

SECTION 260500

GENERAL REQUIREMENTS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 REFERENCES

A. As used in this section, "provide" means "furnish and install", "furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support and to store in a secure area in accordance with manufacturers instructions, and "install" means "to unload at the delivery point at the site or retrieve from storage, move to point of installation and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project".

1.2 EXAMINATION OF SITE

A. Before submitting a bid, the Electrical Contractor shall visit and carefully examine site to identify existing conditions and difficulties that may affect the work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions.
B. Before starting work in a particular area of the project, the Electrical Contractor shall examine the conditions under which work must be performed including preparatory work performed under other Trades, and report conditions that might adversely affect the work in writing to Construction Manager. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.3 SCOPE

A. The work to be accomplished under these specifications includes providing all labor, materials, equipment, consumable items, supervision, administrative tasks, tests and documentation required to install complete and fully operational electrical systems as described herein and shown on the Drawings. The Electrical Contractor shall completely coordinate the work of this section with the work of other trades.
B. The Electrical Contractor shall file plans, obtain permits and licenses, pay fees and obtain necessary inspections and approvals from authorities that have jurisdiction, as required to perform work in accordance with all legal requirements. The Electrical Contractor shall pay utility backcharges and excess costs and perform work in accordance with utility company requirements.
C. The Work shall be complete from point of service to each outlet or device with all accessory construction and materials required to make each item of equipment or system complete and ready for operation. The work shall include but not be limited to the following:
1. Complete power and lighting distribution systems including panelboards, overcurrent devices, raceway, cable and wire.
2. Branch circuits and devices for power and convenience receptacles.
3. Complete interior lighting system including normal and emergency fixtures, exit signs, lamps, controls, trim and accessories.
4. Extension of existing fire alarm and detection system including duct smoke detectors, auxiliary contacts for equipment interlocking, and other devices shown on the Drawings.
5. All motor and HVAC equipment, safety disconnects and motor starters unless integral with equipment.
6. Control wiring not provided by Division 23.
7. Grounding.
8. All support material and hardware for raceway and electrical equipment.
9. Branch circuits to control panels and devices furnished under other sections.
10. Termination of all cable and wire unless otherwise noted.
11. Sealing of ceiling, wall and floor penetrations.
12. Demolition.
13. Empty raceways for voice/data wiring.

1.4 RELATED WORK IN OTHER SECTIONS

A. The following work is not included in this Section and shall be performed under other sections:
1. Concrete work, including concrete housekeeping pads and other pads and blocks for vibrating and rotating equipment.
2. Cutting and patching of masonry, concrete, tile, and other parts of structure, with the exception of drilling for hangers and providing holes and openings in metal decks.
3. Painting.
4. Temporary water, heat, gas and sanitary facilities for use during construction.
5. Control wiring specifically indicated as part of Division 23.
B. The Electrical Contractor shall identify locations of penetrations, structural supports, etc. required for the completion of the Work of this Section to the General Contractor in a timely manner.

1.5 CODES, STANDARDS, AND AUTHORITIES

A. All work shall be performed strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities that have lawful jurisdiction. Additionally, materials and equipment shall be manufactured, installed and tested as specified in latest editions, (except where noted otherwise), of publications, standards, rulings, and determinations of:
1. Local and state building, plumbing, mechanical, electrical, fire and health department and public safety codes agencies.
2. International Building Code (IBC). 2003 edition.
3. International Fire Code (IFC). 2003 edition.
4. International Energy Conservation Code (IECC). 2003 edition.
5. National Fire Protection Association (NFPA)
6. Occupational Safety and Health Act (OSHA)
7. Factory Mutual Association (FM)
8. National Electrical Code (NEC). 2008 edition.
9. National Electrical Safety Code (NESC).
B. All materials and equipment shall be listed by Underwriters Laboratories (UL), and approved for intended service.
C. When requirements cited in this Paragraph conflict with each other or with Contract Documents, the most stringent requirements shall govern conduct of work.

