

## SECTION 16010

### BASIC ELECTRICAL REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 DIVISION OF SPECIFICATIONS

- A. This Division of the Specifications is divided into the following Sections which, with their respective sub-sections, are for convenience only and not intended to establish limits of work:

Section 16010 - Basic Electrical Requirements

Section 16051 - Electrical Related Work

Section 16110 - Raceways

Section 16120 - Wires and Cables

Section 16135 - Electrical Boxes and Fittings

Section 16139 - Cable Trays for Communications/Data Wiring

Section 16142 - Electrical Connections for Equipment

Section 16143 - Wiring Devices

Section 16170 - Circuit and Motor Disconnects

Section 16190 - Supporting Devices

Section 16195 - Electrical Identification

Section 16420 - Service Entrance

Section 16452 - Grounding

Section 16460 - Transformers

Section 16470 - Panelboards

Section 16472 - Overcurrent Protective Devices

Section 16482 - Motor Starters

Section 16500 - Lighting

Section 16620 - Surge Suppression

Section 16621 - Standby Generator Systems

Section 16670 - Lightning Protection System

Section 16721 - Fire Alarm System Specification

Section 16740 - Telephone Raceway System

**1.2 DESCRIPTION:** This section is an extension of the General Requirements (Division 1 of these Specifications) and certain items of a common or administrative nature that pertain to all electrical work.

- A.** The work of this section consists of furnishing materials, equipment, constant competent supervision, special tools, test equipment, technicians, and labor necessary for the electrical and electrical special systems associated with and required for the construction of the new building indicated herein and on the Drawings. It is **presumed that in submitting a bid for this work, the bidder has reviewed the entire set of Construction Documents, and has a clear understanding of all required work involved. Any clarifications required by the bidder, including those related to codes and standards, to achieve such an understanding shall be requested in the form of a written RFI as Division 1 and other related specification sections.**
- B.** The work shall include but not necessarily be limited to the following:
1. Service entrances and mounting of metering equipment as required by the utility company (Entergy).
  2. Connections to electrical service from point of termination by Entergy.
  3. Power distribution systems - feeder and branch circuits, panels, wiring, transformers, devices, etc.
  4. Motor control equipment.
  5. Electrical work incidental to the requirements of the mechanical system.
  6. Wiring and connections to equipment furnished and installed under other Sections of these specifications (e.g. elevators, specialties, etc.).
  7. Raceways and fittings.
  8. Grounding.
  9. Lighting system -- fixtures, lamps, wiring, connections, etc.
  10. Lightning protection system **(based on a Performance Specification)**.
  11. Surge Suppression
  12. Fire alarm system, including telephone wiring to telephone backboard.
  13. Telephone System raceways.
  14. Data Raceway System.

15. All required sleeves, thimbles, anchors, hangers, bolts, miscellaneous structural steel, cutting, etc., for the complete installation of the electrical systems serving the building.
16. Temporary electrical service for construction and maintenance of occupied portions of the building(s).

### **1.3 RELATED DOCUMENTS**

- A. Drawings
- B. General provisions of Contract, including General and Supplementary Conditions.
- C. Division 01 & 15 - Specification Sections.

### **1.4 QUALITY ASSURANCE**

- A. The electrical installation shall conform to the requirements of the 1999 edition of the National Electrical Code (NEC).
- B. Electrical material shall be built and tested in accordance with the applicable standards of the National Electrical Manufacturers' Association (NEMA), the American National Standards Institute (ANSI) the American Society for Testing and Materials (ASTM), and the Institute of Electrical and Electronic Engineers (IEEE)
- C. Electrical materials shall be new and unused and shall be listed and labeled for the service intended by Underwriters' Laboratories, Inc., where such labeling service is available.
- D. Applicable sections of the following codes and standards shall also be followed:
  1. International Building Code, 2000 Edition.
  2. National Fire Protection Electrical Code (NEC), NFPA 70, 2002 Edition
  3. National Fire Protection Association Life Safety Code, NFPA-101, 2003 edition.
  4. Applicable state and local codes/ordinances.
  5. CBM - Certified Ballast Manufacturer
  6. IPCEA - Insulated Power Cable Engineers' Association
  7. FM - Factory Mutual
  8. ETL - Electrical Testing Laboratories
  9. IES - Illuminating Engineering Society
- E. Include all items of labor and materials required to comply with the above referenced codes and standards. Where quantities, sizes, or other requirements indicated on Drawings or herein specified are in excess of the requirements of the standards and codes, the Specifications or Drawings shall govern.

