the Drawings. The unit shall be mounted on a contractor-furnished and installed concrete pad of the size and in the location shown on the Drawings. The pad shall be level. After the Contractor has completed installing the outdoor unit the Contractor shall then complete the electrical conduit connections between the unit and the disconnect safety switch and complete the power wiring to the unit.

7.1.4 Other

The Contractor shall furnish and install ducting, return and supply air grills, and permanent type filters associated with the heat pumps above. The Contractor shall also furnish and install a turning vane to efficiently project air into the Control House. The Contractor shall install a programmable controlled thermostat. The Contractor shall furnish and install an insulated sheet metal duct, with grille, to direct air flow toward the center of the Control House.

8. Battery Room

The Manufacturer shall install the batteries and racks. The Contractor shall install the ventilation, lights, battery chargers, conduits, grounding, and wiring as shown in the Contract Drawings and as indicated below:

8.1. Batteries and Rack

Batteries shall be properly stored indoors per Manufacturer's instructions. The delivery of batteries should be coordinated to avoid additional charging requirements for long-term storage; otherwise, the batteries shall be placed on charge during storage per Manufacturer's instructions.

The battery rack shall be firmly anchored to the battery room's floor only. Racks made of metal shall be grounded. The Manufacturer shall install the batteries, float charge, test, and approve the battery banks for in-service operation.

8.2. Battery Chargers

The Contractor shall install the battery chargers, conduits, and wiring as required by the Drawings. The chargers shall not be installed inside the battery room.

8.3. Ventilation

The Contractor shall furnish and install the ventilation system (thru wall exhaust fan) per the Drawings and Manufacturer's instructions. Fan shall be as indicated on the drawings. The Contractor shall submit for approval the battery room exhaust fan and associated equipment. Exhaust fan motor(s) shall be suitable for 120V, single phase, 60Hz operation.

8.4. Lighting

Lighting fixtures shall be protected from physical damage by guards or isolation. Light switches shall be located outside of battery room.

8.5. Safety Signs

Safety signs inside and outside of battery room (both sides of battery room door), prohibiting smoking, sparks, or flame shall be provided. Signs shall be in accordance with ANSI Z535.1-2011, ANSI Z535.2-2011, ANSI Z535.3-2011, ANSI Z535.4-2011, and ANSI Z535.5-2011.

8.6. Battery Cart Cable Entrance

The Contractor shall furnish and install a 6-inch diameter PVC pipe protruding through the Control House wall to be used as a battery cart cable entrance. The pipe shall be located 2 feet above the Control House floor, in a field- located position convenient to the D.C. panel(s). The pipe shall be caulked on both sides of the wall for weatherproofing and shall be capped with a clean-out plug on each end.

9. Lighting

The Contractor shall furnish and install the lighting fixtures for the control house as shown in the Drawings. All lighting shall operate at 120 VAC.

Each exterior lighting circuit shall be dawn-dusk controlled by a single photocell mounted on the exterior of the control house.

10. Raceways

The Contractor shall furnish and install all raceways and associated materials as shown in the Drawings and as specified herein.

10.1. Cable Tray

The Contractor shall furnish and install the cable tray system as shown on the Drawings.

The Contractor shall submit the Manufacturer's layout drawings to the JEA Project Manager for approval. These drawings shall include certified flexural and loading data with the Manufacturer's recommendation of maximum span for the design load.

Indoor cable trays shall be fabricated from extrusions of aluminum alloy 6063-T5 or 6063-T6. Application shall be in accordance with the ASCE Specifications and AWS Standards. The trays shall be furnished with a six (6") inch depth or four (4") inch depth, as indicated on the Drawings and in nominal twelve (12') foot lengths. Splices shall be of the high pressure bolted type. The design load for the tray installation shall be a minimum 200 lbs. per linear foot for the maximum tray width of thirty-six (36") inches or nine (9") inches, as described on the Drawings, when supported on twelve (12') foot centers.

Indoor cable trays shall be of the aluminum ladder type with cross rungs spaced six (6") inches maximum center to center.

