

SECTION 16010

ELECTRICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 RELATED WORK SPECIFIED UNDER OTHER SECTIONS

1.3 SUMMARY

- A. This Section includes general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1 Sections.
 - 1. Substitutions.
 - 2. Permits and fees.
 - 3. Submittals.
 - 4. Coordination drawings.
 - 5. Record drawings.
 - 6. Maintenance manuals.
 - 7. Rough-ins.
 - 8. Electrical installations.
 - 9. Cutting and patching.
- B. This Section includes basic requirements for materials and installations for electrical work, including but not limited to:
 - 1. Electrical demolition work.
 - 2. Excavating and backfill.
 - 3. Concrete.
 - 4. Sleeves.
 - 5. Sealing of openings.
 - 6. Access doors.
 - 7. Touch-up painting.

1.4 REFERENCES

- A. The electrical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable Standard Specifications of the following recognized authorities:
 - 1. ANSI - American National Standards Institute
 - 2. ASTM - American Society for Testing Materials
 - 3. FCC - Federal Communication Commission

4. ICEA - Insulated Cable Engineers Association
5. IEEE - Institute of Electrical and Electronics Engineers
6. NEC - National Electrical Code
7. NEMA - National Electrical Manufacturer's Association
8. UL - Underwriters' Laboratories, Inc.

1.5 SYSTEM DESCRIPTION

- A. Design Requirements: Furnish all labor, materials, equipment, technical supervision, and incidental services required to complete, test and leave ready for operation the electrical systems as specified in the Division 16 Sections and as indicated on Drawings.
 1. The Electrical Drawings indicate the general design and extent of the electrical system. Comply to the Drawings as closely as actual construction of the building and the work of other Trades permit.
- B. Substitutions: Base Bid must be in accordance with materials or products specified. Any exceptions to this must be approved in writing by the ARCHITECT-ENGINEER ten (10) days or more prior to bidding.
 1. Voluntary alternates may be submitted for consideration, with listed addition or deduction to the Bid, but will not affect the awarding of the Contract.
- C. Permits and Fees: Obtain all permits, licenses, inspections and test required. Upon completion of the Work, obtain and send certificates of inspections and approvals to the ARCHITECT-ENGINEER.
 1. Pay all fees and expenses for permits, licenses, tests and inspections.
- D. Examination of Drawings and Premises: Before submitting Bids, examine the architectural, mechanical and other trades' drawings and specifications.
 1. Notify ARCHITECT-ENGINEER should any discrepancies occur between them and the electrical work.
 2. No additional charges will be allowed because of failure to make this examination, or to include all materials and labor required for the Work.
 3. Before submitting Bids, examine the premises to determine existing conditions for performing the Work. No additional charges will be allowed because of failure to make this examination or to include all materials and labor to complete the Work.
 4. The Architectural Drawings take precedence in all matters pertaining to the building structure, Mechanical drawings in all matters pertaining to Mechanical trades and Electrical drawings in all matters pertaining to Electrical trades installation. However, where there are conflicts or differences between the Drawings for the various trades, report such conflicts or differences to the ARCHITECT-ENGINEER who shall determine the course of action to be taken.
- E. Changes Involving Electrical Work: The design of the electrical systems is based on the mechanical and building equipment specified and scheduled on the Drawings.
 1. Where equipment changes are made that involve additional electrical work (larger size motors, additional wiring of equipment, etc.) the Mechanical or respective trades involved shall compensate the electrical trades for the cost of the additional Work required.

- F. Performance Requirements: Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the Trades involved.
- G. All equipment of the same or similar systems shall be by the same manufacturer.

