

SECTION 16010 – ELECTRICAL GENERAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. The “General Conditions” and “Special Conditions” of Contract as written and referred to hereinbefore are adopted and made part of Division 16.

1.2 DESCRIPTION OF WORK:

- A. Provide equipment, labor, etc., required to install complete working electrical system as shown and specified.
- B. Provide fixed electrical equipment, except where specifically noted otherwise.
- C. Provide portable electrical equipment for complete system.
- D. Provide equipment and/or wiring normally furnished or required for complete electrical systems but not specifically specified on the drawings or in specifications, as though specified by both.
- E. All equipment and wiring shall be new.
- F. Electrical work includes, but is not limited to:
 - 1. Arrange with local utility companies for services as shown or specified.
 - 2. Removal or relocation of electrical services located on or crossing through project property, above or below grade, obstructing construction of project or conflicting with completed project or any applicable code.
 - 3. Complete Power Distribution System. Provide meters, switchboards, panelboards, circuit breakers, power outlets, convenience outlets, switches, and/or other equipment forming part of system.
 - 4. Complete raceway systems and terminal facilities for telephone system.
 - 5. Connection of all appliances and equipment.
 - 6. Complete emergency lighting system, including individual battery units.
 - 7. Complete fire alarm system.
 - 8. Complete empty raceway system(s) for auxiliary system(s) as shown.

9. Complete system of outlets and raceways for television antenna distribution system (community cable system).
10. Complete system of outlets, and raceways for closed circuit television systems.
11. Complete building ground.
12. Complete conduit for voice data system.
13. Complete lightning protection system.
14. Complete interior and exterior lighting.
15. Provide temporary facilities for construction power.

1.3 WORK NOT INCLUDED:

- A. Furring for conduit and equipment.
- B. Finish painting of conduit and equipment.
- C. Installation of motors except where specifically noted.
- D. Control wiring for mechanical systems, except where indicated to be provided by Electrical Contractor.
- E. Installation of telephone instruments, TV antenna or computer data system and wiring.
- F. Flashing of conduits into roofs and outside walls. Inform General Contractor of number and size of roof penetrations prior to bidding.

1.4 RELATED WORK SPECIFIED ELSEWHERE:

- A. Classification of excavation: Architectural Division.
- B. Painting: Painting Division.
- C. Concrete Work: Concrete Division.

1.5 REQUIREMENTS OF REGULATORY AGENCIES:

- A. Obtain and pay for all permits required for the work. Comply with all ordinances pertaining to work described herein.

- B. Install work under this Division per drawings, specifications, latest edition of the National Electrical Code, Local Building Codes, and any special codes having jurisdiction over specific portions within complete installation. In event of conflict, install work per most stringent code requirements determined by Architect.
- C. Arrange, pay fees for and complete work to pass required tests by agencies having authority over work. Deliver to Architect Certificates of Inspection and approval issued by authorities.

1.6 QUALIFICATIONS OF CONTRACTOR:

- A. Has completed minimum two projects same size and scope in past five (5) years.
- B. This qualification applies to Sub-Contractors.
- C. Use workmen experienced in their respective trade. Submit qualifications of Superintendent for review.
- D. Owner reserves right to reject bid of any Contractor failing to meet these qualifications.

1.7 GENERAL JOB REQUIREMENTS:

- A. Drawings and Specifications:
 - 1. Electrical work is shown on "E" series drawings inclusive. Follow any supplementary drawings as though listed above.
 - 2. Drawings and specifications are complementary. Work called for by one is binding as if called for by both.
 - 3. Drawings show general run of circuits and approximate location of equipment. Right is reserved to change location of equipment and devices, and routing of conduits to a reasonable extent, without extra cost to Owner.
 - 4. Refer conflicts between drawings and specifications describing electrical work and work under other Divisions to Architect for remedial action.
 - 5. Use dimensions in figures in preference to scaled dimensions. Do not scale drawings for exact sizes or locations.
 - 6. Execution of Contract is evidence that Contractor has examined all drawings and specifications related to work, and is informed to extent and character of work. Later claims for labor and materials required due to difficulties encountered, which could have been foreseen had examination been made, will not be recognized.

