Technical Specifications

LEON COUNTY HEALTH DEPARTMENT

PROVISIONS FOR PORTABLE GENERATOR – RICHARDSON-LEWIS HEALTH CENTER

Prepared for

Leon County Board of Commissioners

Leon County Facilities

CONSTRUCTION DOCUMENTS

May 6, 2011

Set No.____

McGinniss & Fleming
Engineering, Inc.

Mechanical · Electrical · Fire Protection · Plumbing

LEON COUNTY HEALTH DEPARTMENT
PROVISIONS FOR PORTABLE GENERATOR – RICHARDSON-LEWIS HEALTH CENTER
LEON COUNTY FACILITIES

100% CONSTRUCTION DOCUMENTS
May 6, 2011

INDEX

SPECIFICATIONS

SECTION 01005 – GENERAL REQUIREMENTS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General Conditions and Supplementary General Conditions sections and other Divisions Specification sections apply to work of this section.

SCOPE AND INTENT

The work to be done consists of the furnishing of all labor, materials, and equipment, and performance of all work included in this Contract.

PLANS AND SPECIFICATIONS

Drawings are generally diagrammatic in nature and do not show in every detail all devices and incidental materials necessary to accomplish their intent. Therefore, the Contractor shall understand that such devices and incidental materials required shall be furnished at no cost to the Owner.

Technical Specifications consist of three parts: General, Products and Execution. The General Section contains General Requirements that govern the work. Products and Execution modify and supplement these by detailed requirements for the work and shall always govern whenever there appears to be a conflict.

All work called for in the Specifications applicable to this Contract, but not shown on the Plans, or vice versa, shall be of like effect as if shown or mentioned in both.

SUBSTITUTIONS

If the Contractor or supplier wishes consideration of equipment, materials or field devices other than that specified, he shall make a submittal to the Engineer not less than 10 days after Notice to Proceed. The Engineer may approve such substitution as an alternate, providing the Contractor has demonstrated to his satisfaction that it is equal or superior to the product specified.

COORDINATION

All work shall be coordinated with the Project Manager. At the beginning of each week, the Contractor shall present a schedule to the Project Manager showing what work will be taking place and on what days.

DRAWINGS

The Contractor is responsible for verifying that no conflicts exist at the job site that will prevent the successful completion of work under this section.

DAMAGE

The Contractor shall exercise due care when working in overhead or finished areas, shall take all necessary protective measures, and shall repair all surfaces which are damaged as a result of his work.

The Contractor shall be bound by the requirements of the general specification paragraph for the security and protection of personnel, materials, and equipment on site.

CODES

All work, materials, and equipment provided under this specification shall be in compliance with the applicable sections of the latest editions of the following codes and standards.

a. Occupational Safety and Health Regulations.
b. National Fire Codes.
c. Florida Building Codes.
d. Standards of the National Board of Fire Underwriters.

GUARANTEE/SERVICE

The Contractor shall guarantee all new equipment and work installed under this Division for a period of one year from final acceptance without expense to the Owner.

DELIVERY AND STORAGE

Equipment and materials shall be properly stored and adequately protected and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored, and protected in accordance with the manufacturer's recommendations.

Damaged or defective items, in the opinion of the Engineer, shall be replaced at no cost to the Owner.

INSTRUCTION TO OPERATING PERSONNEL

The Contractor shall furnish without additional expense the services of competent instructors who will give full instruction to the designated personnel in the adjustment, operation and maintenance, including pertinent safety requirements, of the equipment and systems. The instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work-week after the equipment or system has been accepted.

Two man-hours of instruction shall be furnished.

ACCEPTANCE

Prior to final acceptance the Contractor shall complete all work and install all equipment required by the drawings and this specification and shall provide the following:

a. Written certification that all work has been completed.

b. An operation and maintenance manual for each system, except as otherwise specified herein, and for each piece of equipment shall be furnished by the Contractor. Three (3) copies of the manual bound in hardback binder, or an approved equivalent shall be provided to the Owner. One complete manual shall be furnished prior to the substantial completion and the remaining manuals shall be furnished before the contract is completed. The following identification shall be inscribed on the cover: the words "OPERATING AND MAINTENANCE MANUAL", the name

and location of the project, and the name of the Contractor. The manual shall include the names, addresses, and telephone numbers of each subcontractor installing equipment and systems and of the local representatives for each item of equipment and each system. The manual shall have a table of contents and be assembled to conform to the table of contents with tab sheets placed before instruction sheets shall be legible and easily read. The manual shall include, but not be limited to, the following: safety precautions, diagrams and illustrations, test procedures, performance data, and parts lists. The parts lists for equipment shall indicate the sources of supply, and the service organization that is reasonably convenient to the building site. Where data in the manual refers to more than one model, or refers to optional equipment, the model number installed and the options included shall be clearly marked.

c. Three (3) print sets of the As-Built condition, clearly marked and signed and dated by the Contractor.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

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SECTION 01040 - COORDINATION

PART 1 - GENERAL

WORK INCLUDED

Contractor shall supervise and direct the work competently and efficiently, devoting such attention thereto and applying such skills as may be necessary to perform the work in accordance with the Contract Documents.

Contractor shall be solely responsible for all means, methods, techniques, sequences and procedures of construction, and for providing adequate safety precautions and coordinating all portions of the work under the Contract Documents.

Contractor shall be responsible to see that the finished work complies accurately with the Contract Documents.

Contractor shall be responsible for all project coordination.

RELATED REQUIREMENTS

Bidding Conditions

Contractual Conditions

Section 01010 – General Provisions

Section 01200 - Project Meetings

Section 01700 - Contract Closeout

DESCRIPTION

Coordinate scheduling, submittals, and work of the various sections of specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

Maintain reports and records at job site:

a. Maintain Daily Log of progress of work and other pertinent data. Maintain log accessible to Owner, Engineer and his representative.

b. Assemble documentation for handling of any claims or disputes that may arise.

Inspections and Testing:

a. Inspect the work to assure that it is performed in accordance with the requirements of the Contract Documents.

b. Arrange with the Engineer or Owner as applicable for special inspections or testing required.

c. Reject work that does not conform to requirements of the Contract Documents.

Coordinate sequence of work to insure proposed completion dates are met.

Construction Schedule:

a. Prepare detailed schedule of Contractor's operations and for all subcontractors on the project.

b. Monitor schedules as work progresses.

c. Identify potential variances between scheduled and probable completion date.

d. Recommend to Engineer any adjustments in schedule to meet required completion date.

e. Provide monthly summary reports of each monitoring.

f. Observe work to monitor compliance with schedule.

g. Verify that labor and equipment are adequate to meet and maintain the schedule for the work.

h. Verify that product deliveries are adequate to meet and maintain the schedule for the work.

i. Report any non-compliance to Engineer, with recommendations for remedy.

j. Verify that adequate services are provided to comply with requirements for work and climatic conditions.

k. Verify proper maintenance and operation of temporary facilities.

l. Administer traffic and parking controls for construction workers. Construction traffic shall not interfere with surrounding traffic movement.

Coordination of Subcontractors:

a. Coordinate work of all subcontractors and relationship between them.

b. Establish on-site lines of authority and communication. Schedule and conduct progress meetings among Owner and Engineer representatives and subcontractors.

c. Ensure that specified cleaning is done during progress of the work and at completion of contract.

MEETINGS

In addition to progress meeting specified in Section 01200, hold coordination meetings and pre-installation conferences with personnel and subcontractors to assure coordination of work.

COORDINATION OF SUBMITTALS

Administer processing of shop drawings, product data, and samples.

Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

Coordinate Testing Laboratory Services:

a. Notify laboratory of test schedule.

b. Verify that required personnel are present.

c. Verify that specified tests are made as scheduled.

d. Verify compliance of the test results with specified criteria. Determine need for re-testing and submit recommendations to Engineer. Administer and pay for required re-testing.

Coordinate with Sub-contractors as required:

a. Provide temporary utilities (electric, water) required by the Subcontractors in the performance of their work.

b. Provide designated location where the Subcontractors may place construction debris for removal by the Contractor.

Coordinate requests for changes to assure compatibility of space, of operating elements, and effect on work of other sections.

a. Recommend necessary or desirable changes to Engineer.

b. Review subcontractor's requests for changes and substitutions. Submit recommendations to Engineer.

c. Process Change Orders in accord with General Conditions and Change Order Procedures.

COORDINATION OF SPACE

Coordinate uses of project space and sequence the installation of subcontractor work that is indicated diagrammatically on Drawings. Follow routings shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

In finished areas, except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

INTERPRETATION OF CONTRACT DOCUMENTS

Consult with Engineer to obtain interpretation or clarifications for any portions of the contract documents that are unclear or ambiguous. Transmit all requests for interpretation in writing.