1.6 SUBMITTALS

- A. The following is in addition to the requirements for submittals in Division 1, Section 01340.
- B. Material List: Submit a complete list of all materials and equipment, and their manufacturers, for approval by the ARCHITECT-ENGINEER within 15 days after award of contract and prior to submittal of shop drawings.
- C. Shop Drawings: Prepare layout shop drawings drawn to scale and submit one (1) transparency copy and two (2) prints of each to the ARCHITECT-ENGINEER for review, together with required number of additional copies as required by the General Conditions. Sepia transparencies of the Contract Documents will be furnished for this purpose. After the shop drawings are reviewed, the transparency copy will be stamped and returned for printing and distribution. Refer to Division 1 for submittals and quantities.
 - 1. Layout shop drawings shall show building floor plans to scale and shall include lighting and power distribution systems, all details of electrical construction, routing of conduits, wiring, circuiting and related information necessary for the installation and future maintenance of the electrical wiring systems.
- D. No apparatus or equipment shall be shipped from stock or fabricated until shop drawings for them have been reviewed by the ARCHITECT-ENGINEER. By the review of shop drawings, the ARCHITECT-ENGINEER does not assume responsibility for actual dimensions or for the fit of completed work in position, nor does such review relieve Electrical Trades of full responsibility for the proper and correct execution of the work required.
- E. Submit shop drawing with all pertinent data and with identification mark number as specified or scheduled on the electrical Drawings.
- F. Shop drawings shall be reviewed by the Electrical Contractor for completeness and accuracy prior to submitting to the ARCHITECT-ENGINEER for review. The shop drawings shall be dated and signed by the electrical Contractor prior to submission.
- G. Where the shop drawings consist of manufacturer's standard detail drawing or schedules and contain data for a variety of similar equipment, indicate the data pertinent to the equipment furnished for this project only. Standard detail drawings and schedules not clearly indicating which data is associated with this Project shall be returned "Rejected".
- H. Where accessories and/or options are specified and do not appear as part of manufacturer's standard detail drawings, state each accessory that is to be provided with the equipment on the standard detail drawings.
- I. Partial submittals for equipment will not be permitted. Where partial submittals are transmitted to the ARCHITECT-ENGINEER, they will be returned "Rejected".

- J. Lighting fixture submittals shall be submitted as one (1) package including all fixtures intended to be used for this Project.
- K. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
 - 1. Provide a space approximately 4" x 5" on the label or beside the title block on shop drawings to record the Contractor's review and approval markings and the action taken.
 - 2. Include the following information on the label for processing and recording action taken.
 - a. Project Name
 - b. Date
 - c. Name and address of ARCHITECT-ENGINEER
 - d. Name and address of Contractor
 - e. Name and address of Subcontractor
 - f. Name and address of Supplier
 - g. Name of Manufacturer
 - h. Number and title of appropriate Specification Section
 - i. Drawing number, identification mark, fixture type, panelboard number, and detail references, or as noted on the electrical drawings.
- L. Submit manufacturer's submittals on all major electrical systems and/or equipment.
- M. Project Record Documents: Revise layout shop drawings as required during construction to indicate the as-built condition.
 - 1. At the completion of the Project, resubmit to the OWNER'S REPRESENTATIVE the revised sepias and one set of prints for OWNER'S record.
 - 2. Furnish and deliver to the OWNER'S REPRESENTATIVE a manual of all shop drawings and product data upon substantial completion. The manual shall consist of a standard hard cardboard, vinyl covered, 3-ring binder, letterhead size, 8-1/2" x 11". Shop drawings shall be folded and punched. All items and pages shall be numbered with typewritten index inserted at front of manual.
 - 3. Submit final project record documents as described in Division 1.
- N. Operation and Maintenance Data: Retain operating instructions, service instructions, parts lists, etc., which are shipped with electrical equipment. On completion of the work, give these items to the ARCHITECT-ENGINEER, for the OWNER'S use. If this information is not shipped with the equipment, obtain from the manufacturer.
 - 1. Furnish two (2) sets of bound operating instructions to the ARCHITECT-ENGINEER. Each set shall include:
 - a. One (1) copy of all shop drawings.
 - b. Operating and maintenance instructions.
 - c. As-built drawings.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Ordinances and Codes: Perform all work in accordance with applicable Federal, State and local ordinances and regulations, the Rules and Regulations of the National Board of

Fire Underwriters, the National Electric Code, and the latest accepted practices of IEEE and NEMA.

- a. Notify the ARCHITECT-ENGINEER before submitting his proposal should any changes in Drawings or Specifications be required to conform to the above codes, rules or regulations. After entering into Contract, make all changes required to conform to above ordinances, rules and regulations without additional expense to the Owner.
- b. Barrier-Free Regulations: All materials and installations shall comply with the requirements of the State of Michigan Handicapped Barrier-Free Regulations and with the Americans With Disabilities Act (ADA).

B. Rules of Local Utility Companies:

1. Perform work in accordance with the rules of local utility companies. Before submitting the bid check with each utility supplying services to this Project. Determine from them all equipment and charges which they will require and include the cost in the bid.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Storage and Protection: Provide adequate storage space for all electrical equipment, conduit and materials delivered to the job site under a weather protected enclosure. Location of the space will be designated by the ARCHITECT-ENGINEER's Field Representative. Equipment set in place in unprotected areas must be provided with temporary protection.
1. Be responsible for the care and protection of electrical equipment until it has been fully tested and accepted.
 2. Protect materials with permanent factory finish from damage by covering.
 3. Protect conduit openings with temporary plugs or caps.