All rungs, dropouts and other metal surfaces in contact with the cable shall have smooth, rounded edges. The rungs shall be joined to the sides by a homogeneous union method, weld on swage.

Cable tray supports shall be provided at intervals not to exceed the Manufacturer's recommendations for maximum span for the design load and type of tray being supported. In no case shall the spans exceed that shown on the Drawings.

All necessary splice plates, bolts, nuts, lock washers, etc., shall be furnished compatible for use with the type metal tray provided.

Provide ground wire lugs and hardware as required. The cable tray shall NOT be used as a ground path. Grounding of the cable tray shall conform to the requirements of these Specifications.

10.2. Labeling

The Contractor shall provide and install stick-on labels on all newly installed conduits at both ends. The label shall have black text with a white background. The text shall correspond to the conduit # as shown on the Drawings. The labels shall be placed and reasonably sized to be visible by the average person.

11. Electrical Panels

The Contractor shall furnish and install the electrical panels as shown in the Drawings. The Contractor shall submit the Manufacturer's layout drawings to the JEA Project Manager for approval.

11.1. Labeling

The Contractor shall provide and install all labeling of all newly-installed electrical panels.

The front outside cover shall be labeled as shown on the Conduit Plan or Low Voltage Drawing. The paint shall be Rust-oleum spray on #7777-830, flat black. The labels shall be with a block stencil with three (3") inch high letters. The labeling shall be applied, at approximately eye level, centered on the cover.

The Contractor shall apply electrical labels to the branch circuits as shown on the Drawings. The label should be adjacent to the corresponding breaker.

The Contractor shall clearly fill out the manufacturer-provided circuit directory index with a ball-point pen. The index shall be stored inside the panel.

12. Receptacles

The Contractor shall furnish all receptacles, switches, and conduit accessories as needed based on the Drawings. All receptacles, switches, and other materials shall be surface mounted, unless specified in the Drawings.

Receptacles and switches exposed to outdoor environment shall have weatherproof covers.

The Contractor shall furnish and install three (3) Class 123 (ABC) dry chemical fire extinguishers, 10 lbs. in the Control House. Fire extinguishers shall be wall-mounted at a location to be field determined.

13. Control Relay Panels

The Owner will furnish and install all communications, network, and security switchboard panels within the control house. The Owner will only furnish the relay panels. The quantity and location are shown on the Drawings.

The Contractor shall off-load, and install the relay panels by setting them in the correct location, anchor to the floor, and properly ground them. The Contractor shall be responsible for properly leveling the panels and ensuring that all access doors are operable. The panels should be installed only after the Control House is substantially complete, including the installation of the floor sealant.

The Contractor shall be responsible for all additional incurred cost by JEA if the Contractor is unable to unload and place the relay panels into the control house upon delivery from the Manufacturer.

14. Bathroom

The Contractor shall furnish and install one (1) thru wall mounted exhaust fan (as indicated on the drawings) in the bathroom.

14.1. TOILET ROOM ACCESSORIES:

Furnish and install accessories as specified:

- Toilet Paper Dispenser: Tork Twin Jumbo Bath Tissue Roll Dispenser, article 247549A, Color Black, SCC: 10073286622393
- Hand Towel Dispenser: Tork Elevation Matic Model 5510282
- Hand Dryer: Excel Dryer Inc. Model Xlerator XL-W
- Mirror Options:
 - Bradley – Bradex Standard Model Series 7805
 - Brey – Krause Model Series T-10XX-XX-SS with shelf option
 - Bobrick B-166 series
- Waste Paper Basket: Bobrick B-2270

15. Fire Alarm System

15.1. Smoke Detector

Provide ceiling mounted 120 VAC smoke detectors and relays as indicated on the Contract Drawings. Coordinate with JEA's facilities group.

15.2. Fire Extinguisher

Provide two (2) wall mounted 10# Dry Chemical ABC Rated Fire Extinguishers in a convenient location, with one at each doorway.

16. Miscellaneous Items

The Contractor shall furnish and install miscellaneous items as specified in the Drawings. The lateral file cabinet shall be secured to the floor and wall.