### **1.5 REGULATORY REQUIREMENTS**

- A. Permits: Obtain and pay for all necessary permits, inspections, connection charges, fees, insurance, bond, licenses, and comply with all governing laws, ordinances, rules and

regulations including those of the National Fire Protection Association and all municipal, state or other authority having jurisdiction over the work.

- B. Certificates of Inspection: Upon completion and before the date of substantial completion of each designated Phase, furnish a certificate of inspection issued by the proper authorities to the effect that the installation is in full conformity with all local and state requirements.

## **1.6 COORDINATION**

- A. Lay out the work and be responsible for its correctness. Take such measurements as may be necessary to assure approved fitting and proper installation of work, and all other work depending thereon.
- B. Arrange work in a neat, well organized manner with exposed conduit and similar services running parallel with primary lines of the building construction, and with a minimum of 8'-0" overhead clearance or as directed by the Architect.
- C. Perform all work in the best and most substantial manner by workmen skilled in the work to be done. Provide adequate supervision at all times.
- D. Coordinate the work to avoid complications between the installations of the various items of equipment. Advise other trades of openings required in their work for the subsequent move-in of large units of electrical equipment.
- E. Locate operating and control equipment properly to provide easy access, and arrange entire electrical work with adequate access for operation and maintenance.
- F. Where the method of installation is not certain, ask for details. Lack of details, not requested, will not be an excuse for improper installation, and any such work must be corrected.
- G. **Coordination Drawings:** For locations where several elements of electrical or combined mechanical and electrical work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings showing the actual physical dimensions (at accurate scale, minimum 1/4") required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.
- H. Contractor shall be responsible to insure that equipment selected - panelboards, etc., fit in spaces allocated, with provisions for maintenance and/or code required clearances. If specified equipment does not fit, notify Architect prior to equipment purchase/fabrication.

## **1.7 DRAWINGS AND SPECIFICATIONS**

- A. Contract Documents are intended to convey the scope of work and indicate general arrangements of equipment, fixtures and piping, and approximate sizes and locations of

- equipment and outlets. Follow these documents in laying out the work, check all Drawings to become familiar with all conditions affecting the work, and verify spaces in which the work will be installed.
- B. **The contract documents are diagrammatic in showing certain but not all, physical relationships which must be established within the electrical work. Its interface with other work including plumbing, fire protection and mechanical work is the exclusive responsibility of the Contractor.** The Drawings show approximate locations only of selected feeders, branch circuits, outlets, etc., except where specific routing or dimensions are indicated. The Architect reserves the right to make reasonable changes in locations indicated before roughing-in without additional cost to the Owner.
- C. Because of the small scale of the Drawings, it is not possible to indicate all of the offsets, fittings, and accessories required. Contractor shall investigate the structural and finish conditions affecting Division 16 work and shall arrange such work accordingly, furnishing fittings, bends, junction boxes, pull boxes, access panels, and accessories required to meet such conditions.
- D. These Specifications, together with the accompanying Drawings, contemplate apparatus fully erected, and in satisfactory operating condition with the Contractor furnishing and installing everything that may be necessary to complete the job.