1.9 PROJECT/SITE CONDITIONS

- A. Field Measurements:
1. Drawings are not intended to be scaled for roughing-in or to serve as shop drawings. Take all field measurements required for fitting the installation to the building.

1.10 SEQUENCING AND SCHEDULING

- A. Sequence and schedule work so as to avoid interference with the work of other Trades. Be responsible for removing and relocating any work which in the opinion of the OWNER'S REPRESENTATIVES causes interference.

1.11 WARRANTY

- A. Warranty: Provide a one year parts and labor warranty for all equipment and installation. Comply with requirements of the General Conditions.

1.12 MAINTENANCE

- A. Maintenance Materials: Retain all portable and detachable portions of the installation such as keys, tools, manuals, etc., until the completion of the work and then turn them over to the

Owner and obtain itemized receipt. This receipt shall be attached to the "Final Application" for payment.

- B. Retain operating instructions, service instructions, parts lists, etc., which are shipped with electrical equipment. On completion of the Work, give these items to the ARCHITECT-ENGINEER for the OWNER'S use. If this information is not shipped with the equipment, obtain from the manufacturer.
- C. Furnish three (3) sets of bound operating instructions to the ARCHITECT-ENGINEER. Each set shall include:
 - 1. One (1) copy of all shop drawings.
 - 2. Operating and maintenance instructions and manuals.
 - 3. As-built drawings.

PART 2 PRODUCTS

2.1 CONCRETE

- A. Provide concrete work required for the electrical installation. Concrete work shall include envelopes for underground service conduits, ducts, housekeeping pads beneath equipment and bases for outdoor lighting equipment. Concrete work shall be in conformance with the Section 03300 or as indicated.

2.2 ACCESS DOORS

- A. Furnish access doors as required to make accessible all controls, motors, electrical boxes and other equipment installed by Electrical trades or as required by Code.
 - 1. Architectural trades will install access doors provided under this Section.
 - 2. Access door size shall be minimum 12" x 12" in walls, 24" x 24" in ceilings.
 - 3. Plaster or acoustical tile inserts shall be by Architectural trades.
 - 4. Equip access doors with screwdriver operated cam lock.
 - a. At recessed panel access doors to receive plaster or acoustical tile inserts, furnish plastic grommet and sleeve at lock.
 - 5. Access doors in fire rated walls or ceilings shall be 1-1/2 hour rated, "B" label, 250 degF maximum temperature rise in 30 minutes, shall be self-closing and self-latching and shall carry Underwriters' Laboratories, Inc. (UL) or Warnock-Hersey Label.
- B. In non-fire rated drywall, veneer plaster, masonry or ceramic tile walls, furnish "Type M, 3202 Series" access doors as manufactured by Milcor Ltd. Partnership or approved equal.
- C. In non-fire rated gypsum board or veneer plaster walls and ceilings, furnish "Type DW, 3203 Series" by Milcor Ltd. Partnership or approved equal.
- D. In fire-rated drywall, veneer plaster, masonry or ceramic tile walls, furnish "3208 Series" by Milcor Ltd. Partnership or approved equal.

- E. In non-fire rated drywall, veneer plaster or plaster ceilings, furnish "Type M, 3202 Series" by Milcor Ltd. Partnership or approved equal.
- F. In non-fire rated plaster walls or ceilings, furnish "Type K, 3200 Series" by Milcor Ltd. Partnership or approved equal.
- G. In non-fire rated plaster or acoustical tile ceilings, furnish "Type AP, 3206 Series" and "Type AT, 3205 Series" by Milcor Ltd. Partnership or approved equal.

2.3 SEALING OF OPENINGS

- A. Seal openings around electrical materials (Conduit, raceways, cable trays, panels, etc.) where floors, fire rated walls and smoke barriers are penetrated. (Fiberglass is not acceptable.) Fire and/or smoke barriers shall be UL Listed fire and smoke stop fittings and shall have fire rating equal to or greater than the penetrated barrier. Refer to Section 07840 "Firestopping".