XII. OTHER

This section covers other general requirements JEA substations.

1. Signage

The Contractor shall install the following signage on the substation fence, wall, or partitions, and control house entry point(s) as a part of this Work. The signage shall consist of four (4) components, the signs which shall be used on the Perimeter Security Boundary (which shall normally be a fence or a wall), the Perimeter Entry Points (gates, doors, etc.), the Control House Entry Points (typically doors) and inside substation perimeter road (near live equipment, bus, switches etc.).

Perimeter Signage: The perimeter signage shall consist of signs labeled “WARNING HAZARDOUS VOLTAGE KEEP OUT”, placed at approximately Forty (40’) foot spacing around the entire perimeter boundary (fence, wall, etc.) and at a conspicuous height, approximately Six (6’) feet.

- “Warning Hazardous Voltage Keep Out” (JEA Item ID# sigda010)

Substation Entry Points Signage: Each entryway shall have signage in addition to the requirements of the perimeter signage. Entryways include the fence gates and wall entryways. The entryways shall each have the following four (4) signs:

- “WARNING HAZARDOUS VOLTAGE KEEP OUT” (JEA Item ID# SIGDA003)
- “SAFETY INSTRUCTIONS / PPE” (JEA Item ID# SIGDA004)
- “NOTICE CONTACT SYSTEM DISPATCH BEFORE ENTERING/AFTER SECURING” (JEA Item ID# SIGDA005)
- “NOTICE PRIVATE PROPERTY NO TRESPASSING” (JEA ITEM ID# SIGDA012)

Control House Entry Point Signage: Each Control House Entry Point (door, roll up doors, or any other appurtenance for the admission of persons under reasonable conditions) shall have signage in addition to the requirements mentioned above. For this paragraph, the “Control House” shall be any and every humanly- accessible building within or adjoining to the substation property that contains any electrical apparatus that monitors, controls, or otherwise is essential to the operation of the substation, and is not otherwise designed for novice/public entry and occupancy. Each Control House Entry Point shall each have the following sign:

- “NOTICE CONTACT SYSTEM DISPATCH BEFORE ENTERING/AFTER SECURING” (JEA Item ID# SIGDA005)

Interior Substation Signage: Danger signs to be placed inside substation (at inner perimeter of road, by side of switchgear, near transformers, breakers, capacitor banks, bus, and feeders. The following sign and fiberglass post shall be used:

- DANGER HAZARDOUS VOLTAGE KEEP OUT (JEA Item ID# SIGDA011)
- FIBERGLASS POST (JEA Item ID# SIGPO014)

Exact location of the signage may be reviewed and modified with the concurrence of the on-site JEA Project Representative.

All signs for this Work shall be provided by JEA. The Contractor shall request the signage indicating type and quantity, in writing (by email or other typewritten instrument) from the JEA Project Representative approximately two (2) weeks in advance of need.

The Contractor may assume that all signs for this Work shall include corner holes riveted with a non-corroding grommet or eyelet. The Contractor shall fasten the signs to the perimeter fence or wall, or control house door, in a manner that is to be submitted in writing (by email or other typewritten instrument) to, and approved by, the JEA Project Representative.

2. Safety

2.1. Bollards

The Contractor shall furnish and install bollards as shown on the Drawings.

3. Equipment Removal

Contractor shall be responsible for proper disposal of all removed materials, equipment, soils, and construction waste. Consult with JEA Project Representative to determine which removed equipment (if any) JEA will retain possession of.

All Contractor removed equipment that JEA will retain shall be stored on-site and protected until it can be removed by JEA to stores.

All removals that contain hazardous waste shall be disposed of in an appropriate manner according to all legal and regulatory requirements. Consult with JEA Project Representative for appropriate disposal methods/sites.

XIII. REFERENCES

Where the codes and standards referenced herein contain recommendations in addition to requirements, consider the recommendations as requirements and follow unless stated otherwise by this Specification.

In the event of any conflict between codes, or this Specification and codes, the more stringent requirement applies.