Assist in the answering of any questions which may arise.

Transmit written interpretations to Sub Contractors, Suppliers and others whose work may be affected by the clarification.

Interpretations shall be based on the Engineers review of the Contract Documents. In case of conflicting data, assumption shall be made that the item of greater quality, cost of quantity was bid.

START-UP

Direct the check-out of utilities, operational systems, and equipment.

Assist in initial start-up and testing.

Record dates of the start of the operations of systems and equipment.

Submit to Engineer written notice of the beginning of warranty period for equipment put into service.

COORDINATION OF CONTRACT CLOSEOUT

Substantial Completion:

a. Coordinate completion and cleanup of work of separate sections in preparation for Substantial Completion.

b. Upon determination of Substantial Completion of work or portion thereof, prepare for the Engineer a list of incomplete or unsatisfactory items.

c. Request Substantial Inspection at the scheduled time. Provide Engineer and Owner five working days notice.

Final Completion:

Upon determination that work is at final completion:

a. Submit written notice to Engineer that the work is ready for final inspection.

b. Secure and transmit to Engineer required closeout submittals.

Turn over to Engineer.

a. Operations and maintenance data.

b. Spare parts and maintenance materials.

c. Warranties and other data as required for these specifications.

d. Owner file copies of all submittals, changes, etc.

After Owner occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

Assemble and coordinate closeout submittals specified.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

REQUIREMENTS INCLUDED

Contractor shall attend a Pre-Construction meeting administered by the Engineer.

Contractor shall schedule and administer monthly progress meetings and specially called meetings throughout progress of work. Perform the following:

1. Prepare agenda for meetings.
2. Distribute written agenda of each meeting four days in advance of meeting date.
3. Make physical arrangements for meetings.
4. Preside at meetings.
5. Record the minutes; include significant proceedings and decisions.
6. Reproduce and distribute copies of minutes within three days after each meeting.
    a. To participants in the meeting.
    b. To parties affected by decisions made at the meetings.
    c. Furnish three copies of minutes to Engineer.

Representative of Contractors, Subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

Invite Owner and Engineer to all such meetings. Owner and Engineer may attend to ascertain that Work is expedited consistent with Contract Documents and construction schedules.

RELATED REQUIREMENTS

Bidding Conditions.

Contractual Conditions.

Shop drawings, product data and samples.

Section 01010 - Summary of Work

Section 01040 - Coordination.

PRECONSTRUCTION MEETING

Location: A site designated by Owner.

Attendance: forward written notification to the following:

1. Owner's Project Manager.

2. Engineer and his professional consultants.

3. Contractor's Superintendent.

4. Major Subcontractors.

5. Others as Appropriate.

Suggested Agenda:

1. Distribution and discussion of:

    a. List of major subcontractors and suppliers.

    b. Projected Construction Schedules.

2. Critical work sequencing.

3. Major equipment deliveries and priorities.

4. Project Coordination:

    a. Designation of responsible personnel.

5. Procedures and processing of:

    a. Field decisions.

    b. Proposal requests.

    c. Submittals.

    d. Change Orders.

    e. Applications for Payment.

6. Adequacy of distribution of Contract Documents.

7. Procedures for maintaining Record Documents.

8. Use of Premises:

    a. Office, work and storage areas.

    b. Owner's requirements.

9. Construction facilities, controls and construction aids.

10. Temporary Utilities.

11. Safety and first-aid procedures.

12. Security procedures.

13. Housekeeping procedures.

PROGRESS MEETINGS

Contractor shall schedule regular periodic meetings at least monthly or more often if deemed appropriate by the Engineer.

Hold called meetings as required by progress of work.

Location of the meetings: Project jobsite.

Attendance:

1. Owner and Engineer and his professional consultants as needed.
2. Subcontractors as appropriate to the agenda.
3. Suppliers as appropriate to the agenda.
4. Others.

Suggested Agenda:

1. Review, approval of minutes of previous meetings.
2. Review of work progress since previous meetings.
3. Field observations, problems and conflicts.
4. Problems which impeded Construction Schedule.
5. Review of off-site fabrication, delivery schedule.
6. Corrective measures and procedures to regain projected schedule.
7. Revisions to Construction Schedule.
8. Progress, schedule, during succeeding work period.
9. Coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Maintenance of quality standards.
12. Pending changes and substitutions.
13. Review proposed changes for:
    a. Effect on Construction Schedule and on completion date.
    b. Effect on other contracts of the Project.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01340 - SUBMITTALS

PART 1 - GENERAL

REQUIREMENTS INCLUDED

Submit Shop Drawings, Product Data and Samples required by Contract Documents.

Submittals may include, but are not limited to the following:

1. Those required in the individual technical specification sections.

RELATED REQUIREMENTS

Definitions and Additional Responsibilities of Parties: General Conditions of the Contract.

Designate in the Construction Schedule, Application for Payments, or in a separate coordinated schedule, the dates for submission of Shop Drawings, Product Data and Samples.

SHOP DRAWINGS

Drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.

Shall be original drawings, prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate some portion of the work and show fabrication, layout, setting or erection details. Duplication of contract Documents for any submittal shall not be acceptable.

PRODUCT DATA

Preparation:

1. Clearly mark each copy to identify pertinent products or models.
2. Show performance characteristics and capacities.
3. Show dimensions and clearances required.
4. Show wiring or piping diagrams and controls.
5. Note deviations from Contract Documents.

Manufacturer's standard schematic drawings and diagrams:

1. Modify drawings and diagrams to delete information which is not applicable to the work.
2. Supplement standard information to provide information specifically applicable to the work.
3. Note deviations from Contract Documents.

CONTRACTOR RESPONSIBILITIES

Review Shop Drawings, Product Data and Samples prior to submission. Check and stamp submittal with his approval.

Determine and verify:

1. Field measurements.

2. Field construction criteria.

3. Catalog numbers and similar data.

4. Conformance with specifications.

5. Note deviations from Contract Documents.

Coordinate each submittal with requirements of the work and of the Contract Documents.

Notify the Engineer in writing, at time of submission, of his review and approval of submittal and of any deviations in the submittals from requirements of the Contract Documents.

1. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Engineers review of submittals, unless specific deviations are called to the attention of the Engineer in writing and the Engineer gives written acceptance of specific deviations.

2. Contractor's responsibility for errors and omissions in submittals is not relieved by Engineer's review of submittals.

Begin no fabrication or work which requires submittals until return of submittals with Engineer review.

Submittals not reviewed and approved by the Contractor will be rejected.

SUBMISSION REQUIREMENTS

Make submittals promptly in accordance with accepted schedule, and in such sequence as to cause no delay in the work or in the work of any other Contractor.

Number of submittals required:

1. Shop Drawings: Submit sufficient quantity of copies of shop drawing for the Contractor’s use and four (4) copies to be retained by the Engineer.

2. Product Data: Submit sufficient quantity of Product Data for the Contractor’s use and four (4) copies to be retained by the Engineer.

3. Samples: Submit the number stated in each specification section. Provide two (2) samples if not indicated.

Submittals shall contain:

1. The date of submission and the dates of any previous submissions.

2. The project title and number.

3. Contract identification.

4. The names of Contractor, Supplier and Manufacturer.

5. Identification of the product, with the specification section number.

6. Field dimensions, clearly identified as such.

7. Relation to adjacent or critical features of the work or materials.

8. Identification of revisions on re-submittals.

9. Applicable Standards (such as ASTM or Federal Specification numbers).

10. A 5 inch x 3 inch blank space for contractor and Engineer or provide review status cover page.

11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

RE-SUBMISSION REQUIREMENTS

Make any corrections or changes in the submittals required by the Engineer and resubmit until accepted.

Shop drawings and product data:

1. Revise initial drawings of data, and resubmit as specified for the initial submittal.

2. Cloud any change which has been made.

3. Indicate shop drawing is being resubmitted, use Engineer's shop drawing identification number if provided.

Samples: Submit new samples if requested by Engineer.

DISTRIBUTION

Distribute reproductions of Shop Drawings and copies of Product Data which carry the Engineer stamp of acceptance to:

1. Job site file.

2. Subcontractors.

3. Supplier or Fabricator.

4. Project close-out documents.

ENGINEER DUTIES

Review submittals; allowing Engineer a period of 14 calendar days for review and return of Shop drawings.

Affix stamp and initials or signature and indicate requirements for re-submittal or approval of submittal.

Return submittals to Contractor for distribution of for re-submission.

Forward copy of submittal for Owner's use and information. This shall not relieve contractor's requirements in other sections to provide the Owner with a complete record copy at job close-out.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Shop Drawing Submittals shall be reviewed in accord with the following:

Review by Engineer of Record of submittals is for general conformance with the design concept as presented by the Contract Documents. No detailed check of quantities or dimensions will be made.

