

## SECTION 16010

### ELECTRICAL GENERAL PROVISIONS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. The general provisions of the contract including General and Special Conditions and General Requirements shall apply to all work under this Section.

##### 1.2 REQUIREMENTS OF REGULATORY AGENCIES AND STANDARDS

- A. Equipment, fixtures, material and installation shall conform to the requirements of the local Building Department, the serving utility companies, the National Electrical Code, National Electrical Safety Code, Life Safety Code, Occupational Safety and Health Act, and applicable national, state and local codes, ordinances and regulations.
- B. All equipment shall be equal to or exceed the minimum requirements of NEMA, IEEE, and UL.
- C. Should any change in Drawings or Specifications be required to comply with governmental regulations, the Contractor shall notify Architect/Engineer prior to execution of the Work. The work shall be carried out according to the requirements of such code in accordance with the instruction of the Architect/Engineer and at no additional cost to the Owner.
- D. The provisions of Standards, Codes, Laws, Ordinances, etc., shall be considered minimum requirements. In case of conflict between their published requirements, the Owner's Representative shall determine which is to be followed and his decision shall be binding. Specific requirements of this specification or the drawings, which exceed the published requirements, shall take precedence over them.

##### 1.3 FEES

- A. All local fees, permits, and services of inspection authorities shall be obtained and paid for by the Contractor. The Contractor shall cooperate fully with local companies with respect to their services. Contractor shall include in his bid any costs to be incurred relative to power service (primary and/or secondary) and telephone service.

##### 1.4 SCOPE OF WORK

- A. This division of the specifications covers the electrical systems of the project. It includes work performed by the electrical trades as well as trades not normally considered as electrical trades.
- B. Provide all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, tools, supervision, labor consumable items, fees, licenses, etc., necessary to provide complete systems. Perform start-up and checkout on each item and system to provide complete and fully operable systems.
- C. Examine and compare the Electrical Drawings with these specifications, and report any discrepancies between them to the Architect/Engineer and obtain from him written instructions for changes necessary in the work. At time of bid the most stringent requirements must be included in the bid.
- D. Examine and compare the Electrical Drawings and Specifications with the Drawings and Specifications of other trades, and report any discrepancies between them to the

Architect/Engineer and obtain from him written instructions for changes necessary in the work. At time of bid, the most stringent requirements must be included in said bid.

- E. Install and coordinate the electrical work in cooperation with other trades installing interrelated work. Before installation, make proper provisions to avoid interferences in a manner approved by the Architect/Engineer. All changes required in the work of the Contractor, caused by his neglect to do so, shall be made by him at his own expense.
- F. It is the intent of the Drawings and Specifications to provide a complete workable system ready for the Owner's operation. Any item not specifically shown on the Drawings or called for in the Specifications, but normally required to conform with the intent, are to be considered a part of the Contract.
- G. All materials furnished by the Contractor shall be new and unused (temporary lighting and power products are excluded) and free from defects. All materials used shall bear the Underwriter's Laboratory, Inc. label provided a standard has been established for the material in question.
- H. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material shall be the product of one manufacturer throughout the entire project. Multiple manufacturers will not be permitted.

#### 1.5 REFERENCES

- A. Utilize the following abbreviations and definitions for discernment within the Drawings and Specifications.
  - 1. Abbreviations
    - a) NEC National Electrical Code.
    - b) OSHA Occupational Safety and Health Act.
    - c) ANSI American National Standards Institute.
    - d) NFPA National Fire Protection Association.
    - e) ASA American Standards Association.
    - f) IEEE Institute of Electrical and Electronics Engineers.
    - g) NEMA National Electrical Manufacturers Association.
    - h) UL Underwriters' Laboratories, Inc.
    - i) IBC International Building Code.
    - j) IES Illuminating Engineering Society.
    - k) ICEA Insulated Cable Engineers Association.
    - l) ASTM American Society of Testing Materials.
    - m) ETL Electrical Testing Laboratories, Inc.
    - n) CBM Certified Ballast Manufacturers.
    - o) EIA Electronic Industries Association.
    - p) LED Light Emitting Diode.
    - q) OEM Original Equipment Manufacturer.