7. Charges for extra work not allowed unless work authorized by written order from Architect approving charge for work.

B. Visit to Site:

1. Visit site to survey existing conditions affecting work. Include necessary materials and labor to accomplish the electrical work, including relocation of existing services and utilities on building site in bid. No consideration given to future claims due to existing conditions.

C. Definitions:

1. Provide: Furnish, install and connect complete.
2. Wire: Furnish all necessary wiring and connect complete.
3. Install: Set in place and wire complete.
4. Work: Materials completely installed and connected.
5. AWG: American Wire Gauge.
6. NEC: National Electrical Code (latest edition).
7. NFPA: National Fire Protection Association.
8. OSHA: Occupation Safety and Health Administration.
9. UL: Underwriters Laboratories, Inc.
10. NEMA: National Electrical Manufacturers Association.
11. IEEE: Institute of Electrical and Electronic Engineers.

D. Workmanship, Guarantee and Approval:

1. Work under this Division shall be first class with emphasis on neatness and workmanship.
2. Install work using competent mechanics, under supervision of foreman, all duly certified by local authorities. Installation subject to Engineer's constant observation, final approval, and acceptance Engineer may reject unsuitable work.

3. Furnish Architect written guarantee, stating that if workmanship and/or material executed under this Division is proven defective within one (1) year after final acceptance, such defects and other work damaged will be repaired and/or replaced.
4. In event that project is occupied or systems placed in operation in several phases at Owner's request, guarantee will begin on date each system or item of equipment is accepted by Owner.

E. Observations of Work and Demonstration of Operation:

1. At all observations of work, open panel covers, junction box cover, pull box covers, device covers, and other equipment with removable plates for check. Provide sufficient personnel to expedite cover removal and replacement.
2. Contractor to assist Architect in demonstration of operation of new systems to satisfaction of Owner. Contractor to have manufacturer available for demonstration of systems where requested by Owner.

F. Testing of Electrical Systems:

1. Test Completed work as follows:
 - a. Perform test required by Engineer to indicate compliance with specifications, drawings and applicable codes. Provide instruments, labor and materials for tests.
 - b. Insulation – use 1000 VDC insulation tester (0-500 megohm full-scale), equal to "Megger" as manufactured by Biddle Company. Test conductors and busses of all systems, including feeders, main service busway, branches, devices, equipment, etc. Test branches for one (1) minute; test feeders, bus ducts, busses, etc., for 15 minutes with readings at one minute intervals.
 - c. Receptacles:
 - 1) Use Woodhead Ground Loop Impedance Tester. Test each receptacle. Record readings.
2. Ground Testing:
 - a. Testing of Made Ground Electrodes:
 - 1) Test Ground Systems indicated.

- 2) Using a measuring device which generates minimum of 500 VDC, calibrated in ohms (maximum 200 ohm scale) J.C. Biddle "Vibrotester" or approved equivalent.
- 3) Provide test electrode in accordance with Measuring Device Manufacturer's instructions. Use ground rods as specified in Section "Grounding".
- 4) Follow instructions of measuring device manufacturer for proper results.
- 5) Test grounds only when earth is dry.
- 6) Record ambient temperature, date, time, appropriate water table level (as obtained from local geologists); type of earth material.

G. Materials and Substitutions:

1. All material shall be new, with U.L. label. If U.L. label is not available, material shall be manufactured in accordance with applicable NEMA, IEEE and Federal Standards.
2. No material shall be substituted for specified, except by prior written approval of Engineer. Specified catalog numbers are used for description of equipment and standard of quality only. Equivalent material given consideration only if adequate comparison data including samples are provided.
3. Submit to Architect within 30 days after award of contract a complete list of proposed material manufacturers. List does not preclude submission of shop drawings. Approval of manufacturer on list does not constitute approval of specific material or equipment.