The General Contractor/Construction Manager is responsible for assuring that all submittals comply with the latest project plans, specifications, governing codes and regulations and is solely responsible for confirming all quantities, dimensions, fabrication techniques and coordinating work with all trades.

Shop drawings are to be submitted in a timely manner allowing adequate time for processing.

Submit shop drawings for specific components, such as columns, footings, etc., in their entirety. Shop drawings for similar floors shall be submitted in the same package.

All submittals are to be accompanied by a letter of transmittal. Do not combine different submittals on the same transmittal.

All shop drawings must bear evidence of the Contractor's approval prior to submitting to the Engineer of Record.

All changes and additions made on re-submittals must be clearly flagged and noted. The purpose of the re-submittals must be clearly noted on the letter of transmittal. Engineer of Record review is limited to those items causing the resubmission.

Shop drawings not meeting the above criteria or submitted after fabrication will not be reviewed.

The Contract Documents are not to be reproduced for use as shop drawings.

END OF SECTION

SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

REQUIREMENTS

Closeout is hereby defined to include general requirement near end of Contract Time in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner and similar actions evidencing completion of the Work. Time of closeout is directly related to "Substantial Completion" and therefore may be either a single time period for entire work or a series of time periods for individual parts of the work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section.

PREREQUISITES TO SUBSTANTIAL COMPLETION

Prior to requesting Engineer's inspection for certification of substantial completion for either entire Work or portions thereof, complete the following and list known exceptions in request:

1. In progress payment request, show either 100% completion for portion of work claimed as "substantially complete" or list incomplete items, value of incompletion and reasons for being incomplete.

2. Include supporting documentation for completion as indicated in these Contract Documents.

3. Submit statement showing accounting of changes to the Contract sum.

4. Advise Owner of pending insurance change-over requirements.

5. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.

6. Obtain and submit releases enabling Owner's full and unrestricted use of the Work and access to services and utilities, including (where required) occupancy permits, operating certificates and similar releases.

7. Deliver tools, spare parts, extra stocks of materials, portable items and similar physical items to Owner.

8. Complete start-up testing of systems and instructions of Owner's operating/maintenance personnel. Discontinue (or change over) and remove from project site temporary facilities and services, along with construction tools and facilities, mock-ups and similar elements.

Upon receipt of Contractor's request, Engineer will either proceed with inspection or advise contractor of prerequisites not fulfilled. Following initial inspection, Engineer will either prepare certificate of substantial completion or advise contractor of work which must be performed prior to issuance of certificate; and repeat inspection when requested and assured that work has been substantially completed. Results of completed inspection will form initial "punch-list" for final acceptance.

PREREQUISITES TO FINAL ACCEPTANCE

Prior to requesting Engineer's final inspection for certification of final acceptance and final payment as required by General Conditions, complete the following and list known exceptions (if any) in request:

1. Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

2. Submit updated final statement accounting for additional (final) changes to Contract Sum.

3. Submit copy of Engineer's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by Engineer.

4. Submit final meter readings for utilities, measured record of stored fuel and similar data as of time of substantial completion or when Owner took possession of and responsibility for corresponding elements of the work.

5. Submit original Consent of Surety.

6. Submit final liquidated damages settlement statement, acceptable to Owner.

7. Submit record drawings, maintenance manuals, final project photographs, damage or settlement survey, property survey and similar final record information.

8. Complete final cleaning up requirements, including touch-up of marred surfaces.

9. Touch-up and otherwise repair and restore marred exposed finishes.

10. Revise and submit evidence of final, continuing insurance coverage complying with insurance requirements.

11. Electrical:

    a. System tests, full functional.

    b. Project certification

Upon receipt of Contractor's notice that work has been completed including punch-list items resulting from earlier inspections, and excepting incomplete items delayed because of acceptable circumstances, Engineer will re-inspect work. Upon completion of re-inspection, Engineer will either prepare certificate of final acceptance or advise Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.

If re-inspections of above referenced items are required by the Engineer due to the failure of any of the Work t comply with the claims made by the Contractor as to the status of their completeness, the Owner will deduct the costs incurred by such re-inspections from the Contract amount.

RECORD DOCUMENT SUBMITTAL

Specific requirements for record documents are indicated in individual sections of these specifications. Other requirements are indicated in General Conditions. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for Engineer's reference during normal working hours.

At time of final acceptance, submit complete sets of all required record documents to the Engineer for Owner's records.

RECORD DRAWINGS

Maintain a white-print set of contract drawings and shop drawings in clean, undamaged condition with mark-up of actual installations which vary substantially from the work as originally shown. Mark whichever drawings are most capable of showing "field" condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at corresponding location on working drawings. Mark-up new information which is recognized to be of importance to Owner but was for some reason not shown on either contract drawings or shop drawings. Give particular attention to concealed work which would be difficult to measure and record at a later date. Note related change order numbers where applicable.

Upon completion of the Work, this data shall be recorded to scale, by a competent draftsman. A new copy of the contract drawings will be furnished to the Contractor by the Engineer, but cost shall be borne by the Contractor. Where changes are to be recorded, the prints shall be erased in such a way as to properly represent the work as installed. Where the work was installed exactly as shown on the Contract drawings, the prints shall not be disturbed. In showing the changes, the same legend shall be used to identify piping, etc., as was used on the Contract Drawings.

The Contractor shall review the completed record drawings and ascertain that all data furnished on the record drawings are accurate and truly represent the Work as actually installed. Information for reference data can be obtained from the office of the Engineer. Upon completion, the subcontractor involved shall date and sign the drawings, signifying compliance with the requirements set forth herein prior to submission of the sepias and prints required.

The Contractor shall sign all pages to certify completeness of the Record Set of Drawings. Contractor shall submit the drawings and two sets of photocopies to the Engineer for the Owner.

Record Specifications:

Maintain one copy of specifications including addenda, change orders and similar modifications issued in printed form during construction and mark-up variations (of substance) in actual Work in comparison with text of specifications and modifications as issued. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data where applicable.

Record Shop Drawings and Product Data:

Maintain one copy of each product data submittal and mark-up significant variations in actual work in comparison with submitted information. Include both variations from manufacturer's instructions and recommendations for installation. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark-up or record drawings and specifications.

Record Sample Submittal:

Immediately prior to date(s) of substantial completion, Engineer (and including Owner's personnel where desired) will meet with Contractor at site and will determine which (if any) of submitted samples maintained by Contractor during progress of the work are to be transmitted to Owner for record purposes. Comply with Engineer's instructions for packaging, identification marking and delivery to Owner's sample storage space.

Miscellaneous Record Submittals:

Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to date(s) of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference.

FINAL CLEANING

Special cleaning for specific units of work is specified in sections of Divisions 2 through 16. General cleaning during progress or work shall be performed daily. Provide final cleaning of the work at time indicated, consisting of cleaning each surface or unit of Work to normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturer's instructions for cleaning operations. The following are examples of cleaning levels required:

1. Remove non-permanent protection and labels which are not required as permanent labels.

2. Clean transparent materials including mirrors and window or glass to a polished condition removing substances which are noticeable as vision-obscuring materials. Replace broken glass and damaged transparent materials.

3. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.

4. Wipe surfaces of mechanical and electrical equipment clean; remove excess lubrication and other substance.

5. Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes and similar spaces.

6. Clean concrete floors in non-occupied spaces broom clean.

7. Vacuum and steam clean carpeted surfaces and similar soft surfaces.

8. Clean light fixtures and lamps so as to function with full efficiency.

9. Clean project site (yard and grounds) of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petro-chemical spills and other foreign deposits. Rake grounds which are neither planted nor paved, to a smooth, even-textured surface.

10. Vacuum clean all cabinetwork, equipment, etc.

Removal of Protection:

Remove temporary protection devices and facilities which were installed during course of the Work to protect previously completed Work during remainder of construction period.

Compliances:

Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at site or bury debris or excess materials on Owner's property or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from site and dispose of in a lawful manner.

Where extra materials of value remaining after completion of associated work have become Owner's property, dispose of these to Owner's best advantage as directed.

CLOSEOUT DOCUMENTS CHECKLIST

All items listed below, with the exception of Item No. 1 and Item No. 2 shall be bound in individual heavy duty 3-ring vinyl covered binders. Mark appropriate identification on front and spine of each binder.

All items shall be submitted in triplicate within fifteen day of Substantial Completion for the project.