#### 1.6 DEFINITIONS

- A. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
- B. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.

- C. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
- D. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
- E. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- F. "AS DIRECTED" means as directed by the Architect/Engineer, or his/her representative.
- G. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

#### 1.7 COORDINATION OF THE WORK

- A. Certain materials will be provided by other trades. Examine the Contract Documents to ascertain these requirements.
- B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
- D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
- E. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
- F. The Drawings show only the general run of raceways and approximate location of outlets. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.
- G. Obtain from the Architect/Engineer in the field the location of such outlets or equipment not definitely located on the Drawings.
- H. Circuit "tags" in the form of arrows are used where shown to indicate the home runs of wiring to electrical distribution points. These tags show the circuits in each home run and the panel designation. Show the actual circuits numbers on the finished record drawings and on panel directory card. Where circuiting is not indicated, Electrical Subcontractor must provide required circuiting in accordance with the loading indicated on the drawings and/or as directed.
- I. Adjust location of conduits, panels, equipment, pull boxes, fixtures, etc. to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each raceway prior to fabrication.
  - 1. Right-of-Way:
    - a) Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of-

way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.

- b) Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.
- J. Wherever the work is of sufficient complexity, prepare additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field.
- K. Coordinate with the local Electric Utility Company and the local Telephone Company as to their requirements for service connections and provide all necessary materials, labor and testing.
- L. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.

#### 1.8 EXAMINATION OF SITE

- A. Prior to the submitting of bids, the Contractor shall visit the site of the job and shall familiarize himself with all conditions affecting the proposed installation and shall make provisions as to the cost thereof. Failure to comply with the intent of this paragraph will in no way relieve the contractor of performing all necessary work shown on the Drawings.

#### 1.9 PROGRESS OF WORK

- A. The Contractor shall order the progress of his work to conform to the progress of the work of other trades and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from the defective or ill-timed work performed under this section shall be borne by the Contractor.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Ship and store all products and materials in a manner that will protect them from damage, weather and entry of debris. If items are damaged, do not install, but take immediate steps to obtain replacement or repair. Any such repairs shall be subject to review and acceptance of the Architect/Engineer.
- B. Deliver materials in manufacturer's unopened container fully identified with manufacturer's name, trade name, type, class, grade, size and color.
- C. Store materials suitably sheltered from the elements, but readily accessibly for inspection by the Architect/Engineer until installed. Store all items subject to moisture damage in dry, heated spaces.

#### 1.11 EQUIPMENT ACCESSORIES

- A. Provide supports, hangers and auxiliary structural members required for support of the work.
- B. Furnish and set all sleeves for passage of raceways through structural, masonry and concrete walls of floors and elsewhere as will be required for the proper protection of each raceway passing through building surfaces.

#### 1.12 OPERATIONS AND MAINTENANCE MANUALS

- A. General: Provide operations & maintenance (O&M) manuals in accordance with the Contract Documents.
  - 1. Provide two (2) copies of each manual.
  - 2. Manuals shall be 8-1/2 inches X 11 inches in hard cover 3-ring loose-leaf binders.
  - 3. Manuals shall be complete and in Owner's hands prior to turning building over to Owner and at least 10 days prior to instruction to operating personnel.
- B. Provide O&M manuals including but not limited to the following:
  - 1. Alphabetical list of all system components, with the name, address, and phone number of the company responsible for servicing each item during the first year of operation.
  - 2. Operating instructions for complete system including:
    - a) Normal starting, operating, and shut-down.
    - b) Emergency procedures for fire or failure of major equipment.
    - c) Summer and winter special procedures, if any.
    - d) Day and night special procedures, if any.
  - 3. Maintenance instruction including:
    - a) Proper lubricants and lubricating instructions for each piece of equipment, and date when lubricated.
    - b) Necessary cleaning, replacement and/or adjustment schedule.
  - 4. Manufacturer's data for each piece of equipment including:
    - a) Installation instructions.
    - b) Drawings and specifications.
    - c) Parts list, including recommended items to be stocked.
    - d) Complete wiring diagrams.
    - e) Marked or changed prints locating all concealed parts and all variations from the original system design.
    - f) Test and inspection certificates.
- C. Refer to individual specification sections for additional O&M requirements.