## 1.8 SUBMITTALS

- A. Refer to Division 1 for Submittal Requirements. The following paragraphs are an extension of Division 1.
- B. Review of shop Drawings shall in no way modify the contract or relieve the Contractor from compliance with the contract.
- C. Names of manufacturers or catalog numbers are listed in the Specification in order to establish a standard for the type, general design and quality of the product required. Other products similar in design and of equivalent quality and complying with the Drawings and Specifications will be considered for acceptance **after award of the Contract**. See Division 1 Section "Product Substitutions".
- D. Any item not specified herein, but submitted as a substitute for the specified item, shall be submitted in accordance with Division 1 Section "Product Substitutions" and accompanied by manufacturer's documentation stating/illustrating the following applicable information in addition to the specific information requested in other sections:
1. Dimensions/weight.
  2. Electrical ratings-voltage, amperage, short circuit capability, etc.
  3. Construction - gauge of steel/aluminum, paint finish/application method, color, NEMA type, etc.
  4. Warranty.
  5. Local manufacturer's representative or nearest stocking distributor.

6. Length of time the product has been available to the public.
  7. Specific deviations.
- E. Shop Drawings:
1. Listed below are Shop Drawings required for transmittal.
    - a. Lighting Fixtures (complete with input wattage and photometry of actual fixture submitted. Submittals will be rejected without this information).
    - b. Lighting Controls, including finish colors and materials.
    - c. Lamps and ballasts. Include THD for fluorescent and HID fixtures.
    - d. Poles/standards. Include pole height, material, finish, weight and adequate information for review by structural engineer for foundation requirements.
    - e. Raceways
    - f. Transformers
    - g. Lightning Protection System (including layout, equipment and components and Master Label certification requirements)
    - h. Connectors
    - i. Safety Switches
    - j. Fuses
    - k. Circuit Breakers
    - l. Wiring Devices
    - m. Motor Controls
    - n. Panelboards
    - o. Switchgear
    - p. Conductors
    - q. Fire Alarm System and Components
    - r. Relays and Contactors
  2. Further descriptions or information required with shop Drawings shall be included with the description of materials specified herein as follows:
    - a. Grounding Products: Include a complete grounding system diagram with materials and ground conductor sizes.
    - b. Miscellaneous Electrical Controls and Control Wiring: Include control-wiring diagrams for all miscellaneous electrical controls.
    - c. Fire Alarm Components: Include shop Drawings showing fire alarm system riser, wiring diagrams and dimensioned Drawings of Fire Alarm Control Panel and mimic annunciator panel. **Include certification that this Division has fully coordinated all fire alarm system signal and control connections to work of the other Divisions, including but not limited to, air conditioning unit shutdown controls, automatic temperature controls, fire sprinkler system, and elevators.**
    - d. Housekeeping Pads: Include location and dimensions of housekeeping pads, including blockouts and anchor bolts.
    - e. Firestops: Include all firestop materials for the project, indicating intended use and UL fire rating where applicable.

- f. Detailed, dimensioned shop Drawings for the installation of the work in the electrical equipment rooms/areas shall be prepared and submitted for review. These Drawings shall be new Drawings prepared by the Contractor and shall not be reproductions or tracings of the Drawings. In preparing shop Drawings, establish lines and levels for the work specified and check the Drawings to avoid interference with structural features and the work of other trades. Immediately call to the attention of the Architect in writing any interferences for clarification.
  - 3. Corrections or comments made on shop Drawings during the review do not relieve the Contractor from compliance with requirements of the contract documents. Shop Drawings will be checked for general conformance with the design concept of the project and general compliance with information given in the contract documents. Review of the shop Drawings shall not relieve the Contractor from responsibility for confirming and correlating all quantities and dimensions, coordinating work with that of all other trades, and performing work in a safe and satisfactory manner. Review of shop Drawings shall not permit any deviation from Drawings and Specifications. Shop Drawings must be accompanied by signed statement from contractor, stating that he has reviewed the submittal and checked it for compliance.
  - 4. Contractor shall provide products as specified if submittals for review of materials are not received within thirty (30) days after award of the Contract.
- 1.9 PROTECTION OF APPARATUS:** At all times the Contractor shall take precautions necessary to protect his apparatus from damage. Failure on the part of the Contractor to comply with the above to the Architect's satisfaction shall be sufficient cause for the rejection of the particular piece of apparatus in question.
- 1.10 CUTTING AND PATCHING**
- A. Do all cutting, fitting, and all other work that may be required to make the several parts come together and fit. Cutting for equipment entry shall be under other Divisions. Do not endanger any work by cutting, digging, or otherwise, and do not cut or alter the work of any other Divisions, except with the consent of the Architect. Cutting shall be done under the supervision of the Project Superintendent. Patching, including patching of bonded roofing, shall be performed under Division 7.
  - B. Provide, properly located and sized, all required chases, shafts, openings, furred spaces, etc., required for the work or to conceal any of the work, in any part of the structure.
  - C. It is the responsibility of this Division to coordinate with other responsible Divisions for required cutting and patching.
  - D. Fireproofing:

1. Where conduit and/or cables penetrate fire-resistant/rated walls, partitions, ceilings, or floors, adequate fire seals using approved methods to maintain the fire-resistance rating shall be provided and installed.
2. Approved methods constitute providing a minimum of one-inch (1") depth of Scotch Putty 303 or Caulk CP25.3 surrounding metal conduit penetrations. Larger square or circular penetrations shall require construction of fire-rated barrier utilizing Scotch Series 7903/7904 barrier sheets.
3. Plastic sleeves/pipe shall not be used within the building when penetrating a fire-resistant-rated wall, ceiling, partition, or floor.

#### **1.11 INSERTS AND THIMBLES**

- A. Set in place as formwork progresses, all necessary inserts and thimbles as may be required. Cutting of beams or of concrete floors or walls will not be permitted. All thimbles set in concrete shall be of standard pipe, plain ends, and shall be of proper size to allow for freedom around piping passing through thimble.
- B. Thimbles set in the walls, partitions or in chases where structural requirements will allow, shall be of rigid galvanized steel conduit.
- C. Inserts shall be nailed to form work and shall be of size to allow for installation of hangers for the particular pipe served.

#### **1.12 RECORD DRAWINGS**

- A. Prepare Record Drawings in accordance with the requirements in Division 1 Section "Record Documents and Project Closeout."
- B. In addition to the requirements specified in Division 1, indicate the following installed conditions:
  1. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
  2. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
  3. Complete As-Built Drawings of Division 16 work shown and not shown on the contract drawings in the new and existing facilities.

#### **1.13 WARRANTY/GUARANTEE**

- A. Except where longer periods of warranty are specified, guarantee all labor and materials for a period of twelve (12) months from the date of substantial completion of the particular phase of the work. Repair all defective materials and work; replace with new materials and/or equipment, any material and/or equipment failing to give satisfactory service.



- B. During the period of guarantee, promptly correct any defects in equipment, materials or workmanship without cost to the Owner.
- C. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Any deficiencies in equipment specified shall be promptly corrected.
- D. Contractor's warranty shall include an inspection of the system one (1) week before the end of the one (1) year warranty period. Replace or repair any items found to be defective at this time.

#### **1.14 TESTS AND BALANCING**

- A. **Provide a neutral third party electrical testing company to perform a Short Circuit and Coordination Study of the electrical system as specified in Section 16425, 3.01A.**
- B. At such times as the Architect directs, conduct operating tests to demonstrate that the electrical systems are installed and will operate properly and in accordance with the requirements of this Specification. Tests shall be performed in the presence of the Architect's representative. Furnish instruments and personnel required for such tests.
- C. Perform tests to show Architects that the power and lighting loads are equally divided among phases of feeders serving each piece of equipment and each panelboard, and record the results of such tests and turn over to the Architect.
- D. Any work and materials tested and found varying from the requirements of the Drawings and Specifications shall be replaced without additional cost to the Owner.
- E. Perform test in the presence of the Architect as specified in Section 16721.
- F. This section does not relieve the Contractor from testing equipment installed under this Division but not listed in this section. Contractor is required to test all equipment, feeders, etc., installed under this Division.