1. Application and Certification for Payment (Final). Four copies with original signatures and seals.

2. Final schedule of contract values.

3. Contractor's Affidavit of Payment of Debts (AIA G706).

4. Contractor's Affidavit of Release of Liens from all Contractors, Subcontractors, and Suppliers (AIA G706A).

5. Power of Attorney from Surety to make Final Payment.

6. Consent of Surety to Final Payment (AIA G707).

7. Contractor's Guarantee and Warranties as specified.

8. Provide a list summarizing the various guarantees and warranties and stating the following with respect to each:

    a. Character of work affected.
    b. Name, address and telephone number of each Subcontractor.
    c. Name, address and telephone number of each local firm designated to provide warranty service for an out-of-town firm. Copy of agreement between the firms.
    d. Period of guarantee and effective date.
    e. Statement of guarantee in the following form.

    "If within any guarantee period, repairs or changes are required in conjunction with the guarantee work, which in the opinion of the Engineer is rendered necessary as the result of the use of materials, equipment or workmanship, which are defective or inferior, or not in accordance with the terms of the Contract, the Contractor shall, upon written notice from the Owner, and without expense to the Owner, proceed within twenty four (24) house to place in satisfactory condition in every particular all of such guaranteed work, correct all defects therein; and make good all damages to the structure or site or equipment or contents thereof disturbed in fulfilling any such guarantee work.

11. Operation and Maintenance Manuals.

12. Affidavit of all Subcontractor payrolls, bills for materials/equipment and other indebtedness paid and satisfied.

13. As-built drawings. Provide in accordance with other specification sections.

14. Punch lists signed off by Owner's Representatives.

END OF SECTION

SECTION 16010 ELECTRICAL - GENERAL PROVISIONS

PART 1 - GENERAL

APPLICATION

The work described hereunder shall be installed subject to the Contractual Conditions for the entire Specifications.

These provisions apply to all sections of Division 16 of this project except as specified otherwise in each individual section.

CORRELATION

This Section of the Specifications and its accompanying Drawings are made separate for the convenience of the General Contractor / Construction Manager in preparing his bid and in no way relieves the General Contractor / Construction Manager of his responsibility to correlate the work under this Section with that of all other trades as regards the items to be furnished by various Subcontractors, the exact location of all equipment and materials and the necessity of planning the work of all trades to avoid interference.

DESCRIPTION OF WORK

Furnish all labor, materials, equipment and incidentals required to complete all electrical work as specified in this Division and as shown on the Contract Drawings. Division 16 work shall include the installation of a complete and properly operating electrical system. This system required consists basically of, and is not limited to, the following:

Extend the distribution system for lighting and power including the necessary feeders, branch circuits, installation of and connection to lighting fixtures, devices, panelboards, transformers, switches, and all other equipment shown or specified, and the connection to motors, and other power loads furnished under separate divisions.

Extend the building ground system and provide special grounds as indicated.

Connect all control devices as indicated, including all line voltage connections to equipment provided under other sections of the Specification or by other trades.

Furnish and install all necessary access panels for work performed under this section.

Provide the temporary and portable equipment described including power distribution points, cables, cable management, etc.

Refer to other Divisions of this specification for electrical requirements of factory installed motors, controllers, power supplies, etc. Electrical connections to equipment furnished as specified in other sections of these Specifications or shown on other than the Electrical Drawings shall be governed by this Division of the Specifications.

The bidder shall inspect the present jobsite conditions before preparing his bid. The submission of a bid will be considered evidence that such a visit and inspection was performed by the bidder and that he takes full responsibility for all factors governing his work.

The electrical work shall be complete, fully operational, and suitable in every way for the service required. Drawings are generally diagrammatic in nature and do not show all details, devices and incidental materials necessary to accomplish their intent. Therefore, it shall be understood that such devices and incidental materials required shall be furnished at no cost to the Owner.

RELATED WORK

Drawings and general provisions of Contract, including General Conditions, Supplementary General Conditions, and Special Conditions sections apply to work specified in Division 16.

The Contractor shall be aware that other divisions of these Specifications may apply to related work required to perform Division 16 requirements. All related work shall be performed in accordance with those divisions.

CONFORMANCE

If the Contractor takes no exceptions to these Specifications in the Submitted Bid, the Contractor will be held totally responsible for failure to comply.

Any exception to the Specification shall reference the affected paragraph(s), subject(s), and list benefit to the Owner.

The Owner reserves the right to have the Contractor replace installed material or equipment which does not comply with these Specifications at the Contractor's expense.

SUBMITTALS

Obtain approval before procurement, fabrication, or delivery of items to the job site. Submit manufacturers' data on the equipment listed below and as directed in other Sections of Division 16. Data shall be in the form of manufacturer's descriptive data sheets and engineering drawings and will be reviewed by the Engineer before materials and equipment are delivered to the work site. Review of the submittal by the Engineer is to check for general conformance to the design intent and will not relieve the Contractor of the responsibility for the correctness of all dimensions, conformance and the proper fitting of all parts of the work.

Automatic transfer switch
Circuit Breakers
Disconnect Switches
Plugs Receptacles and Devices

Submit manufacturers' names and catalog numbers for the following materials:

Conduit, Fittings, and Couplings
Boxes and Fittings
600 Volt Wire and Cables
Grounding Equipment

The Contractor shall thoroughly check the submittal for accuracy and compliance with the contract requirements. Shop drawings and data sheets shall bear the date checked and shall be accompanied by the Contractor's statement that they have been checked for conformity to the Specifications and Drawings. Submittals not so checked and noted will be returned without review.

Deliver the entire electrical submittal to the Engineer complete and in one package. An incomplete submittal will be returned to the Contractor without review.

EQUIPMENT SUBSTITUTIONS

Substitutions that do not increase installation value will not be accepted.

Contractor proposed substitutions may result in necessary changes to the construction documents. Coordination effort due to Contractor proposed substitutions shall be the complete responsibility of the Contractor. All potential conflicts are to be addressed. The Contractor shall also be responsible for any work of any other trades made necessary by the substitution. All potential conflicts with other trades are to be addressed.

The Engineer's review of the proposed substitutions and coordination documents is for the benefit of the Owner and not the Contractor and does not relieve the Contractor of responsibility for making any corrections necessary to insure the Owner receives full benefit of the original design intent.

Detailed coordination documents shall be provided for any equipment that, in the opinion of the Engineer, materially differs from the design documents. This difference includes but is not limited to any equipment having:

- access requirements that differ from the design / specification
- operating characteristics that differ from the design / specification
- footprints or elevations that differ from the design / specification
- connection requirements or locations that differ from the design / specification
- venting or combustion air requirements that differ from the design / specification
- electrical characteristics that differ from the design / specification
- control requirements that differ from the design / specification
- hydronic characteristics that differ from the design / specification
- plumbing requirements that differ from the design / specification

Documentation shall include a detailed listing of all differences from the design / specification. Also included will be a detailed explanation as to why these differences should be considered equal or an improvement.

Any physical differences shall be coordinated with drawings. All Coordination Drawings shall be produced by a competent drafts person and shall be equivalent in quality, detail, and scope to the Construction Drawings.

Acceptance of the substitution as an equal will be the sole descretion of the Engineer. Items of necessary coordination or review omitted from the documentation shall be grounds for rejection of the substitution.

CODES, INSPECTION AND FEES

Comply with the indicated edition of the following codes and ordinances. Where specific edition is not indicated, comply with the latest published edition.

NFPA 70 - 2008; The National Electrical Code
NFPA 72 – 2006;The National Fire Alarm Code
NFPA 90A – 2002; Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 101 – 2006; The Life Safety Code
NFPA 110 -2002; Standard for Emergency and Standby Power Systems
NFPA 111 – 2001; Standard on Stored Electrical Energy Emergency and Standby Power Systems
UL Standard 467; Electrical Grounding and Bonding Equipment
UL Standard 506; Enclosures
UL Standard 869; Electrical Service Equipment
ANSI C2 – 1994 - The National Electrical Safety Code

ANSI/NEMA MG 1 - Motors and Generators
ANSI/NEMA MG 2 - "Safety and Use of Electrical Motors and Generators"
IEEE Standard 446 - "IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications".
NEMA ICS 1 and 2, and IEEE 472
FBC 2007; The Florida Building Code (with 2009 Supplement)
FBC 2007; The Florida Fire Prevention Code
FBC 2007; The Florida Mechanical Code
FBC 2007; The Florida Plumbing Code
State and Municipal Codes and Requirements

Obtain all permits required. Contractor shall pay all fees for permits and inspections.

COMPLIANCE AND REVIEW

Within two weeks of the awarding of the contract, and before any work is commenced, the Contractor shall meet with all legal authorities having jurisdiction, review all materials and details of this project, and agree on any required revisions. A letter shall be forwarded to the Engineer listing the names, dates and place of such review and the revisions required. A copy of the letter shall also be sent to the reviewing authority.

TEMPORARY LIGHTING AND POWER

Provide temporary lighting and power during construction. The Contractor may utilize existing building distribution power for temporary and construction power. Temporary power shall be 120/240 volt, single phase.