1.6 CONTRACT DRAWINGS

A. Work to be performed under this section is shown on the Contract Drawings and described in the specifications.
B. The listing of electrical drawings does not limit responsibility of determining the full extent of work required by contract documents. The Electrical Contractor shall refer to architectural, plumbing, HVAC, structural, and other drawings and other sections that indicate types of construction with which work of this section must be coordinated. Electrical Contractor shall check with the General Contractor and other trades to determine whether there will be any interference by such trades with the electrical work. If the Electrical Contractor fails to check with the General Contractor and the electrical work is later found to interfere with their other work, the Electrical Contractor shall make necessary changes, without additional cost to the Owner, to eliminate such interference.
C. Drawings are diagrammatic and indicate general arrangement of systems and work included in contract. Information and components shown on riser diagrams or called for in the specifications but not shown on plans and vice versa, shall apply and shall be provided as though required expressly by both. It is not intended to specify or to show every offset, fitting, or component; however, contract documents require components and materials whether or not indicated or specified as necessary to make electrical installation complete and operational.

1.7 DISCREPANCIES IN DOCUMENTS

A. It shall be the responsibility of each bidder to examine the drawings and specifications carefully before submitting his bid. Any discrepancy discovered shall be brought to the immediate attention of the Engineer for resolution.
B. The drawings and these specifications are intended to comply with all the above mentioned rules and regulations. If discrepancies occur, the Electrical Contractor shall notify the Engineer of said discrepancies for resolution.

1.8 EQUIPMENT AND MATERIALS

A. All equipment and materials shall be new and of the quality specified. All materials shall be free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged during construction shall not be repaired at the jobsite, but shall be replaced with new materials.
B. All equipment installed on this project shall have local representation, local factory authorized service and a local stock of repair parts.
C. No equipment or material shall be installed in such a manner as to void a manufacturer's warranty. The Electrical Contractor shall notify the Architect of any discrepancies between the Contract Documents and manufacturer's recommendations prior to execution of the work.

1.9 RECORD DRAWINGS

A. As work progresses, and for duration of the Contract, the Contractor shall maintain a complete and separate set of prints of Contract Documents at the job site at all times and record work completed and all changes from original Contract.
B. At completion of work the Contractor shall submit a complete set of reproducible record drawings showing all systems as actually installed.

1.10 SHOP DRAWINGS

A. The Electrical Contractor shall obtain complete shop drawings, product data (and samples when requested) from manufacturers, suppliers, vendors, and Subcontractors for all materials and equipment specified herein, and submit data and details of such materials and equipment for review by the Architect and Engineer. Prior to submission of the shop drawings, product data and samples to the Architect, the Electrical Contractor shall review and certify that the shop drawings, product data and samples are in compliance with the Contract Documents. Further, the Electrical Contractor shall check all materials and equipment after their arrival on the jobsite and verify their compliance with the Contract Documents.
B. The shop drawing submittal shall include all data necessary for interpretation as well as manufacturer's name and catalog number. Sizes, capacities, colors, etc., specified on the drawings shall be specifically noted or marked on the shop drawings.
C. Submittals shall contain only information specific to systems, equipment and materials required by Contract Documents for this Project. Do not submit catalogs that describe products, models, options or accessories, other than those required, unless irrelevant information is marked out or unless relevant information is highlighted clearly.
D. If the Electrical Contractor proposes an item of equipment other than that specified or detailed on the drawings which requires any redesign of the wiring or any other part of the mechanical, electrical or architectural layout, the required changes shall be made at the expense of the trade furnishing the changed equipment at no cost to the Owner.
E. Manufacturer's names are listed herein and on the drawings to establish a standard for quality and design. Unless otherwise noted, where one manufacturer's name is mentioned, products of other manufacturers will be acceptable if, in the opinion of the Engineer the substitute material is of quality equal to or better than that of the material specified. Where two or more manufacturer's names are specified, material shall be by one of the named manufacturers only.