H. Shop and Erection Drawings:

1. Submit shop drawings as required for material and equipment furnished under Division 16 of specifications, to Architect for review within (30) days after award of contract. Shop drawings shall be submitted on timely basis to allow adequate lead time for review, re-submission if necessary, manufacture and delivery to allow access of material to project at correct time based on schedule established by Architect/Contractor. Include complete descriptive data with dimensions, operating data and weight for each item of equipment. Carefully examine shop drawings to assure compliance with drawings and specifications prior to submittal to Architect. Shop drawings and submittals shall bear the stamp of approval of the

Electrical and General Contractor as evidence drawings have been checked by them. Drawings submitted without this stamp of approval will not be considered and will be returned for proper resubmission.

2. Drawings larger than 8-1/2" x 11", submit 3 copies and 1 reproducible of each drawing. Architect will retain 2 copies and return 1 reproducible and 1 copy to Contractor. Contractor is responsible for copying reproducible for distribution.
3. 8-1/2" x 11" drawing in brochure: Submit 6 original copies for review Architect will retain 2 copies and return 4 copies to Contractor.
4. Review of shop drawings does not relieve Contractor of responsibility for errors and omissions in shop drawings. Contractor is responsible for dimensions and sizes of equipment. Inform Architect in writing of equipment differing from that shown.
5. Prepare erection drawings when required by Architect. Investigate thoroughly all conditions affecting work and indicate on drawing. Architect will review erection drawings before work commences.
6. Provide for Owner three (3) sets of final shop and erection drawings, except provide 1 set of 1.5 mil mylar sepia of shop drawings larger than 8-1/2" x 11" size.

I. Cooperation:

1. Carefully coordinate work with other contractors. Refer conflicts between trades to Architect.
2. Work to be installed as progress of project will allow. Schedule of work determined by General Contractor and/or Architect.

J. Maintenance and Operating instructions for Equipment:

1. Submit to Architect three (3) sets of data prepared by manufacturer for each item of electrical equipment completely describing equipment. Data to include parts lists, description of operation, shop drawings, wiring diagrams, maintenance procedures and other literature required for maintenance of equipment. Bind in booklet form for presentation.

K. Record Drawings:

1. When work starts the Architect will furnish two complete sets of white prints of the Electrical Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in

colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.

2. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this contract.
 - a. Block out areas modified by change order and identify them by change order number.
3. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.
4. When work is completed, contractor shall be provided CAD files (AutoCAD Version 2004) of Electrical Drawings for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to the CAD drawings, removing all superseded data in order to show the actual completed conditions. When record drawings are completed, provide one set of mylar sepias, two sets of blue line prints and one complete set of CAD drawing files (AutoCAD Version 2004) on compact disks.

L. Items for Owner:

1. Provide following items for Owner at time of substantial completion:
 - a. Certificates of inspection and approval from authorities having jurisdiction.
 - b. Written guarantees.
 - c. "Record" blue line prints.
 - d. Final approved shop drawings (3 sets).
 - e. Spare fuses (furnish receipt).
 - f. Maintenance data (3 sets).
 - g. Affidavit of Owner Instruction (1 copy).

M. Marking:

1. Identify each starter, (including starters furnished under Mechanical Section), panelboard, cabinet, control device, breaker, disconnect and safety switch with ¼" high black letters cut in a white laminated phenolic strip. Use red letters for all equipment connected to emergency system. Attach to enclosure with two (2) metal screws.
2. Identify receptacle outlets in critical care areas with nameplates indicating circuit number and panel designation. Critical care areas include: Operating Rooms, Delivery Rooms, Intensive Care Units, Special Procedure Rooms, Emergency Trauma and Treatment Rooms. Plates shall be engraved with black fill. Outlets for emergency shall be similarly engraved in red.
3. Nameplates required for other items in this Division similar to those described above.