2.4 SLEEVES

- A. Provide conduit sleeves where conduits pass through concrete floors, walls, beams and ceilings.
- B. Sleeves shall be galvanized rigid steel conduit. Do not use aluminum conduit. Where specific sizes are not indicated on the Drawings, sleeves shall be sized to provide one-half (1/2) inch clearance around the outside surface of the item for which they were installed. They shall be cut flush with wall surfaces, and shall extend one inch, or as directed through floor. Sleeves shall be packed with approved non-combustible packing material and sealed with sealant to prevent passage of air, liquid or fumes from one area to another. The filler and sealant materials used shall be rated at least equal in fire resistance to the construction material being penetrated. Floor sleeves shall be sealed between floor and sleeve with concrete grout. Refer to Section 07840 "Firestopping".

2.5 EXPANSION FITTINGS

- A. Provide expansion fittings in all conduit, cable trays, and feeder bus duct runs that cross building expansion joints, both in concrete slabs and where exposed.

2.6 NAMEPLATES AND DIRECTORIES

- A. Identify switchgear, unit substations, motor controls, panelboards, safety switches, etc., with manufacturers' nameplate, shop order, where applicable on composite assemblies, and designations used on the Drawings.
- B. All identification shall comply with the requirements of SECTION 16050, Appendix "A".

PART 3 EXECUTION

3.1 ELECTRICAL DEMOLITION WORK

- A. General: Perform electrical demolition work in a systematic manner. Use such methods as outlined below to complete Work indicated on the Drawings.
- B. Obtain approval from the Owner prior to interrupting existing services. All service interruptions shall be at a time suitable to the Owner. Where the Owner approves service interruptions at times resulting in premium time work to this Contractor, this Contractor shall include the premium time in his Base Bid.
- C. Ring out circuits prior to deactivating feeders and branch circuits to insure maintaining electrical power in adjacent unrenovated area. Where removal of conduit and wire affects “downstream” circuits, refeed downstream circuits.
- D. Conduit in floor slabs shall be cut 1/2 inch below the floor and patched.
- E. Where applicable, existing in-place conduit may be reused for new work providing that the installation is in accordance with Section 16050.
- F. Where equipment or fixtures are removed, outlets shall be properly blanked-off, and conduits capped. After alterations are done, the entire installation shall present a “finished” look, as approved by the ARCHITECT-ENGINEER. The original function of the present electrical work to be modified shall not be changed unless required by the specific revisions to the system as specified or as indicated.
- G. Materials salvaged from this work shall not be reused except where reuse is specifically indicated.
- H. Existing electrical equipment removed, not reused and not specifically indicated to be turned over to the Owner shall be legally and properly disposed of off OWNER’S property.
- I. Existing electrical equipment specifically indicated to be turned over to the Owner shall be carefully disconnected, removed and turned over to the Owner in a storage area as directed by the Owner.

3.2 TEMPORARY SERVICES

- A. Provide temporary lighting, power and telephone service as described in Division 1.
- B. The existing building will be occupied during the building expansion. Maintain electrical services and provide necessary temporary connections and their removal at no additional expense.

3.3 CUTTING AND PATCHING

- A. Refer to Division 1 for requirements for cutting, patching and refinishing work necessary for the installation of Electrical Work.
- B. Direct miscellaneous cutting and patching of the existing building construction for the installation of the Electrical Work.
- C. The cutting of holes through the existing building construction shall only be done by the use of abrasive saws and rotary coring machines. The use of hammer and drill points will not be permitted. The openings shall not be cut larger than necessary for the installation of the electrical work. Openings shall then be grouted in. Where existing piping, etc. is removed, the unused openings shall be grouted in.
- D. The drilling or punching of structural members, such as holes through beams or columns, shall not be done without the specific permission of the ARCHITECT-ENGINEER.
- E. Cutting of holes through floors and walls shall be done only at such locations as may be directed by the ARCHITECT-ENGINEER.
- F. Cooperate with the other Contractors so that all cutting and repairing in any given area will be done simultaneously.
- G. Electrical work which may interfere with changes in piping, ducts or other mechanical equipment, as well as conduits and outlets that may be uncovered by the cutting of new openings in present building, shall be removed at the direction of the ARCHITECT-ENGINEER.

3.4 DAMAGE TO OTHER WORK

- A. The Electrical Trades will be responsible for all damage to other Work caused by their Work or through the neglect of their workers.
 - 1. All patching and repairing of any such damaged Work shall be performed by the trades which installed the Work, but the cost shall be paid by the Electrical Trades.

3.5 CHASES AND RECESSES

- A. Provide sizes and locations of chases and recesses affecting the electrical work for provision by general trades.