#### 1.13 RECORD DOCUMENTS

- A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
- B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.
- C. Provide in each main electrical switchboard room a framed copy under glass of the appropriate Single Line Riser Diagram as reviewed by the electrical engineer. Media shall be a high quality presentation type paper. Blueprints or other media which fade shall not be used.

#### 1.14 GUARANTEE

- A. Guarantee all material and workmanship for a period of one (1) year from date of final acceptance by the Owner, except that where guarantees or warranties for longer terms are specified herein, such longer term to apply. Within 24 hours after notification, correct any deficiencies that occur during the guarantee period at no additional cost to the Owner, all to the satisfaction of the Owner and Architect/Engineer. Obtain similar guarantees from subcontractors, manufacturers, suppliers and subtrade specialists.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Applicable equipment and materials shall be listed by Underwriters' Laboratories and Manufactured in accordance with ASME, NEMA, ANSI or IEEE standards, and as approved by local authorities having jurisdiction.
- B. If products and materials are specified or indicated on the Drawings for a specific item or system, use those products or materials. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of Shop Drawings where Shop Drawings are required or as approved in writing where Shop Drawings are not required.
- C. All equipment capacities, etc. are listed for job site operating conditions. All equipment sensitive to altitudes or ambient temperatures to be derated and method of derating shown on Shop Drawings. Where operating conditions shown differ from the laboratory test conditions, the equipment to be derated and the method of derating shown on Shop Drawings.

### **2.2 SUBSTITUTION OF MATERIALS OR EQUIPMENT**

- A. All requests for substitution of materials or equipment shall be made in writing by the Contractor. The request must be in the Engineers office not less than 10 days prior to the bid date. Samples of proposed substitute materials or equipment shall be submitted to the Engineer for review whenever they are requested. Bids shall be based only upon the specified materials and equipment, or substitutes that have received written acceptance from the Engineer prior to the bid.
- B. Wherever the words "for approval" or "approved" are used in regard to manufactured specialties, or wherever it is desired to substitute a different make or type of apparatus for that specified, submit all information pertinent to the adequacy and adaptability of the proposed apparatus, and secure Architect/Engineer's acceptance before apparatus is ordered.
- C. Wherever quantities or a definite make and size of apparatus is specified, the make and size of apparatus which is proposed must conform substantially (in regard to the operating results) to that specified or implied. Same shall apply to important dimensions relating to operation of apparatus in coordination with the rest of the system, or to properly fitting it into available space conditions. Any substitution of equipment or apparatus shall include all necessary revisions, as required to complete the installation.
- D. Acceptance of substitutions, for equipment specified herein, will not be given merely upon submission of manufacturer's names and will be given only after receipt of complete and satisfactory performance data covering the complete range of operating conditions. Furnish complete and satisfactory information relative to equipment dimensions, weight, etc. Any additional construction and design costs incurred as a result of any accepted substitution shall be borne by the Contractor. The opinion and judgment of the Architect/Engineer shall be final, conclusive, and binding.

### **2.3 SHOP DRAWINGS**

- A. Prepare and submit detailed Shop Drawings for materials, systems, and equipment as listed herein, including locations and sizes of all openings in floor decks, walls, and floors.