The latest edition and published addenda of the referenced publications herein effect on the date of Contract Award are a part of this Section and, where referred to by title or by basic designation only, are applicable to the extent indicated by the specific reference:

1. American Association of State Highway and Transportation Officials (AASHTO)

- 1) M 43 - Standard Specification for Sizes of Aggregate for Road and Bridge Construction
- 2) M 145 - Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
- 3) T 99 – Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
- 4) T 180 - Moisture-Density Relations of Soils Using a 10-lb Rammer and 18-inch Drop
- 5) T 191 - Standard Method of Test for Density of Soil In-Place by the Sand Cone Method

2. American Concrete Institute (ACI)

- 1) 117 – Specification for Tolerances for Concrete Construction and Materials
- 2) 229R - Report on Controlled Low-Strength Materials
- 3) 301 - Specifications for Structural Concrete
- 4) 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete
- 5) 305R - Hot Weather Concreting
- 6) 306R - Cold Weather Concreting
- 7) 309R - Guide for Consolidation of Concrete
- 8) 318 - Building Code Requirements for Structural Concrete
- 9) 347 - Guide to Formwork for Concrete
- 10) 530/530.1 – Building Code Requirements and Specification for Masonry Structures

3. American Institute of Steel Construction (AISC)

- 1) 303 - Code of Standard Practice for Steel Buildings and Bridges

4. American National Standards Institute (ANSI)

- 1) A 185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete

5. American Society for Testing and Materials (ASTM) International

- 1) A 36 - Standard Specification for Carbon Structural Steel
- 2) A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 3) A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- 4) A 153 - Specification for Zinc Coating (Hot-Dip) on iron and Steel Hardware
- 5) A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete 6) A 370 - Standard Test Methods and Definitions for Mechanical Testing of Steel Products
- 7) A 497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete. 8) A 563 - Standard Specification for Carbons and Alloy Steel Nuts
- 9) A 615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
- 10) A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- 11) A 706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement 12) A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- 13) A 924/A 924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
- 14) A 992 - Standard Specification for Structural Steel Shapes
- 15) B 695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel 16) C 5 – Standard Specification for Quicklime for Structural Purposes
- 17) C 29 - Standard Test Method for Bulk Density (Unit Weight) and Voids in Aggregate 18) C 31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field 19) C 33 - Standard Specification for Concrete Aggregates
- 20) C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 21) C 40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
- 22) C 42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- 23) C 88 - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate 24) C 90 – Standard Specification for Loadbearing Concrete Masonry Units
- 25) C 91 – Standard Specification for Masonry Cement
- 26) C 94 / C94M - Standard Specification for Ready Mixed Concrete
- 27) C 109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens)
- 28) C 117 - Standard Test Method for Materials Finer Than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing
- 29) C 123 - Standard Test Method for Lightweight Particles in Aggregate

- 30) C 127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
- 31) C 128 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
- 32) C 131 - Standard Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- 33) C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
- 34) C 138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
- 35) C 142 - Standard Test Method for Clay Lumps and Friable Particles in Aggregates
- 36) C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete
- 37) C 144 – Standard Specification for Aggregate for Masonry Mortar
- 38) C 150 - Standard Specification for Portland Cement
- 39) C 172 - Standard Practice for Sampling Freshly Mixed Concrete
- 40) C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- 41) C 192 - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
- 42) C 207 – Standard Specification for Hydrated Lime for Masonry Purposes
- 43) C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- 44) C 260 - Standard Specification for Air Entraining Admixtures for Concrete
- 45) C 270 – Standard Specification for Mortar for Unit Masonry
- 46) C 289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
- 47) C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- 48) C 403 – Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
- 49) C 404 – Standard Specification for Aggregates for Masonry Grout
- 50) C 451 - Standard Test Method for Early Stiffening of Hydraulic Cement (Paste Method)
- 51) C 470 - Standard Specification for Molds for Forming Concrete Test Cylinders Vertically
- 52) C 476 – Standard Specification for Grout for Masonry
- 53) C 494/C494M - Standard Specification for Chemical Admixtures for Concrete
- 54) C 535 - Standard Test Method for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- 55) C 566 - Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
- 56) C 617 - Standard Practice for Capping Cylindrical Concrete Specimens
- 57) C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- 58) C 920 - Standard Specification for Elastomeric Joint Sealants
- 59) D 994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
- 60) C 1064 – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete

- 61) C 1077 - Standard Practice for Laboratories Testing Concrete, and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
- 62) C 1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
- 63) 1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
- 64) D 422 - Standard Test Method for Particle-Size Analysis of Soils
- 65) D 448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction
- 66) D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
- 67) D 854 – Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer
- 68) D 994 – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
- 69) D 1140 - Standard Test Methods for Determining the Amount of Material Finer Than 75 μ m (No. 200 Sieve) in Soils by Washing
- 70) D 1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
- 71) D 1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
- 72) D 1751 - Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- 73) D 1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
- 74) D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
- 75) D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- 76) D 2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
- 77) D 2940 - Standard Specification Graded Aggregate Material for Bases or Subbases for Highways or Airports
- 78) D 3282 - Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
- 79) D 3740 – Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- 80) D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- 81) D 4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
- 82) D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles
- 83) D 4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
- 84) D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
- 85) D 4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile
- 86) D 4832 – Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders
- 87) D 5199 – Standard Test Method for Measuring the Nominal Thickness of

- Geosynthetics 88) D 5261 – Standard Test Method for Measuring Mass per Unit Area of Geotextiles
- 89) D 6241 – Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
- 90) D 6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- 91) E 4 - Standard Practices for Force Verification of Testing Machines 92) F 436 - Standard Specification for Hardened Steel Washers
- 93) F 1554 - Standard Specification for Anchor Rods, Steel, 36, 55, and 105-ksi Yield Strength

6. American Society of Civil Engineers (ASCE)

- 1) 5-11/6-11 - Building Code Requirements and Specifications for Masonry Structures.
- 2) 7-10 – Minimum Design Loads for Building and Other Structures

7. American Welding Society (AWS)

- 1) D1.1 - Structural Welding Code - Steel

8. Concrete Reinforcing Steel Institute (CRSI)

- 1) MSP-2-01 - Manual of Standard Practice

9. National Ready Mixed Concrete Association:

- 1) Certification of Ready-Mixed Concrete Production Facilities

10. The Society for Protective Coatings (SSPC)

- 1) PA-1 - Shop, Field, and Maintenance Painting of Steel
- 2) SP-6 - Commercial Blast Cleaning

11. U.S. Army Corps of Engineers

- 1) CRD-C572 - Specifications for Polyvinyl Chloride Waterstops

12. U.S. Department of Labor, Occupational Safety and Health Administration Standards (OSHA)

- 1) 29 CFR, Part 1926, Safety and Health Regulations for Construction, Standard Number: 1926.652, Requirements for Protective Systems, Subpart P – Excavations
- 2) 29 CFR, Part 1926, Safety and Health Regulations for Construction, Standard Number: 1926.652, Requirements for Protective Systems, Subpart T – Demolition

13. 2010 Florida Building Code

13.1. City of Jacksonville, Florida (COJ)

- 1) Land Development Procedures Manual
- 2) City Standard Specifications, Department of Public Works³

13.2. Florida Department of Environmental Protection

- 1) Florida Stormwater Erosion and Sedimentation Control Inspector's Manual
- 2) State of Florida, Erosion and Sediment Control, Designer and Reviewer Manual

13.3. Florida Department of Transportation

- 1) FM 5-515 - Florida Method of Test for Limerock Bearing Ratio (LBR)
- 2) Standard Specifications for Road and Bridge Construction

13.4. Florida Administrative Code

- 1) 62-621 – Generic Permits
- 2) 62-701 – Solid Waste Management Facilities
- 3) 62-710 – Used Oil Management
- 4) 62-711 – Waste Tire Rule
- 5) 62-730 – Hazardous Waste