SECTION 16010 – "BASIC ELECTRICAL REQUIREMENTS"

In addition to the requirements previously presented herein, each specification shall contain the following general information:

1.0 General:

A. Incorporate, by reference, Division 1 into Division 16.

B. Define the contractors and subcontractors covered by Division 16.

2.0 Laws, Ordinances, Regulations and Requirements:

A. State that all workmanship must conform to all pertinent laws, ordinances and regulations of all bodies having jurisdiction.

B. Identify all references.

C. State which standards apply: ASTM, NEC, NFPA, UL, NETA, etc by Title and Standards Number.

3.0 Tests:

A. Define the Contractor's responsibility for execution, notification, documentation of results, and witnessing.

B. Define, in detail, the factory and field tests required as part of the contract. As a minimum, factory acceptance tests shall be required for generators, transformers, UPS, switchgear, paralleling switchgears. Field acceptance testing shall be completed in accordance with International Electrical Testing Association Inc. (NETA) Acceptance Testing Specifications.

C. The Contractor shall be required to perform an infrared thermographic inspection of all current carrying equipment and connections per NETA Standards, six months after beneficial occupancy, and provide a report to the Owner. The inspector shall be Level III certified in infrared testing by the American Society of Nondestructive Testing (ASNT).

D. A commissioning plan shall be provided for electrical systems. See Section 15010, 3.A. for requirements.

4.0 Instructing Owner's Personnel:

A. Require the contractor and manufacturers' agent to fully instruct the representatives of the University in all details of operation of the equipment installed under his contract.

B. Each contractor shall be directed to provide three (3) copies of printed instructions in separate hardback, three-ring loose-leaf binders and an electronic copy in Adobe or other acceptable format. The instructions shall be prepared by section and contain detail operating and maintenance data including wiring and piping diagrams. Each section shall be labeled and include detailed parts list data and the name, address and phone number of the nearest supply source. The manuals must provide all the information required to run the building efficiently.

C. The manufacturer's spec. sheets, if generalized in any way, will be clearly marked to show exactly which item has been supplied, and the job designation for that item will be noted on manufacturer's specification sheet which includes all details for this unit.

D. If there are differences between pieces of equipment, then include a specification sheet for each, properly marked.

E. Include control diagrams, single-line diagrams, interconnection (point to point) wiring diagrams, sequence of operations, and service instructions.

F. Provide one section for preventive maintenance procedures (recommended materials and procedures, frequency, etc.).

G. Include Contractor's phone numbers and any other reference required to obtain warranty service.

5.0 Mechanical-Electrical Coordination:

A. Include an article which clearly defines the extent of responsibility between the mechanical and electrical contractors regarding equipment which involves the work of both trades.

B. Require coordination drawings among all trades.

6.0 Description of Work:

A. Include a description of the scope of work highlighting all major systems.

7.0 Shop Drawings:

A. Each shop drawing submitted shall be identified by the following:

1. Project Name
2. Specification Section
3. Drawing Numbers
4. Shop drawing data shall include but not be limited to:
   a. Manufacturer's catalog designation.
   b. Complete data and wiring diagrams.
   c. Dimensions, capacities, ratings, weights, materials, finishes, and storage conditions.
   d. Recommended installation procedures, performance, and conditions of performance, testing, and certifications if required.

5. Each submittal shall be required to bear the review stamp of each contractor associated with the processing of the document. The processing of shop drawings shall follow contractual relationships between the Prime Contractor and all Subcontractors.
6. Shop drawings which require coordination of two or more trades shall be required to bear the stamp of the coordinating trades.

8.0 Record Drawings

A. The specifications must define the requirements for the record drawings. At a minimum, these drawings must identify locations and size of all major raceway systems; locations of all devices; updated panel schedules, equipment locations; substitutions; depth of ductbanks, routing of duct banks. Also record on as-built drawings the dimensioned locations of other piping systems where they cross underground electrical duct banks. Provide digital pictures of duct bank crossings with other piping systems and at building entrances.

C: Require an electronic file of drawings in a version compatible with current University CADD software.

9.0 Sleeves:

A. The specificationsand drawings must define and detail the installation of grouting and waterproofing of sleeves and fireproofing, if necessary.

B. Each through penetration fire-rated sealant shall be located on as-built drawings and identified by UL directory file number.

10.0 Contract Drawings: The following applies to the preparation of drawings:

A. All Division 16 drawings will be labeled as follows: E-1, E-2, etc.

B. Separate sheets must be used for plans, details, schedules, single line diagrams, and risers.

C. Standard University details must be used where applicable.

11.0 Additional Design Considerations:

A. All primary (high voltage) main breakers installed on the campus will be monitored (amperes and breaker status) from the centrally located Operations Control Center.

B. Coordination of the design for the location of all floor and wall openings, lintels, equipment pads, etc. is the responsibility of the professional engaged to design the system which penetrates the floor, wall or roof.

C. The following is a list of prohibited installations:

1. Armored Cable. (Type AC)
   C: (MC cable with insulated internal ground wire is acceptable.)
2. Aluminum wires and cables.
3. Aluminum bus duct.
4. Aluminum windings in transformers and motors.
5. Plug-on twin breakers.
6. Aluminum bus in panelboards or switchboards.
7. Underslab/inslab conduits.
8. Direct burial of underground cable.

D. All equipment must be installed on raised concrete pads. Pads shall be a minimum of 4 inches high.

E. Work sequence required to accommodate Owner's occupancy requirements must be described.

F. Temporary work required to facilitate construction or Owner's occupancy requirements (i.e. maintenance of service) must be identified. Work and connections requiring interruption of services shall be identified and coordinated with Owner and performed only with prior written approval of Owner. Seven-(7) days prior notice of service interruption is required.

G. The A/E shall demonstrate that electrical equipment is able to fit in space allotted with required clearances. Also demonstrate that equipment removal paths from the building are defined.

12.0 Power System Study:

A. A power system coordination and short circuit study shall be performed. Provide a system fully coordinated. A complete short circuit protection and coordination study shall be prepared to denote actual items of equipment proposed to accomplish the required degree of coordination between protective devices from the external source feeding the building through all internal switchboards and panelboards. The study shall provide the time-current characteristic curves of protective devices set by the Utility Company, and medium voltage substations. Define exact limits that must be included in the study. Study shall also evaluate withstand ratings of passive equipment such as bus duct, automatic transfer switches, contactors, and safety switches.

B. The minimum interrupting rating of 15KV class switchgear shall be 500 MVA.

C. The professional shall design the system for power factor correction to 95 percent.. Capacitors should be placed locally at motors 20 HP and above, except for motors fed from VFDs. In addition, secondary automatic power factor correction capacitors shall be provided to further correct to 95 percent.

13.0 Power Capacity Analysis:

A. An electrical power capacity analysis shall be performed to confirm existing power system capacities to handle additional loads on renovation projects and building expansion projects. For projects with demand loads of 100 KVA or more, the capacity analysis shall include local panelboards, affected power risers or feeders and the service feeder or transformer. For new buildings, a service capacity study shall be performed in conjunction with the Office of the University Engineer. A load study of the existing capacity shall be preformed on all projects that intend to draw power from a campus sub.

END OF SECTION