- B. The Work described in any Shop Drawing submission shall be carefully checked for all clearances (including those required for maintenance and servicing), field conditions, maintenance of architectural conditions, and proper coordination with all trades on the job. Each submitted Shop Drawing shall include a certification that all related job conditions have been checked and that no conflict exists.
- C. All drawings shall be submitted sufficiently in advance of field requirements to allow ample time for checking and resubmittal as may be required. All submittals shall be complete and contain all required information.
- D. Acceptance of any submitted data or Shop Drawings for material, equipment apparatus, devices, arrangements, and layout shall not relieve Contractor from responsibility of furnishing same of proper dimensions and weight, capacities, sizes, quantity, quality and installation details, to efficiently perform the requirements and intent of the Contract. Such acceptance shall not relieve Contractor from responsibility for errors, omissions, or inadequacies of any sort on submitted data or Shop Drawings.
- E. Each Shop Drawing shall contain the following information.
  - 1. Provide general information on each copy of the submittal.
    - a) Project title.
    - b) Reference to the applicable drawing and specification article.
    - c) Contractor and supplier identification, addresses and telephone numbers.
    - d) Submittal Date.
  - 2. Certification that the contractor has reviewed the submittal.
  - 3. Refer to individual specification sections for additional information requirements.
- F. Shop Drawing submittals shall be provided for each specific material, system, or equipment as identified herein.
  - 1. As a minimum, make submittals on the following items:
    - a) Raceways, conduit & wire
    - b) Wiring devices and plates
    - c) Switchboards
    - d) Transformers
    - e) Panelboards
    - f) Fuses
    - g) Disconnect switches
    - h) Motor control centers
    - i) Motor controllers, starters, and contactors
    - j) Lighting fixtures, lamps
    - k) Instrumentation, metering equipment
    - l) Special systems - fire alarm, security, CCTV, intercom, etc.
  - 2. Refer to individual specification sections for additional submittal requirements.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Follow manufacturer's instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the Architect/Engineer before installing any equipment. Provide a copy of such instructions at the equipment during any work on the equipment.
- B. Use mechanics skilled in their trade for all work.
- C. Keep all items protected before and after installation. Clean up all debris.

- D. Before commencing Work, examine all adjoining, underlying, etc., Work on which this Work is in any way dependent for perfect workmanship and report any condition which prevents performance of first class work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.

### 3.2 PREMIUM TIME WORK

- 1. The following Work shall be performed at night or weekend other than holiday weekends as directed and coordinated with the Owner.
  - a) All tie-in, cut-over and modifications to the existing electrical system and other existing system requiring tie-ins or modifications shall be arranged and scheduled with the Owner to be done at a time as to maintain continuity of the service and not interfere with normal building operations.

### 3.3 EXCAVATION, TRENCHING AND BACKFILL

- A. Provide excavation for the Work. Excavate all material encountered, to the depths indicated on the drawings or required. Remove from the site, excavated materials not required or suitable for backfill. Provide grading, as may be necessary, to prevent surface water from flowing into trenches or other excavations. Remove any water accumulating therein. Provide sheeting and shoring as may be necessary for the protection of the Work and for the safety of personnel.
- B. Provide trenches of widths necessary for the proper execution of the Work. Grade bottom of the trenches accurately to provide uniform bearing and support the Work on undisturbed soil at every point along its entire length. Except where rock is encountered, do not excavate below the depths indicated. Where rock excavations are required. Excavate rock to a minimum overdepth of four (4") inches below the trench depths indicated on the Drawings or required. Backfill overdepths in the rock excavation and unauthorized overdepths with loose granular, moist earth, thoroughly machine tamped, to a compaction level of at least 95 percent to standard protector density or 75 percent relative density or as specified by the Architect. Whenever unstable soil that is incapable of properly supporting the Work, as determined by Architect/Engineer, is encountered in the bottom of the trench, remove soil to a depth required and backfill the trench to the proper grade with coarse sand, fine gravel, or other suitable material.
- C. Excavate trenches for utilities to a depth that will provide the following minimum depths of cover from existing grade or from indicated finished grade, whichever is lower, unless otherwise specifically shown.
  - 1. Primary electric service: four (4) feet (minimum)
  - 2. Secondary electric service: two (2) feet (minimum)
  - 3. Telephone service: two (2) feet (minimum)
- D. Trenches shall not be placed within ten (10) feet of foundation or soil surfaces which must resist horizontal forces.
- E. Do not backfill trenches until all required tests have been performed and the installation observed by the Engineer. Comply with the requirements of other sections of these specifications. Backfill shall consist of non-expansive soil with limited porosity. Deposit in six (6") inch layers and thoroughly and carefully tamp until the Work has a cover of not less than one (1) foot. Backfill and tamp remainder of trench at twelve (12") inch intervals until complete. Uniformly grade the finished surface. Backfill and tamp with compaction at least equal to the surrounding area.