1.11 SPACE, EQUIPMENT ARRANGEMENT AND ACCESS

A. The size of equipment shown on the drawings is based on the dimensions of a particular manufacturer. Where other manufacturers are acceptable, it is the responsibility of the Electrical Contractor to determine if the equipment he proposes to furnish will fit the space available. Shop drawings shall be prepared by the Electrical Contractor when required by the Architect to indicate a suitable arrangement.
B. Locate all equipment that must be serviced, operated or maintained in fully accessible positions. Minor deviations from the drawings may be made to allow for better accessibility at no additional cost to the Owner, but changes shall not be made without review by the Architect.
C. Minimum clearances in front of or around equipment shall conform to the latest applicable NEC code requirements.
D. Panelboard labels shall be self adhesive and indicate panel name, voltage, amperage and where panelboard is fed from.
E. All variable frequency drives, starters, disconnect switches and fire alarm panels shall be marked with engraved laminated plastic plates, minimum 1/2" high with 1/4" engraved letters.
F. Cardholders for panelboards shall be filled out with typewritten identification of each circuit, except that the word "spare" shall be written in soft pencil to identify all circuit breakers installed that are not used.
G. All receptacles and switches shall be labeled with panelboard and circuit number that feeds device. Labels shall be white with black type, self adhesive Brother PTouch or equal.
H. All boxes and fittings for the fire alarm system shall be painted red.
I. All boxes and fittings for the emergency power system shall be painted orange.

1.12 MARKING AND LABELING

A. Panelboard labels shall be self adhesive and indicate panel name, voltage, amperage and where panelboard is fed from.
B. All variable frequency drives, starters, disconnect switches and fire alarm panels shall be marked with engraved laminated plastic plates, minimum 1/2" high with 1/4" engraved letters.
C. Cardholders for panelboards shall be filled out with typewritten identification of each circuit, except that the word "spare" shall be written in soft pencil to identify all circuit breakers installed that are not used.
D. All receptacles and switches shall be labeled with panelboard and circuit number that feeds device. Labels shall be white with black type, self adhesive Brother PTouch or equal.
E. All boxes and fittings for the fire alarm system shall be painted red.
F. All boxes and fittings for the emergency power system shall be painted orange.

1.13 WIRING METHODS

A. Above Grade Wiring.
Unless otherwise noted, all wiring shall be installed in raceway. Wiring shall be installed as follows:
1. All feeders and motor branch circuit wiring shall be installed in electrical metallic tubing (EMT). Flexible conduit shall be permitted for final connections to lighting and motors.
2. All raceway and wiring shall be concealed in finished spaces and exposed in unfinished spaces.
3. All fire alarm system wiring shall be single conductor wiring installed in EMT.
4. Branch circuit wiring to lighting and receptacles shall be installed in electrical metallic tubing (EMT). When run exposed and hospital grade MC cable when installed within wall cavities and above ceiling.
5. All exterior wiring to be run in rigid steel conduit.

END OF SECTION 260500

SECTION 260519

LOW VOLTAGE ELECTRICAL CONDUCTORS

PART 1 - GENERAL

1.1 GENERAL

A. The provisions of Section 260500, General Requirements for Electrical Work apply to the Work of this Section.

1.2 CODES AND STANDARDS

A. Products shall comply with the following codes and standards and shall be UL-listed and labeled:
ASTM B-3 Soft or Annealed Copper Wire
ASTM B-8 Concentric Lay Stranded Copper Conductors
NEMA WC-5 Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
UL 44 Rubber Insulated Wires and Cables
UL 83 Thermoplastic Insulated Wires and Cables

1.3 SUBMITTALS

A. Manufacturer's product data sheets.

1.3 SUBMITTALS

A. Manufacturer's product data sheets.

PART 2 - PRODUCTS

2.1 GENERAL

A. All conductors shall be annealed copper in accordance with ASTM B-3.
B. The jacket of all wire shall be printed with the following information:
1. Manufacturer
2. Size
3. Insulation type
4. Maximum voltage
5. UL label
C. All insulation shall be rated 600 volt.

2.2 POWER WIRING

A. Feeders and motor branch circuits shall be type THHN/THWN.
B. All power wiring shall be stranded, Class B strand in accordance with ASTM B-8, minimum size #12 AWG.