#### **1.15 PROJECT CLOSEOUT**

- A. See Division 1 Sections. The following paragraphs are in addition to Division 1 Section requirements.
- B. Coordination Study: Provide two (2) bound copies of the electrical short circuit and coordination study per 1.14A above and 16425, 3.01A.
- C. Circuit Breaker Testing: See 16425, 3.01A for Circuit Breaker testing requirements. Provide two (2) bound copies of the testing report.
- D. Equipment Manuals:

1. **Before the date of substantial completion**, Contractor shall furnish to the Architect three (3) bound sets of descriptive, dimensional and parts data on all major items of electrical equipment and material including those items listed above under "Shop Drawings".
2. **Each set of this literature shall be bound in a permanent type hard cover ring binder and shall be suitably indexed.**
3. **This submittal shall be accompanied by final Electrical Inspection Certificate** from the authority having jurisdiction and Statement of Inspection from State Fire Marshal's Office.

E. Spare Parts:

1. Provide all spare parts required in attached specifications sections along with a complete list of same (e.g. 16721, 2.04E).

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Refer to DIVISION 1 sections for general requirements on products, materials and equipment. The provisions outlined below expand or modify the requirements as applicable to electrical work. Refer to other DIVISION 16 sections for additional requirements.
- B. Materials and equipment shall conform in all respects to the requirements set forth in these Specifications and the accompanying Drawings.
- C. Provide products which are compatible with other products of the electrical work, and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with the Architect. Determine in advance of purchase that equipment and materials proposed for installation will fit into the confines indicated, leaving adequate clearance as required by applicable codes, and for adjustment, repair, or replacement.

- 2.2 MANUFACTURERS' NAMEPLATES:** Each major component of the equipment shall have the manufacturer's name, address, model number, and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. NEMA Code ratings or other data which are die-stamped into the surface of the equipment shall be stamped in an easily visible location.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Visit the building site before bidding to determine existing conditions and assume all responsibility and bear all expenses in allowing for these conditions in the bid.
- B. Comply with all federal, state and local safety laws, ordinances and regulations relating to the building and public health and safety.
- C. No work shall be concealed until approved by the local inspector and all local regulations are adhered to.
- D. Electrical Drawings are diagrammatic except where dimensioned. Do not scale. Follow manufacturer's certified shop Drawings for accuracy. Consult Architect in cases of doubt or conflict. Unless noted as fixed, dimensions are based on the product of one (1) manufacturer. Verify dimensions with certified shop Drawings of the materials actually approved and purchased.

### **3.2 TEMPORARY WIRING, LIGHTING AND POWER AT THE SITE:** Furnish and install provisions for temporary electrical service and construction light and power during the construction period conforming to the contract documents, all local code and State labor law requirements. Temporary light and power provisions to be included shall be as hereinafter specified and as required in Section 01500 - Temporary Facilities.

- A. Arrange for temporary service, including temporary service meter, with Entergy.
- B. Furnish, install, and maintain all temporary service equipment as required until permanent service is installed and "alive".
- C. Switchover temporary systems to the permanent service when latter is ready for same. At that time, remove all temporary service wiring, including temporary service meter.
- D. Furnish, install, maintain, and switch on and off on all regular work days a complete temporary light system, for the building while under construction.
- E. Furnish, install, and maintain temporary feeders to permanent mechanical equipment and existing distribution and power electrical panels requiring service before permanent feeders are ready for same.
- F. Provide any and/or all relocations of temporary electric facilities as necessary to clear the permanent installations of all trades.
- G. Provide temporary panels, wires, conduits, etc. as required, to keep in operation the different building areas during construction. No additional compensation shall be

- provided to the Contractor to provide electrical power to all existing lights, receptacles, devices, HVAC equipment, etc., to keep these said areas in operation during construction.
- H. Provide all required lighting for stairways to meet the requirements of all authorities having jurisdiction.
  - I. Refer to the Project Schedule for sequencing of the work. All electrical related services to and within the limits of work phasing areas not currently under construction shall be maintained in complete functional operation. All electrical related work in areas designated by the work-phasing plan to be under construction shall be made complete and functionally operable prior to proceeding with any other phase of the work.