Temporary wiring shall be done in a safe and neat manner. See Article 527 of the NEC.

RECORD DOCUMENTS

Prepare record documents. Record documents shall be complete and accurate and clearly show deviations to the Contract Drawings. Additionally, indicate major raceway sizes and routings, locations of all control devices, all equipment and locations to scale, and fuse and circuit breaker ratings and arrangements.

Prepare bound sets of equipment Operation and Maintenance Instructions. These instructions shall include the name and location of the system, the name and telephone number of the Contractor, and all subcontractors installing the system or equipment, and the name and telephone number of each local manufacturer's representative for the system or equipment.

Furnish bound copies of all test results required in other sections of this division.

GUARANTEES

Equipment (excluding lamps): one (1) year from final acceptance by the Owner. Materials and labor: one (1) year from final acceptance by the Owner.

All equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced and the unit(s) restored to service at no expense to the Owner.

In addition to the guarantee of equipment by the manufacturer the Contractor shall also guarantee such equipment for a period of one (1) year from final acceptance by the Owner. The Contractor's one (1) year guarantee shall be for equipment, materials, and labor.

The manufacturer's warranty period shall run concurrently with the Contractor's warranty period. No exception to this provision will be allowed.

Additional guarantee requirements specific to certain parts or assemblies or installations may be in the General and Special Conditions, or other Sections of these Specifications.

PART 2 - PRODUCTS

EQUIPMENT AND MATERIALS

Furnish materials or equipment specified by manufacturers named.

Materials furnished shall be new, undamaged and packed in the original manufacturer's packing.

All equipment and apparatus shall bear the seal of approval of the Underwriter's Laboratory where testing and listing performance criteria has been established for like items.

Protect equipment and materials from mechanical and water damage during construction. Suitable storage facilities shall be provided. Equipment shall not be stored out-of-doors.

All items to be installed shall be free of rust and dirt. Damaged materials and equipment shall be replaced by the Contractor at no cost to the Owner.

All electrical panels, enclosures, raceways, conduit, and boxes shall be fabricated of metal unless indicated otherwise.

EQUIPMENT AND MATERIALS STANDARDS

Design and fabrication of electrical equipment and materials:

The American National Standards Institute (ANSI)
The American Society of Mechanical Engineers (ASME)
The American Society for Testing and Materials (ASTM)
The Institute of Electrical and Electronic Engineers (IEEE)
The National Electrical Manufacturers Association (NEMA)
The Occupational Safety and Health Administration (OSHA)
The Underwriters Laboratories (UL)
The National Fire Protection Association (NFPA)

Comply with the latest edition and revisions of these codes and standards.

EQUIPMENT RATINGS

Horsepower and wattages of equipment shown on the Drawings are estimated and comply with a certain basis of design. It is the Contractor's responsibility to coordinate with, and furnish proper connections to equipment substituted and accepted as equivalent to the basis of design.

Conduit, wire, disconnects, fuses, and circuit breakers shall be sized to suit the horsepower and wattage of equipment actually furnished. However, conduit, boxes, wire or disconnects shall not be sized smaller than shown on the Drawings.

PART 3 - EXECUTION

QUALITY ASSURANCE

Installer's Qualifications: At least five years of successful installation experience on projects with electrical work similar to that required for this project.

Manufacturer's Qualifications: Manufacturers regularly engaged in the manufacture of electrical components and equipment of the types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

Electrical work shall be performed by experienced persons skilled in the trade.

Work shall be supervised by a licensed journeyman or master electrician who shall be on the job site at all times while work is in progress.

Work shall be done neatly and in keeping with good practice and conventions of the trade. The electrical installation shall be of high quality, and of the performance level associated with top level commercial electrical installations as determined by the Engineer and the National Electrical Code.

IDENTIFICATION

Provide laminated plastic nameplates for each panelboard, automatic transfer switch, safety disconnect, equipment enclosure and all other major pieces of equipment installed or modified as part of this contract.

Furnish all starters, disconnect switches and control panels with engraved name plates identifying the equipment served. Attach nameplates to equipment, aligned with structural features of equipment, with two pressure pins or #4 stainless steel screws, nuts, and lockwashers.

Identification of flush mounted panelboards and other cabinets shall be on the inside of the cabinet only.

Panelboards shall have typewritten directories with all loads thoroughly described for each circuit. Update existing panelboards and their directories to reflect new work.

CLEANING AND PAINTING

Clean all equipment and boxes thoroughly inside and outside at the completion of installation. Do not leave dirt and debris inside panelboard and equipment cabinets, device and junction boxes, etc.

Paint all exposed conduit and wiremold installed on painted surfaces to match surrounding surface. Paint exposed threads on conduits and touch up all scratches in galvanized pipe and fittings with a high quality cold galvanizing compound.

TESTS

Contractor shall test all wiring for shorts and all equipment for proper grounding before energizing. Equipment shall be thoroughly checked and adjusted for proper operation. Check motors for proper rotation before energizing and adjust if necessary.

END OF SECTION

SECTION 16100 BASIC MATERIALS AND METHODS

PART 1 - GENERAL

SCOPE OF WORK

Furnish all labor, materials and equipment and incidentals required to construct and install the complete electrical systems as indicated on the Drawings and as specified in this Section.

STANDARD OF MATERIALS

All materials, equipment and apparatus covered by this specification shall be new, of current manufacture and shall bear the seal of approval of the Underwriters' Laboratories.

All equipment and materials shall have ratings established by a recognized independent agency or laboratory. The Contractor shall apply the items used on this project within the ratings and subject to any stipulations or exceptions established by the independent agency or laboratory.

All conduits and raceways, wire, devices, panelboards, switches, etc. of a given type shall be the product of one manufacturer.

SUBMITTALS

Manufacturer's data and shop drawings for all components, fixtures, assemblies and accessories indicated in this Division.

PART 2 - PRODUCTS

RIGID CONDUIT, TUBING AND FITTINGS

Rigid steel conduit: zinc coated, threaded type conforming to the requirements of Federal Specification WW-C-581, UL 6 and ANSI C80.1 standards. Zinc coating shall be applied to both inner and outer surfaces.

Intermediate metal conduit: hot-dipped galvanized, threaded type conforming to the requirements of Federal Specification WW-C-581, UL 1242 and ANSI C80.6 standards.

A fitted thread protector shall protect threaded ends from damage during shipment and handling.

Fittings for rigid steel and IMC conduit: zinc coated, threaded type, conforming to Federal Specification W-F-408.

Electrical Metallic Tubing (EMT): Federal Specification WW-C-563, UL 797 and ANSI C80.3 standards.

Fittings for electrical metallic tubing: Federal Specification W-F-408. Steel compression type, galvanized or cadmium plated, and suitable for location of installation. Conduit bushings shall be metallic with insulated throats. Insulating grounding type bushings shall be provided where required under "Grounding". EMT connectors shall be similar to T&B "Insuline" with completely insulated throats. Field applied insulated throats are not acceptable.

Rigid aluminum conduit: Federal Specification WW-C-540c, UL 6 and ANSI C80.5 standards.

Couplings, fittings, pipe straps and spacers used with aluminum conduit shall be fabricated of aluminum.

Acceptable Metal Conduit and Tubing Manufacturers:

EMT: Allied Tube & Conduit Co.
Republic Steel Corp.
Triangle PWC, Inc.

Fittings: Steel City
Thomas & Betts (T&B)
Raco Inc.

FLEXIBLE METAL CONDUIT, COUPLINGS AND FITTINGS

Flexible metal conduit for dry interior applications: Federal Specification WW-C-566 and UL 1, continuous, spiral wound galvanized steel type.

Fittings (connectors) for flexible metal conduit:: UL E 23018. Squeeze Type, malleable iron zinc plated.

Flexible metal conduit for damp or exterior applications: liquid tight, UL listed, spiral wound galvanized steel with PVC outer jacket.

Fittings for liquid tight conduit: Federal Specification W-F-406. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and gasket sealing rings and insulated throats.

Acceptable Metal Conduit and Fittings Manufacturers:

FMC: Alflex Corp.
American Flexible Conduit Co.
Anaconda Metal Hose, ANAMET Inc.

FMC Fittings: Steel City
Thomas & Betts (T&B)
Raco Inc.

Wall and Floor Seals: O-Z/Gedney Co.
Spring City Electrical Mfg. Co.
Chase Technology Corp.

CONDUIT MOUNTING EQUIPMENT

Hangers, rods, backplates, beam clamps etc. shall be hot-dipped galvanized iron or steel. They shall be as manufactured by the Appleton Electric Co., Thomas and Betts Co., Unistrut Corp., or approved equal.

JUNCTION BOXES

Sheet Steel Outlet Boxes: conform to UL 514A, “Metallic Outlet Boxes, Electrical”, UL 514B, “Fittings for Conduit and Outlet Boxes, Covers, and Box Supports”, and NEMA OS1, “Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports”.