3.6 EXCAVATION AND BACKFILL

- A. Furnish excavating and backfilling to install work specified in the Electrical Division. Refer to electrical drawings and Section 02300 for methods and materials.

3.7 EQUIPMENT FOUNDATIONS AND SUPPORTS

- A. Furnish foundations and supports for electrical equipment and materials as required by codes, as listed hereinafter and shown or noted on the Drawings.
- B. Provide necessary inserts, rod, structural steel frames, brackets, platforms, etc., for equipment suspended from ceilings or walls, such as conduits, transformers, panels, etc.
- C. Inserts for equipment support shall be lead shield anchors for small work and expansion shields for large work. Wooden plugs will not be allowed. Do not use metal roof decking and cellular floors for supporting equipment.
- D. Provide and install concrete bases 4" above finished floor, with leveling channels, where noted, for floor-mounted equipment such as unit substations, transformers, switchboards, distribution panels, motor control centers, etc.

3.8 STRUCTURAL AND MECHANICAL INTERFERENCES

- A. Should construction conditions prevent the installation of switches, conduit, outlet boxes, junction boxes, conductors, lighting fixtures and/or other related equipment at locations shown on the drawings, minor deviations may be permitted and shall be as directed by the ARCHITECT-ENGINEER, and shall be made without additional cost to Owner.

3.9 COORDINATION WITH OTHER TRADES

- A. Install Work so as to avoid interferences with the Work of other trades. Be responsible for removing and relocating any work which, in the opinion of the OWNER'S REPRESENTATIVE, causes interferences.

3.10 ASSEMBLY OF EQUIPMENT

- A. The Contract Drawings and Specifications indicate items to be purchased and installed which are noted by a manufacturer's name, catalog number and/or brief description.
- B. The catalog number may not designate all the accessory parts and appurtenances required for the particular use or function.
- C. Arrange with the manufacturer for the purchase of all items required for the complete installation and efficient operation.

3.11 EQUIPMENT CONNECTIONS

- A. Connections to equipment, motors, lighting fixtures, etc., shall be made in accordance with the shop drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished. Any and all additional connections not shown on the Drawings but called for by the equipment manufacturer's shop drawings or required for the successful operation of the particular equipment furnished shall be installed as part of this Contract at no additional charge to the Owner.

3.12 TESTING DUCTS AND CONDUIT FOR OBSTRUCTIONS

- A. Ducts and conduits which are installed underground or concealed in concrete floor slab, foundations, etc., shall be cleared of foreign material and obstructions after installation and before conductor or pullwires are drawn in, by wire brushing, swabbing and employing an iron or hardwood mandrel which is ¼” smaller in diameter than the internal diameter of the duct or conduit. Pulling wires shall be left in empty conduits.

3.13 PHASING

- A. Identify general power and lighting feeder and branch circuits with a visual color code as an integral part of the outer jacket or as a printed color coding the entire length of the insulation in accordance with the NEC.

3.14 PAINTING

- A. In general, no painting is required by Electrical Trades other than touch-up of factory-finished electrical equipment.
- B. All factory finished electrical equipment shall be cleaned at completion of the job. Equipment showing rust or mars shall be thoroughly cleaned and sanded, prime coated and touched up with enamel of color to match original finish.

3.15 FIELD QUALITY CONTROL

- A. Tests and Inspection: When the systems are completed, operate equipment as directed by ARCHITECT-ENGINEER. Replace all faulty equipment. Make necessary adjustments before final acceptance.
 - 1. Tests shall include but not be limited to panels, lighting fixtures, receptacles, fire alarm system, generator transfer, sound systems, emergency lighting, branch circuits, etc.
 - 2. Test receptacles for polarity, opens, grounds, etc., using an approved receptacle tester, Hubbell #5200. Provide a letter to the Engineer stating that all equipment has been tested and adjusted properly.
 - 3. Perform all tests required by State, City, County and/or other agencies having jurisdiction.
 - 4. Provide all materials, equipment, etc., and labor required for tests.

3.16 CLEANING

- A. Keep premises free from accumulation of waste materials and rubbish. At completion of work remove all rubbish from and about the building and leave the electrical systems clean and ready for use.

- B. Final clean-up shall include washing of fixture lenses, switchboards, substations, transformers, motor control centers, distribution panels, lighting panels, etc., to remove shipping and/or construction dust and debris. Fixture reflectors and/or lenses with water marks or cleaning streaks will not be accepted.

END OF SECTION

Revision History	
Date	Rev. No.
A	0
B	0
D	0
E	0
F	0
02-19-09	0

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