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. Power branch circuit panels, transformers and distribution systems including overcurrent devices, raceway, cable, wire and devices.

2. Grounding.

3. All support material and hardware for raceway and electrical equipment.

4. Termination of all cable and wire unless otherwise noted.

5. Sealing of ceiling, wall and floor penetrations.

6. Demolition.

1.4 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). 2009 edition.

3. International Fire Code (IFC). 2009 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). 2011 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.

1.5 CONTRACT DRAWINGS

A. Work to be performed under this section is shown on the Contract Drawings and described in the specifications.

B. 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.

1.6 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 Construction Manager 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 Architect of said discrepancies for resolution.

1.7 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.

1.8 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 as specified in Division 1.

1.9 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 owner.

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. Shop Drawings shall include as a minimum panelboards, transformers, light fixtures, lighting controls, receptacles and switches, conduit, wire and cable.

1.11 MARKING AND LABELING

A. All conduits shall be labeled at each end indicating the location of the opposite end of the conduit run. Junction boxes with circuits provided for future use shall be labeled with appropriate circuit designation.

B. Cardholders for panelboards shall be updated 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. Owner assigned room numbers are to be used and not construction drawing numbering unless owner numbering is not provided.

C. All receptacle wall plates shall be permanently labeled with the panel and circuit number.

1.12 WIRING METHODS

A. Above Grade Wiring.

Unless otherwise noted all wiring shall be either MC, AC or 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 transformers, lighting and motors.

2. All raceway and cables shall be concealed from within finished rooms. Surface raceway will only be allowed with prior approval by the architect.

3. Branch circuit wiring shall be type AC or MC cable.

END OF SECTION 260500

LOW VOLTAGE ELECTRICAL CONDUCTORS AND DEVICES

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.

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 XHHW–2.

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 #12 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.

2.6 STRAIGHT–BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5–20R, UL 498, and FS W–C–596.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 5351 (single), CR5362 (duplex).
b. Hubbell; HBL5351 (single), HBL5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).
e. Wiring devices shall be ivory.

2.7 WALL PLATES

A. Screws: Metal with head color to match plate finish.
B. Material: Smooth, high–impact thermoplastic, color to match device.

PART 3 – EXECUTION

3.1 GENERAL

A. All wire and devices 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 CONNECTIONS

A. Connections to equipment ground busses or pads shall be compression type lugs, bolted to the bus or pad.

B. Grounding connections shall be made to clean, dry surfaces. All scale, rust, paint, grease and other contamination shall be removed prior to making connections. Upon completion of welded connections, all slag shall be removed.

3.3 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 265100

LIGHTING FIXTURES

PART 1 – GENERAL

1.1 GENERAL

A. Provisions of Section 260500, General Requirements for Electrical Work and Section 260560, Installation of Wire and Cable 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:

CBM Labels	Certified Ballast Manufacturers Assoc.
NEC Art. 410	National Electrical Code
FCC, Part 18	RFI and EMI
ANSI C62.41	Line Transient Protection
UL 1570	Fluorescent Lighting Fixtures
UL 924	Emergency Lighting and Power Equipment
UL 1088	Temporary Lighting

1.3 SUBMITTALS

A. Submit manufacturer's product data, photometrics, and installation instructions for each type of light fixture specified. Fixture submittals shall be in booklet form with separate sheet for each fixture assembled in "luminaire type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet.

B. Submit on a separate sheet for each fluorescent fixture type specified, the ballast manufacturer, type and technical data for that ballast.

C. Submit on a separate sheet for each light fixture specified, the proposed lamp and manufacturers data for that lamp.

1.4 MANUFACTURERS

A. Provide products of the manufacturers specified on the contract drawings and as listed under Part 2 of this section.

PART 2 – PRODUCTS

2.1 GENERAL

A. Light fixtures shall be provided with housings, trims, ballasts, lamp holders, sockets, reflectors, wiring and other components required, as a factory–assembled unit for a complete installation.

B. Provide electrical wiring within light fixtures suitable for connecting to branch circuit wiring in accordance with N.E.C. Article 410, Paragraph 52.

C. Deliver interior lighting fixtures in factory fabricated containers and wrapping, which properly protect fixtures from damage.

D. Store interior lighting fixtures in original packaging. Store inside well–ventilated area protected from weather, moisture, soiling, humidity, extreme temperatures, laid flat and on skids to keep off floors and ground.

E. Fixtures installed in ceilings, suspended from ceilings or on walls shall have a plastic film covering protecting lens, louver and lamps from dust, dirt and debris. Plastic film shall not be removed until construction is completed.

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. Lighting and branch circuits

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

B. Metal clad cable connectors.

1. For non–jacketed metal clad cable in dry locations, cable terminations shall be O.Z. Gedney Type PK for use with galvanized steel armor or Type PK–A for use with aluminum armor. Cable terminations shall be provided with locknuts and bushings.

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. All terminations shall be properly torqued and provided with Belleville washers.

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:

Phase	208Y/120V	480Y/277V
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

3.5 RECEPTACLE INSTALLATION

A. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.

2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

4. Existing Conductors:
a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

B. Device Installation:

1. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.

2. Use side wiring with binding–head screw terminals. Wrap solid conductor tightly clockwise, two–thirds to three–fourths of the way around terminal screw.

3. Use a torque screwdriver when a torque is recommended or required by manufacturer.

4. When conductors larger than No. 12 AWG are installed on 15– or 20–A circuits, splice No. 12 AWG pigtails for device connections.

5. Tighten unused terminal screws on the device.

6. When mounting into metal boxes, remove the fiber or plastic washers used to hold device–mounting screws in yokes, allowing metal–to–metal contact.

C. Receptacle Orientation: Retain first subparagraph below if the position of the ground pin is important for consistency. Trade and professional literature is inconsistent in recommending benefits of either orientation.

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

D. Device Plates: Do not use oversized or extra–deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

E. Identification: Identify each receptacle with panelboard identification and circuit number. Use stamped, machine printing with black–filled lettering on face of plate.

END OF SECTION 260560

ASD

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