Sheet Steel: Flat-rolled, code gauge galvanized steel.

Acceptable Manufacturers: Sheet-steel boxes shall be manufactured by RACO, Steel City or equal.

All junction boxes and pull boxes shall be sized per NEC requirements and be of the proper NEMA classification for the locations where they are installed. Where boxes occur above other than lift-out ceilings, access panels must be provided.

Wet location covers shall meet NEC wet location requirements (shall comply with NEC 2005 Article 406.8 (B)(1). Covers shall mount vertically or horizontally and be of gasketed heavy-duty polycarbonate construction with clear cover with lockable hasp for 1/8" shank lock

OUTLET BOXES

Switch, receptacle and wall or ceiling mounted junction boxes shall be the 4" X 2 1/8" square type. Tile, dry wall, or flat cover plates for one or two devices shall be furnished for each box as required.

LIGHTING FIXTURE BOXES

Lighting fixture boxes shall be the 4" X 1 1/2" octagonal type.

OUTDOOR BOXES

Cast Aluminum Boxes: exposed, exterior locations; copper free aluminum, threaded raceway entries, and features and accessories suitable for each location including mounting ears, threaded screw holes for devices, and closure plugs.

Boxes shall have a rear opening in addition to necessary top and bottom openings. Boxes shall be provided complete with a minimum of two closure plugs and self-threading ground screw. Boxes shall have a thermoset, baked enamel silver gray finish. Weatherproof cover plates for one or two devices shall be furnished for each box as required.

Covers shall be of heavy duty die-cast construction. Mounting screws shall be stainless steel. Covers shall have a thermoset, baked enamel silver gray finish and be equipped with a sealing gasket. Covers shall be equipped with a hasp-type locking tab.

Nonmetallic boxes shall be thermoplastic or polyester fiberglass types as manufactured by Carlon or Pass & Seymour.

LOCATION OF OUTLETS

The approximate locations of outlets, etc. are shown on the drawings. The exact locations shall be determined at the building.

CONDUIT BODIES

Conduit bodies shall be constructed of galvanized or cadmium plated malleable iron or copper-free aluminum. Galvanized steel or aluminum covers and gaskets shall be supplied.

LB's 3" and greater shall be mogul type with domed covers.

CONDUCTORS

Compliance: Provide wires, cables and connectors that comply with the following standards as applicable:

UL Standard 83	Thermoplastic Insulated Wires and Cables
UL Standard 486A	Wire Connectors and Soldering Lugs for Use with Copper Conductors

UL Standard 854	Service Entrance Cable
NEMA/ICEA WC-5	Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA/ICEA WC-8	Ethylene Propylene Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
IEEE Standard 82	Test procedures for Impulse Voltage Tests on Insulated Conductors

Wire and cable manufactured more than twelve months before delivery to the jobsite shall not be used.

All conductors shall be soft-drawn copper of not less than ninety-eight percent (98%) conductivity, with NEC Type THW, THHN, or THWN for No. 4 and smaller, and Type RHW, THW, or THWN for No. 2 and larger, 600 volt insulation.

Jackets: Factory applied nylon or PVC external jacketed wires and cables for installation in raceways and where indicated.

Color coding of all ungrounded service, feeder, and branch circuits conductors shall be required according to the following convention:

120/208 Volt, 3 phase: black, red, and blue
277/480 Volt, 3 phase: yellow, brown and orange

Ground wires shall be green and neutrals shall be white. Green and white shall be used for these purposes only.

Conductors No. 12 AWG through No. 10 AWG may be solid or stranded, and No. 8 AWG and larger shall be stranded. No conductors smaller than No. 12 AWG shall be used except as otherwise noted.

Control conductors shall be No. 14 AWG Type TW, stranded unless indicated otherwise.

Multi-conductor control cable shall be stranded copper, 600 volt polyvinyl chloride insulated and jacketed Type PNR.

Acceptable manufacturers: Anaconda Wire and Cable Co., General Electric Co., Okonite Co., Southwire Co., or Rome Cable Co.

CABLE AND WIRE SPLICES

General: the materials shall be compatible with the conductors, insulations and protective jackets of the respective cables and wires. Use connectors with ampacity and temperature ratings equal to or greater than those of the wires upon which used.

In locations where moisture might be present, the splice shall be watertight and submersible.

Connectors: UL 486A. Aluminum and aluminum alloy fittings will not be accepted. Connectors shall be plated with tin or tin alloy.

Conductor Sizes No. 6 AWG and Larger: Splices in conductors shall be made with indenter, crimp connectors and compression tools or with bolted clamp type connectors to insure a satisfactory mechanical and electrical joint.

WIRE AND CABLE MARKERS

Wire and cable markers shall be "Omni-Grip" as manufactured by W.H. Brady Co., or equal.

RECEPTACLES

Receptacles shall be furnished and installed where shown on the drawings and shall conform to the following requirements:

Grounding type duplex receptacle: rated 20 amperes, 125 volt, 2 wire, 3 pole with grounded shunt (yoke permanently grounded to third clip), NEMA Configuration No. 5-20R, and conforming to Federal Specification W-C-596F (submit proof of compliance).

All receptacles listed on the drawings shall be specification grade receptacles.

All exterior devices shall be designed for the application and shall be installed in a waterproof enclosure with proper cover.

Acceptable manufacturer: Eagle, GE, Hubbell, Leviton or Pass and Seymour.

SWITCHES

Flush, enclosed type, specification grade, rated at 20 amperes, 120/277 volts, alternating current only, quiet operation, and shall comply with Federal Specification W-S-896F (submit proof of compliance). Switch housing shall be color coded for current rating.

Acceptable manufacturer: Eagle, GE, Hubbell, Leviton or Pass and Seymour.

Motor switches with inherent thermal overload protection shall be Square D, Type F for flush or surface mounting as required by the location of the unit. Units shall be furnished with pilot lights as indicated.

DEVICE PLATES

All plates for switch, receptacles and telephone outlets located on finished walls shall be UL listed stainless steel with the number of gangs required for the application. All plates for outlets located on unfinished walls or on condulet type fittings shall be zinc coated sheet metal with rounded or beveled edges.

Weatherproof plates shall be of stainless steel, gasketed, sized with twin covers for duplex receptacles, and weatherproof switch for switch plates.

Device plates shall be factory engraved where indicated on the drawings. Letters shall be black filled.

RELAYS

Relays shall be electrically held and operated. Relays shall be mounted in a NEMA 1 enclosure. The contactors shall be capable of switching inductive and resistive loads.

CIRCUIT BREAKERS INSTALLED IN EXISTING PANELS

Circuit breakers installed in existing panels shall have an A.I.C. rating equal to that of the panel in which they are installed.

SAFETY DISCONNECT SWITCHES

Compliance: NFPA 70 National Electrical Code, UL 98, “Enclosed and Dead Front Switches”, NEMA Publication KS1, “Enclosed Switches”, and NEMA KS 250, “Enclosures for Electrical Equipment (1000 Volts Maximum)”.

Safety switches shall be provided for all motors and equipment indicated or required by the National Electrical Code.

Safety switches shall be Type "HD" (heavy duty) unless noted otherwise, fused or non-fusible as indicated with number of poles as shown or required. Safety switches for equipment may be non-fused only if equipment is UL tested with circuit breaker protection.

Fuses: general use, dual element time-delay, current limiting. Manufactured by Bussman, Littlefuse, Edison, or equivalent.

Safety switches for indoor general purpose application shall be NEMA 1 and for exterior application shall be NEMA 3R.

Acceptable manufacturer: provide safety switches manufactured by Cutler-Hammer, Square D, or Siemens.

Construction: Gray baked enamel finish. NEMA 3R enclosures shall be manufactured from galvanized steel.

Ratings: Fusible disconnects shall be 240 or 600 volt rated depending on the service voltage.

Fusible disconnects shall be furnished with Class R fuses of the indicated ampere rating (up to 600 amps) and be equipped with rejection clips.

Fusible disconnects shall be UL listed for 200,000 RMS symmetrical ampere short circuit current when equipped with Class R or Class L fuses.

Lugs shall be front removable and be UL listed for aluminum or copper conductors at 60 degrees C or 75 degrees C.

Disconnect switches shall be horsepower rated.

GROUNDING AND BONDING

Conductors: type THW, THHN/THWN, or RHW to match power supply wiring.

Bonding Jumper Braid: copper braided tape, constructed of 30 gage bare copper wires and properly sized for application.

Flexible Jumper Strap: flexible flat conductor, 48,250 circular mils, with copper bolt hole ends sized for 3/8” diameter bolts.