### 3.4 CUTTING, PATCHING AND REPAIRING

- A. The work shall be carefully laid out in advance. Where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of raceway, outlets or other equipment, the work shall be carefully done. Any damage to the building, piping, equipment or defaced finish plaster, woodwork, metalwork, etc. shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner.
- B. Where conduits, mounting channels, outlet, junction, or pull boxes are mounted on a painted or stucco finished surface, or a surface to be finished, they shall be painted to match the surface. Whenever support channels are cut, the bare metal shall be cold galvanized.

### 3.5 DEMOLITION AND CONTINUANCE OF EXISTING SERVICES

- A. All existing electrical services not specifically indicated to be removed or altered shall remain as they presently exist.
- B. Should any existing services interfere with new construction, the Contractor shall (after obtaining written approval from the Architect/Engineer) alter or reroute such existing equipment to facilitate new construction.
- C. Under no circumstances shall existing services be terminated or altered unless deemed necessary by the Architect/Engineer or specified herein; also, prior to altering any existing situation, the Contractor shall notify the Owner in writing giving two (2) weeks advance notice of planned alteration.
- D. It shall be solely the Contractor's responsibility to guarantee continuity of present facilities (with respect to damage or alteration due to new construction) and any unauthorized alteration to existing equipment shall be corrected by the Contractor to the Architect/Engineer's satisfaction at the Contractor's expense.

### 3.6 CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
- B. Contractor shall clean up all fixtures and equipment at the completion of the project.
- C. All switchboards, panelboards, wireways, trench ducts, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

### 3.7 WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense.

### 3.8 SUPPORTS

- A. Support work in accordance with the best industry practice and the following.

- B. Include supporting frames or racks extending from building structure for work indicated as being supported from walls where the walls are incapable of supporting the weight. In particular, provide such frames or racks in electric closets.
- C. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a free standing position.
- D. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.
- E. Nothing, (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways, or cables for support, except that threaded hub type fittings having a gross volume not in excess of 100 cubic inches may be supported from heavy wall conduit, where the conduit is securely supported from the structure within five inches of the fitting on two opposite sides.
- F. Nothing shall rest on, or depend for support on, suspended ceilings media (tiles, lath, plaster, as well as splines, runners, bars and the like in the plane of the ceiling).
- G. Provide required supports and hangers for conduit, equipment, etc., so that loading will not exceed allowable loadings of structure.

### 3.9 FASTENINGS

- A. Fasten electric work to building structure in accordance with the best industry practice and the following.
- B. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor fastening in all cases.
- C. For items which are shown as being ceiling mounted at locations where fastening to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging, tying to the building structural elements.

### 3.10 TESTING EQUIPMENT AND MATERIALS

- A. The Contractor shall provide all testing instruments, equipment and all materials, connections, labor, etc., required to perform tests.
- B. Test all circuits, fixtures, equipment, and systems for proper operation and freedom from grounds, shorts and open circuits before acceptance is requested.
- C. Measure voltage at panelboards and outlets after the building is fully occupied. Make final transformer tap adjustments based on these measurements.
- D. Perform all tests required by local authorities, such as tests of life safety systems, in addition to tests specified herein.
- E. Perform tests required by other specification sections.

-- END OF SECTION --