2.3 BRANCH CIRCUITS

A. All lighting and convenience receptacle branch circuit wiring shall be type THHN/THWN.
B. Branch circuit wiring shall be solid or stranded conductor, minimum size #14 AWG.

2.4 CONTROL WIRING

A. Wiring for control circuits shall be THHN/THWN.
B. Control wiring shall be stranded, Class B strand in accordance with ASTM B-8, minimum size #14 AWG.

2.5 FIXTURE WIRE

A. Where high temperature fixture wire is required it shall be silicone rubber type SF-2.

PART 3 - EXECUTION

3.1 GENERAL

A. All wire shall be installed in accordance with Section 260560, Installation of Wire and Cable.

END OF SECTION 260519

SECTION 260526

GROUNDING

PART 1 - GENERAL

1.1 GENERAL

A. The provisions of Section 260500, General Requirements for Electrical Work, apply to the work of this Section.
B. The Electrical Contractor shall provide grounding where required including grounding electrode conductors, bonding jumpers, equipment grounding conductors, connections and other materials as may be required.

1.2 CODES AND STANDARDS

A. Products shall comply with the following codes and standards and shall be UL listed and labeled.
NFPA 70 National Electrical Code
UL 467 Grounding and Bonding Equipment

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated grounding conductors shall be stranded copper with Type TW, THW or THHN/THWN insulation colored green.

PART 3 - EXECUTION

3.1 EQUIPMENT GROUNDING CONDUCTORS

A. A separate insulated green copper conductor shall be installed as an equipment grounding conductor in all raceway and with every feeder, branch circuit and control circuit. This shall be in addition to the grounded metallic conduit system.
B. All equipment grounding conductors shall be terminated at both ends.

3.2 RACEWAY AND EQUIPMENT

A. All raceway and non-current carrying metal equipment and enclosures shall be electrically continuous and bonded to the grounding system.
B. Where equipment is provided with a ground bus, all equipment grounding conductors shall be terminated on the bus. The Electrical Contractor shall perform all drilling and tapping required and provide all hardware.

END OF SECTION 260526

SECTION 260560

INSTALLATION OF WIRE AND CABLE

PART 1 - GENERAL

1.1 GENERAL

A. The Provisions of Section 260500, General Requirements for Electrical Work, apply to the Work of this Section.

1.2 CODES AND STANDARDS

A. Products shall comply with the following codes and standards and shall be UL-listed and labeled where applicable.
UL 486A Wire Connectors and Soldering Lugs for use with Copper Conductors.
UL 510 Electrical Insulating Tape

PART 2 - PRODUCTS

2.1 WIRE AND CABLE

A. Wire and cable are specified in other Sections of Division 26.

2.2 TERMINATIONS AND SPLICES

A. Power Wiring:
1. Terminal lugs, connectors and splices shall be tin plated, high conductivity copper compression type. They shall have chamfered barrels and be permanently identified with conductor sizes.
2. Terminal lugs for conductors No. 3/0 AWG and larger shall be long barrel NEMA two hole type.
3. Splices shall be long barrel butt type with a center stop in the splice barrel.
4. Hydraulic crimping tools with proper die sizes which require full closure before reopening shall be used.

B. Lighting and branch circuits

1. Splices and taps in lighting and branch circuit wiring shall be 3M Scotchlok spring connectors or equal.

PART 3 - EXECUTION

3.1 PREPARATION OF RACEWAYS

A. Raceways shall be substantially completed before any wiring is installed in them. Before any wiring is pulled into a conduit, the conduit shall be cleaned and tested for obstructions and cleared of foreign material that may be found.

3.2 PULLING INTO RACEWAYS

A. All possible care shall be taken in pulling of wiring into conduits or other raceways. The cable reels or coils shall be set up in such a way that the conductor may be trained into the raceway as directly as possible with a minimum number of changes of direction or amount of bending. Where several cables are contained in one conduit, all such cables shall be pulled in together.
B. The use of pulling lubricants shall be restricted to non-hardening type, approved by UL and the cable manufacturer.