NAMEPLATES

Nameplates: 0.125 inch thick laminated plastic; white and black finish; rectangular shaped; minimum of 1.0 X 2.5 inches with 0.25 inch high block style engraved lettering

PART 3 - EXECUTION

RACEWAY INSTALLATION

All interior and above grade exterior wiring shall be installed in a metal conduit and all embedded in concrete or below grade wiring shall be in PVC conduit unless indicated otherwise on the drawings.

Exterior low voltage (less than 50 volts) wiring may be installed in liquid tight, non-metallic flexible conduit ("Sealtite") where installation is above grade and not subject to damage.

No conduit smaller than 1/2 inch electrical trade size shall be used, nor shall any have more than three 90 degree bends in any one run. Pull boxes shall be provided as required or directed.

No wire shall be pulled until the conduit system is complete in all details.

The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction.

Conduit support shall be spaced at intervals of 8 ft. or less, as required to obtain rigid construction.

Single conduits shall be supported by means of two-hole pipe clamps. Multiple runs of conduits shall be supported on trapeze type hangers with steel horizontal members and threaded hanger rods. The rods shall be not less than 3/8 inch diameter. The channel shall be not less than 1 1/2" nominal size.

Conduit hangers shall be attached to structural steel by means of beam or channel clamps.

All conduits on exposed work shall be run at right angles to and parallel with the surrounding walls and shall conform to the form of the ceiling. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduit shall be run straight and true.

Conduit terminating in sheet steel boxes shall have double locknuts and insulated bushings.

Flexible metal conduit shall be used for all motor terminations and other equipment where vibration is present. Flexible conduit length shall not exceed 1'-6" in length for this application.

Provide expansion coupling every 100 feet for long runs of conduit and at concrete expansion joints. Provide ground bonding jumpers around expansion couplings, used on metallic conduit, sized according to Table 250-122 of the NEC.

Transitions from below grade to above grade shall be with rigid galvanized steel long sweep nineties with a bituminous coating where in contact with earth or concrete. Area of transition shall not be subject to standing puddles of water.

Seal all wall penetrations to watertight condition. Finish as applicable to location.

Approval by the Engineer shall be required to install conduit in structural members.

In general, the conduit installation shall follow the layout shown on the plans. This layout is, however, diagrammatic only, and where changes are necessary due to structural conditions, other apparatus or other causes, such changes shall be made without additional cost to the Owner. It is recognized that branch circuit routing shown on the drawings may not always be the most economical or the most feasible method. Routing may be changed by the Contractor subject to the following provisions:

Conduits shown routed overhead may not be installed in or below slabs or in walls.

Not more than three circuits may be installed in any one conduit. Care must be taken to provide the appropriate number of neutrals where two or three circuits are on the same phase.

All conduit shall be concealed unless otherwise noted on the drawings.

Exposed conduit will be permitted only as shown on the drawings. Exposed conduit shall be run parallel with or at right angles to the building walls.

All empty conduits shall be provided with a plastic pull wire.

Conduit stub-ups at panels shall be secured in place by use of Unistrut and clamps.

Conduit and tubing shall be kept at least twelve (12) inches from parallel runs of flues, steam pipes or hot water lines.

Telephone and data raceways shall be 3/4” minimum.

Where exposed connections to motors and equipment from overhead conduits are made without benefit of a wall for conduit mounting, the connection shall consist of vertical conduit (minimum size 1") from Type "LL", "LR" or “TT” Unilet to floor flange. Connection to equipment shall be with flexible liquid-tight from Type FDT boxes located in the vertical conduit.

Flexible conduit in all areas subject to moisture shall be liquid-tight flexible conduit.

All electrical connections to vibration isolated equipment shall be made with flexible conduit.

Connections to indoor dry type transformers shall be made with weatherproof flexible conduit.

All conduit entering the building shall be suitably sealed to prevent the entrance of moisture.

All conduit passing through a structural expansion joint shall be provided with a UL approved expansion joint fitting and bonded as required by the National Electrical Code.

RACEWAY INSTALLATION - CONDITIONS

Conduit raceways shall be installed as indicated herein. Where more than one type of raceway is listed under one condition, the Contractor may exercise his option of the raceway used. Conditions of raceway installation are as follows:

Exposed Raceway Below 8'-0" from Finish Floor and in Areas Subject to Moisture: Rigid galvanized steel conduit.

Raceway Concealed Overhead, or in Walls: Rigid galvanized steel conduit, intermediate metallic conduit or electrical metallic tubing (EMT).

Raceway Concealed in Ground Outside Building: Schedule 40 PVC or rigid steel. Rigid steel conduits installed below slab-on-grade or in the earth shall have a factory-applied PVC coating, two coats of a coal-tar system, or shall be field-wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50-percent overlay.

Final Raceway Connection to Recessed Fixtures in Accessible Locations: Flexible steel conduit maximum of 6'-0" long.

Final Raceway Connection to Pumps, Motors, Transformers, Etc.: Liquid-tight flexible steel conduit maximum of 1'-6" long.

Raceway That Extend Through the Slab or Above Finish Grade: 90° elbows, nipples and couplings of rigid galvanized steel or IMC shall be used where any raceway extends through the slab or above finished grade. In general PVC conduit shall not be allowed above finished slab inside the building or within 1 1/2' of finished grade outside the building.

WIRING

All conductors shall be carefully handled to avoid kinks or damage to insulation.

All wires, cables and each conductor of multi-conductor cables shall be uniquely identified at each end by color or with wire and cable markers. Lighting and receptacle wiring shall be distinctly differentiated and junction boxes marked.

Lubrications shall be used, if required, to facilitate wire pulling. Lubricants shall be UL approved for use with the insulation specified.

Neutral wires shall be pigtailed to receptacles so that a receptacle can be removed for replacement without the neutral connection to other receptacles on the circuit being disconnected.

Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A.

When stranded wire is used for receptacle and lighting circuit, connections to the devices shall be made using vinyl insulated "Sta-Kon" connector terminals.

All 600 Volt wire insulation shall be tested with a "megger" after installation. Tests shall be made at not less than 500 Volts.

OUTLET BOXES

Outlet boxes for flush mounted lighting fixtures shall be accessible. If lighting fixture is in a non-accessible ceiling the box shall be accessible when the fixture is removed.

Set boxes plumb and such that their device mounting plane is within 1/8" of the finished wall.

Surface mounted boxes and wiremold boxes, both new or existing, shall be painted to match surrounding surfaces.

Above ceiling sub-system boxes shall be labeled and color coded. Junction box covers shall be color coded. The following conventions shall be used:

Fire alarm	RED
HVAC Controls	BLUE
Telephone	GREEN

The location of boxes on the electrical plans is approximate. Review drawings for specific location or if not shown center and align within architectural detail. The Engineer shall reserve the right to move boxes during rough in.

DEVICES

Unless indicated otherwise on the drawings all light switches shall be mounted with the centerline of the device 48" above the finished floor. Pits are the exception to this requirement.

Unless indicated otherwise on the drawings or in the specifications all receptacles shall be mounted with the centerline of the device 18" above the finished floor. Pits are the exception to this requirement.

Receptacles shall be installed with the grounding contact at the top. Where receptacles are required to be mounted horizontally they shall be installed with the neutral contact at the top.

Mount all devices so that the cover plate edges are in contact with the wall and are parallel to building features.

DISCONNECTS

Motor circuit disconnects shall be mounted within fifty feet and in sight of the load being served.

Disconnects shall be labeled in accordance with Section 16010.

Safety disconnects for fire alarm service shall be factory painted red, with engraved plastic nameplate identifying the circuit.

GROUNDING

Ground all non-current carrying metal parts of the electrical system to provide a low impedance path for ground fault current. Route ground connections and conductors to ground and protective devices in shortest and straightest paths as possible.

Insulated grounding bushings shall be required for all raceways, service entrance panels, distribution panels, all raceways one inch and larger and any raceway entering a concentric knock-out.

In general a ground wire shall be installed in every conduit. The conduit installation itself shall serve as an additional grounding means.

Where there are parallel feeders installed in more than one raceway, each raceway shall have a ground conductor.

Where conduits terminate without mechanical connection (i.e., locknuts and bushings) to panelboards, and for all terminations of conduit sizes one inch and larger; and for all sizes of metallic conduit (rigid or flexible) terminating in concentric knockouts, the following procedure shall be followed: Each conduit shall be provided with an insulated grounding bushing and each bushing connected with a bare copper conductor to the ground bus in the electrical equipment. The ground conductor shall be in accordance with Article 250 of the NEC.

Grounding conductors shall be attached to equipment with a bolt or sheet metal screw used for no other purpose. Use crimp-on spade lugs for stranded conductors.

IDENTIFICATION

Equipment identification shall be made using engraved laminated plastic plates (indented tape labels will not be permitted). Characters shall be white on a black background and 1/4" high minimum. Plates shall be secured to the panels by means of screws or metal pressure pins. Cement, by itself, will not be acceptable. All nameplates shall be mounted on the outside surface of the piece of equipment.