### **3.3 WIRING FOR EQUIPMENT**

- A. Electrical service for all equipment furnished under this Specification and/or indicated on the Drawings shall be roughed-in and connected under this Section. It is the responsibility of the Contractor to obtain correct roughing-in dimensions and requirements for this equipment.
- B. Electrical work for Kitchen equipment - Food Service Equipment shall be as specified below.
- C. Electrical work for equipment specified in Division 15 - Mechanical shall be as specified.
- D. Raceways, outlets, backboards, cabinets, grounding connections, handholes, underground distribution system, and other roughing-in indicated shall be provided as work of this Division for telephone and data systems.

### **3.4 MECHANICAL EQUIPMENT**

- A. All power wiring associated with Division 15, Mechanical shall be done as work of Division 16, Electrical. All power disconnect switches and single speed manual starting switches shall be furnished and installed under Division 16. Multi-speed manual starters shall be furnished under Division 15 and installed under Division 16.
- B. Except as may be indicated on the Drawings and/or hereinafter noted, all control wiring, including all temperature control wiring, interlocking, start-stop wiring, together with conduit for same be furnished and installed under Division 15. This includes, but is not limited to, wiring to low voltage thermostats, damper motors, aquastats, firestats, pushbuttons, selector switches, and control panel(s). All disconnect switches for control wiring shall be furnished and installed under Division 15.
- C. Work of other Divisions will include furnishing and setting motors.
- D. All magnetic starters will be furnished under Division 15 and installed under Division 16. Overload elements in all starters shall be selected according to actual motor nameplate

full load current. Responsibility for this coordination shall lie with the Division under which the particular starter was furnished.

- E. Firestats for single phase exhaust fans with manual starting switches and wall mounted thermostats which interrupt line voltage power circuits to motors shall be furnished and set under Division 15, and electrically connected in the branch circuit wiring as work of Division 16.

### **3.5 FOOD SERVICE EQUIPMENT**

- A. Each piece of food service equipment will be furnished and set in operating position under other Divisions, ready to receive electrical connections as work of this section at a single point from the building system. The final connections from the building system shall be made as work of this Electrical Division. Work of Division 16 - Electrical, will not include any internal wiring and/or any interconnecting wiring between electrical components on the equipment unless specifically indicated on the Drawings.
- B. Verify all requirements with manufacturer or equipment supplier rough-in Drawings and provide disconnect switches where required by the NEC.

### **3.6 ELEVATORS**

- A. Connection from fire alarm control panel to each elevator controller, to signal an alarm conditions shall be provided as work of Division 16.

- 3.7 WORKMANSHIP:** Install all materials and electrical components of the work in accordance with instructions of manufacturer following the best modern construction practices and conforming with the Contract Documents. Workmanship shall be first class, in both function and appearance, whether finally concealed or exposed and shall be performed by experienced workmen skilled in the type of work. As practicable, the lines of all components of the system shall be perpendicular or parallel. In general, workmanship shall conform to guidelines set forth in N.E.C.A. manuals.

### **3.8 CLEANING UP**

- A. Remove once per week and at the completion of the work all empty cartons, scrap wire, raceways, rubbish, etc., accumulated on the project as a result of work performed.
- B. Remove all marks, stains, fingerprints, bugs, dust and other foreign material from all electrical components. Refinish damaged surfaces and restore original finish to the satisfaction of the Architect.

- 3.9 SAFETY:** It shall be the Contractor's responsibility to do all things necessary in the pursuit of the installation or testing to provide safe conditions in which to work.

### 3.10 MOUNTING HEIGHTS

- A. Unless otherwise noted on the Drawings or required by the Architect, the following mounting heights shall apply:

Toggle Switches	48" CL
Receptacles -	18" CL
Panelboards	6'-6" to top
Telephone Outlets	18" CL
Fire Alarm Horns/Speakers	In or On Ceilings
Smoke Detectors	In or on ceilings
Fire Alarm Stations	42" CL Above Floor
Fire Alarm Strobes	80" Bottom Above Floor

- B. Upon approval of the Architect mounting heights may be adjusted.

END OF SECTION