3.3 SPLICES AND TERMINATIONS

A. All power and control wiring shall be continuous and shall not be spliced unless otherwise indicated on the Drawings.
B. Bolts, nuts and hardware used for terminations shall be silicone bronze.
C. Where terminations are made on insulated buses, the terminations shall be insulated using the proper tape(s) and fillers for the voltage level of the cable.
D. Connections in motor terminal boxes shall be made by installing compression type lugs on the motor branch circuit conductors and the motor leads and bolting the lugs together then insulating with motor lead connection kits, Raychem, 3M or equal.

3.4 IDENTIFICATION

A. All power wiring conductors shall be color coded as follows:

Table with 3 columns: Phase, Color, and Voltage. Phase A: Black, Brown, 208Y/120V. Phase B: Red, Orange, 480Y/277V. Phase C: Blue, Yellow. Neutral: White, Gray. Ground: Green.

END OF SECTION 260560

SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.1 GENERAL

A. The provisions of Section 260500, General Requirements for Electrical Work, apply to the Work of this Section.

1.2 CODES AND STANDARDS

A. Products shall comply with the following codes and standards and shall be UL-listed and labeled:
NEMA AB-1 Molded Case Circuit Breakers
NEMA PB-1 Panelboards
UL 50 Enclosures for Electrical Equipment
UL 67 Panelboards
UL 489 Molded Case Circuit Breakers and Circuit Breaker Enclosures

1.3 SUBMITTALS

A. Manufacturer's product data sheets.
B. Circuit breaker schedules.
C. Dimensioned plans, elevations, sections and details.

1.4 MANUFACTURERS

A. Subject to compliance with the requirements of this Section:

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Approved equal

PART 2 - PRODUCTS

2.1 GENERAL

A. Panelboards shall be of the sizes, rating and arrangement shown on the Drawings.
B. Panelboards shall be provided complete with all overcurrent devices, accessories and trim.
C. All panelboards shall be provided with safety barriers for dead front construction.
D. The required short circuit ratings of assembled panelboards are shown on the drawings. The short circuit rating of every overcurrent device in the panel shall meet or exceed the panel rating. Unless otherwise noted on the drawings, series rated combinations will not be permitted.

2.2 CABINETS

A. Boxes shall be code gauge galvanized sheet steel.
B. Trim shall be code gauge steel, ANSI-61 gray finish with stainless steel flush type lock/latch handle. All locks shall be keyed alike.
C. Trim for surface mounted panels shall be door-in-door construction such that the gutter space may be exposed by a hinged door.
D. Directory frames shall be metal frame with plastic covers.

2.3 BUS

A. All bus work shall be copper.
B. Neutral busses shall be 100% rated with adequate connections for all outgoing neutral conductors.
C. Panelboards shall be provided with copper ground busses.
D. Bus shall be designed for sequence phase connection to allow the installation of one, two or three pole branch circuit breakers in any position.

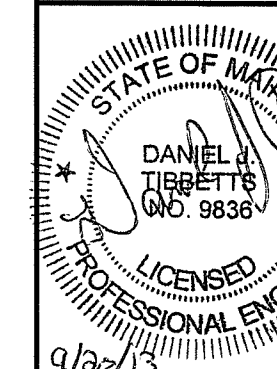
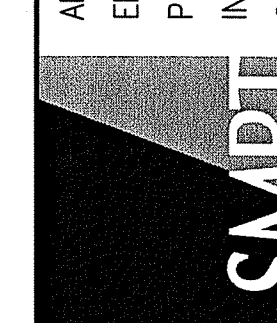
2.4 OVERCURRENT DEVICES

A. Overcurrent devices shall be trip-free molded case, bolt-on, thermal-magnetic circuit breakers.
B. Front faces of all circuit breakers shall be flush. Trip indication shall be clearly shown by the handle position between the ON and OFF positions.
C. All connections shall be rated for 75° C copper conductors.

END OF SECTION 262416

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