Individually enclosed safety switches, circuit breakers, and motor starters, pull boxes, control cabinets and other such items shall be identified indicating load, electrical characteristics, and source. For example, a disconnect switch for a 7-1/2 horsepower, 208 volt, 3 phase air handling unit, Number 8 feed from Panel "MDP", Circuit Number 2 shall be labeled as follows:

AHU-8
7-1/2 HP, 208V, 3Ø
Cir: MDP-2

Distribution panels, panelboards, and transformers shall be identified indicating panel designation from the drawings, electrical characteristics and source. For example, a 277/480 volt 3 phase panel "LPA" feed from "MDP" Circuit No. 3 shall be labeled as follows:

LP-A
277/480V, 3Ø
(Feeder: MDP-3)

All enclosures containing energized components shall be marked with mylar labels identifying hazards. Such warning messages as "WARNING-HAZARDOUS VOLTAGE", 480 VOLTS", "240 VOLTS", etc. are acceptable. Labels shall be EZ-Code by Thomas & Betts or similar product.

Junction Box Identification: Each junction box cover shall be labeled with a permanent "magic" marker or other means to identify the circuits within. For example, a junction box containing lighting circuits 21, 23, 25 from Panel L2A would be labeled "L2A-21,23,25". Telephone junction boxes shall be labeled "T". Fire alarm system junction boxes shall be labeled “FA”. Public address and other system junction boxes shall be labeled accordingly.

All raceways leaving the service entrance panel and distribution panels shall be clearly marked as to their circuit number. For example, a conduit containing conductors for Panel MDP, Circuit No. 5 would be marked MDP-5. Empty conduits shall be marked "empty".

FIREPROOFING

All conduit and boxes passing through or installed within fire walls and smoke walls shall be installed so as to maintain the integrity and rating of the wall through which it passes. Boxes shall be installed within 1/8" of wall surface. Conduits penetrating rated floors shall be installed to maintain the fire rating of the floor using UL approved sealing materials.

END OF SECTION

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SECTION 16262 - AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

DESCRIPTION OF WORK

Furnish and install Automatic Transfer Switch as specified here and shown on the Contract Drawings.

SUBMITTALS

Submit manufacturer's data in accordance with Section 16010. Include outline drawings, certified electrical ratings, general arrangement, and detail drawings.

PART 2 - PRODUCTS

AUTOMATIC TRANSFER SWITCH (ATS)

Conformance: UL 1008 - Standard for Automatic Transfer Switches; NFPA 70 - National Electrical Code; NFPA 110 - Standard for Emergency and Standby Power Systems; IEEE Standard 446 - Recommended Practice for Emergency and Standby Power Systems; IEEE Standard 241 - Recommended Practice for Electric Power Systems in Commercial Buildings; NEMA Standard ICS 2-447 - Automatic Transfer Switches.

Operation: electrical operation shall be accomplished by a non-fused momentarily energized solenoid direct operating (or electric motor operated mechanism or stored energy operator). The automatic transfer switch shall be mechanically held on both the emergency and the normal side. Power for transfer shall be taken from the source to which the Transfer Switch is transferring. The Transfer Switch shall be double-throw, mechanically and electrically interlocked. No hydraulic or pneumatic mechanisms shall be allowed.

Ratings: ATS shall be rated for all classes of loads when installed in an non-ventilated enclosure. ATS shall be the double-throw type and shall be electrically operated but mechanically held in both positions, with the operator momentarily receiving power from the source to which the load is to be transferred. ATS constructed with either automatic or non-automatic circuit breakers are unacceptable. ATS equipped with protective devices to interrupt fault currents are also unacceptable.

ATS shall be rated for continuous standby duty at the continuous current rating specified. Switches shall be adequately rated for the application indicated, and shall have the following characteristics:

1. Voltage: 480 volts AC.
2. Number of Phases: Three
3. Number of Wires: Four
4. Frequency: 60 Hz
5. Number of Switched Poles: Three
6. Continuous Current Rating: As indicated on drawings
7. Fault Current Rating: 42,000 amperes RMS Symmetrical

The Transfer Switch shall employ standard industrial relays that plug into suitable sockets on a single common printed-circuit board. All controls shall be accessible from the front of the control board. Al control wiring shall be permanently marked along the full length of the wire and shall be

neatly harnessed. All control circuitry shall be 120 VAC nominal. If line voltage is higher, suitable step-down transformers shall be permanently mounted to the base plate. Internal components shall be rated for continuous duty.

Accessories: provide the following accessories factory installed.

1. Engine start contact.
2. Non-adjustable, one second time delay to override momentary dips in normal power source.
3. Phase voltage relay supervision of three phases of the normal source. Relay shall dropout at 65 to 70 percent and pickup at 92 to 95 percent of nominal voltage to detect "brown-out" conditions.
4. Voltage/frequency lockout relay with 90 percent pick-up nominal, to prevent premature transfer.
5. System test switch, momentary type.
6. Engine starting control contacts, one normally closed and one normally open.
7. Auxiliary pilot contacts rated 10 amperes at 480 volts AC., one closed on normal and one closed on emergency.
8. Re-transfer time delay to normal power source: Adjustable from 2 to 25 minutes.
9. Adjustable time delay after retransfer of load to normal engine cool-down timer wherein the generator set runs unloaded after retransfer to line.
10. Plant exerciser to start and run the generator set with or without load (selectable) each 168 hours for a 30 minute interval. Automatic return of the ATS to the normal position if the generator set fails during the exercise period and power is available to initiate transfer.
11. Isolated (ungrounded) neutral bar.

Auxiliary Contacts: Two normally open and two normally closed auxiliary contacts shall operate when the transfer switch is connected to the normal power source, and two normally open and two normally closed contacts shall operate when the transfer switch is connected to the emergency power source.

Indicating Lights: the following indicator and status lights shall be provided.

1. A green indicating light shall supervise the normal power source and shall have a nameplate engraved NORMAL.
2. A red indicating light shall supervise the emergency power source and shall have a nameplate engraved EMERGENCY.
3. Pilot lights to indicate source to which the load is connected.

Service Conditions: ATS shall be suitable for performance under the following service conditions:

1. Altitude: 100 feet above mean sea level.
2. Relative Humidity: 90 percent maximum, continuous.
3. Temperature: From 10 degrees F. to 110 degrees F.
4. Seismic Zone: 0

ENCLOSURE

The switch and accessories shall be in a wall mounted and non- ventilated NEMA ICS 6, NEMA 3R, smooth sheet metal enclosure constructed in accordance with UL 1008. Metal shall be not less than US Standard Gauge No. 14. Doors shall have hinges, locking handle latch, and gaskets at jamb, sill, and head.

Enclosure shall be furnished with factory installed heater and adjustable, automatic thermostat.

Construction: The enclosure shall be constructed for convenient removal and replacement of contacts, coils, springs and control devices from the front without the removal of main power conductors or removal of major components.

Cleaning and Painting: Ferrous surfaces shall be cleaned and painted. Surfaces to be painted shall be free of all oil, grease, welding slag and spatter, mill scale, deleterious corrosion, dirt, and other foreign substances. Painting shall include at least one coat of rust- inhibiting primer and one coat of finish enamel. The rust-inhibiting primer shall be applied to a clean, dry surface as soon as practicable after cleaning. Painting shall be manufacturer's standard material and process, except the total dry film thickness shall be not less than 2.5 mils.

PART 3 - EXECUTION

INSTALLATION

Installation shall conform to the requirements of NFPA 70 and manufacturer's recommendations and shall be in accordance with other sections of Division 16 work including Section 16100 - Basic Materials and Methods.

FIELD TESTS AND INSPECTIONS

The Contractor shall furnish labor, equipment, and incidentals for, and shall perform all field tests. Work affected by deficiencies shall be completely re-tested at the Contractor's expense. Field testing shall be done in conjunction with the testing of the portable engine-generator and temporary power operational testing/training. Field tests shall include the following:

1. Start generator and demonstrate complete ATS operation. Restore normal power and demonstrate re-transfer. Contractor shall show by demonstration in service that the ATS is in good operating condition, and function not less than three times.

PROJECT CLOSEOUT

Cleaning: clean all surfaces of the transfer switch and vacuum clean interior of all debris, wire and insulation shards, etc.

Painting: touch up any minor scratches with paint supplied by the switch manufacturer for the purpose.

Identification: in accordance with Section 16100.

Manuals: provide three (3) bound sets of operating and maintenance manuals. Manuals shall include the installer’s name and telephone number, the supplier’s name and telephone number, maintenance instructions, and complete manufacturer’s data on the operation of the equipment.

END SECTION