N. Protection and Storage:

1. Provide warning lights, bracing, shoring, rails, guards and covers necessary to prevent damage or injury.
2. Do not leave exposed or unprotected, electrical items carrying current. Protect personnel from exposure to contact with electricity.
3. Protect work and materials from damage by weather, entrance of water or dirt. Cap conduit during installation.
4. Avoid damage to materials and equipment in place. Repair, or remove replace damaged work and materials.
5. Exercise particular care when working around telephone (electronic) equipment to prevent entrance of dust, moisture and debris into the equipment. Provide dust barriers and partitions as required.
6. Deliver equipment and materials to job site in original, unopened, labeled container. Store to prevent damage and injury. Store ferrous materials to prevent rusting. Store finished materials and equipment to prevent staining and discoloring. Store materials affected by condensation in warm dry areas. Provide heaters. Storage space on site and in building designated by Owner/Architect.
7. Install equipment per manufacturer's recommendations. Conflicts between contract documents and these recommendations, deferred to Architect.

O. Excavation and Backfill:

1. Excavate for work in this Division.
2. Avoid existing facilities in excavating. Contractor is responsible for repair and replacement of damaged facilities in executing work.
3. Backfill in twelve inch (12") lifts, wetted down and tamped. Compaction minimum 95% of adjacent earth.
4. Repairing to be comparable to work cut including new asphalt paving, concrete paving, sod, replanting shrubbery, etc. Architect will observe repair work, and reject unsuitable work.

P. Cutting and Repairing:

1. Cut and repair walls, floors, roof, etc., required to install work. Where work cut is finished, employ original installer of finish to repair finish. Do not cut structural members.

Q. Anchors:

1. Provide anchors for all equipment, raceways, hangers, etc. to safely support weight of item involved. Anchors to consist of expansion type devices similar to "Redhead" or lead expansion anchors. Plastic anchors are not acceptable. Protect telephone equipment from drilling residue.

R. Cleaning and Painting:

1. Clean equipment furnished in this Division after completion of work.
2. Touch-up or re-paint damaged painted finishes.
3. Remove debris, packing cartons, scrap, etc., from site.

S. Starters:

1. Separately mounted starters are furnished under another Division, but installed in Division 16 unless specifically noted otherwise.

T. "Contingency Items":

1. Provide in electrical pricing the following components to consist of labor and materials for complete installation:
 - a. 4 15 amp duplex receptacle and wall plate and 20 feet of 2 #12 and 1 #12(G)-1/2"C. connected to circuit for power.
 - b. 2 15 amp double duplex outlet in box with plates and 20 feet of 2 #12 and 1 #12(G)-1/2"C. connected to circuit for power.
 - c. 1 20 amp three phase breaker furnished and installed in panel.
 - d. 2 Exit lights furnished and installed with box and 20 feet of conduit and wiring.
 - e. 2 Two-head battery packs furnished and installed with mounting and 20 feet of conduit and wiring.
 - f. Furnish and installed with all necessary programming to be an integral part of Fire Alarm system and 30 feet of circuit wiring in conduit connected to Fire Alarm wiring.
 - 1) 2 Manual Pull Stations
 - 2) 4 Ceiling Mount Smoke Detectors
 - 3) 2 Duct Detectors
 - 4) 4 Audio/Visual Notification Devices
2. Unused components will be turned over to Owner for their attic stock.

U. Code Compliance:

1. Entire electrical installation shall comply with all aspects of code including local interpretations. This included but is not limited to:
 - a. Installation adjustment to meet all code clearances between electrical such as ductwork, other HVAC, plumbing, fire protection, and structural systems.
 - b. Locations for items such as fire alarm appliances, exit lights, egress lighting, disconnect switches, etc.

2. No additional compensation will be allowed for code compliance. Notify engineer of difficulty encountered for assistance.

END OF SECTION 16010