SECTION 26 01 00 - BASIC ELECTRICAL REQUIREMENTS

part 1 – GENERAL

* + - 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
				2. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.
			2. SUMMARY
				1. Drawings are necessarily diagrammatic by their nature and are not intended to show every connection in detail or every pipe or conduit in its exact location. Carefully investigate structural and finish conditions and coordinate the separate trades in order to avoid interference between the various phases of Work. Organize and lay out Work so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Install all Work parallel or perpendicular to building lines unless otherwise noted.
				2. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Owner’s Project Manager for Owner’s interpretations.
				3. Coordinate the actual locations of electrical outlets and equipment with building features and equipment as indicated on architectural, structural, mechanical, and plumbing Drawings. Review any proposed changes in electrical wiring devices or equipment location with the Owner’s Project Manager. Owner may direct relocation of outlets before installation, up to five (5) feet from the position indicated, without additional cost. Remove and relocate outlets placed in an unsuitable location when requested by the Owner, at no additional cost to the Owner.
				4. All dimensional information related to new structures shall be taken from the appropriate Drawings. All dimensional information related to existing facilities shall be taken from actual measurements made by the Contractor on the Site.
				5. Existing Structures: The building floor slabs, structure, and outer walls are generally existing to remain. The only existing penetrations are openings where indicated on the Drawings. This Contract requires the Contractor to core drill all other floor or wall penetrations as required. All floor penetrations shall include a sleeve that extends two (2) inches above the floor. Bus duct penetrations shall have a minimum 4-inch high curb as per NEC requirement or per drawing, whichever is higher.
			3. REFERENCE STANDARDS
				1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
				2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
				3. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the Contract Documents.
			4. definitions
				1. Concealed: Concealed areas are those areas that cannot be seen by building occupants.
				2. Exposed: Exposed areas are all areas that are exposed to view by building occupants, including areas below counter tops, inside cabinets and closets, inside all equipment rooms, and areas outside the building exterior envelope, exposed to the outdoors.
			5. QUALITY ASSURANCE
				1. Regulations: Work, materials and equipment shall comply with the latest rules and regulations specified in National Fire Protection Association (NFPA).
				2. Discrepancies: The Drawings and Specifications are intended to comply with listed codes, ordinances, regulations and standards. Where discrepancies occur, immediately notify the Owner’s Project Manager in writing and ask for an interpretation. Should installed materials or workmanship fail to comply, the Contractor is responsible for correcting the improper installation at no additional cost to the Owner. Additionally, where sizes, capacities, or other such features are required in excess of minimum code or standards requirements, provide those specified or shown.
				3. Contractor Qualifications: An acceptable Contractor for the Work under this Division must have personnel with experience, training and skill to provide a practical working system. The Contractor shall furnish acceptable evidence of having installed not less than three systems of size and type comparable to this Project. All personnel installing equipment under this Division shall possess the valid AHJ Licensing requirements for their skill level. Each Journeyman shall supervise no more than two apprentice helpers. Refer also to Owner’s Special Conditions.
			6. SUBMITTALS
				1. Product Data: Provide coordination Drawings with submittals as required by Division 01.
				2. Record Documents: In addition to hard copy format, all material submitted as final record products, including approved Shop Drawings and submittals, shall be submitted to the Owner in its original electronic file format on compact disc or DVD. Material may be scanned into electronic file format where necessary.
			7. DELIVERY, STORAGE and HANDLING
				1. All equipment and materials shall be delivered to the Project Site clean and sealed for protection.
				2. Moisture: During construction, protect switchgear, transformers, motors, control equipment, and other items from insulation moisture absorption and metallic component corrosion by appropriate use of strip heaters, lamps or other suitable means. Apply protection immediately upon receiving the products and maintain continually.
				3. Damage: Take such precautions as are necessary to protect apparatus and materials from damage. Failure to protect materials is sufficient cause for rejection of the apparatus or material in question.
				4. Finish: Protect factory finish from damage during construction operations until acceptance of the Project. Restore any finishes that become stained or damaged to Owner’s satisfaction.
1. PRODUCTS
	* + 1. GENERAL
				1. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
				2. Equipment and control systems should match, integrate, communicate or cooperate with Owner’s existing systems, such as power monitoring systems, building automation, fire alarm, motor control centers, switchgears, breakers, transformers, and lighting dimming systems.
				3. Conditions: Provide new products of manufacturers regularly engaged in production of such equipment. Provide the manufacturer's latest standard design for the type of product specified. Products shall be U.S. made. Owner reserves the right to approve or disapprove foreign-made products.
				4. NEC and UL: Products shall conform to requirements of the National Electrical Code. Where Underwriters' Laboratories have set standards, listed products and issued labels, products used shall be listed and labeled by UL.
				5. Space Limitations: Equipment selected shall conform to the building features and shall be coordinated with all components. Do not provide equipment that will not meet arrangement and space limitations. Contractor shall submit room layouts with submitted items shown drawn to scale. Submittals will be rejected without floor plan Drawings showing submitted items.
				6. Factory Finish: Equipment shall be delivered with a hard surface, factory-applied finish so that no additional field painting is required except for touch-up.
				7. Common Source: Equipment specified in Sections 26 22 13, 26 23 00, 26 24 16, 26 24 19, 26 28 17, 26 29 14, 26 43 13 shall be provided by the same manufacturer.
				8. Series Ratings: Overcurrent devices shall have fully rated interrupting capacity. Series rating of devices is unacceptable.
			2. EQUIPMENT AND DEVICE MARKING
				1. Designations: Externally mark all equipment, devices, feeders, branch circuits and similar items with nameplates with the same designations as indicated on the Contract Documents.
				2. Nameplates shall be black laminated rigid phenolic with white core or owner approved equal. Emergency nameplates shall be red laminated phenolic with white cores. Nameplate minimum size shall be 1 inch high by 3 inches long with 3/16 inch high engraved white letters. Supply blank nameplates for spare units and spaces.
				3. Nameplate Fasteners: Fasten nameplates to the front of equipment only by means of stainless steel self-tapping screws. Stick-ons or adhesives are not acceptable unless the NEMA enclosure rating is compromised, then only epoxy adhesive shall be used to attach nameplates.
				4. Nameplate Information: The general naming convention shall consist of the following segments:

Building name in abbreviated form where equipment is located;

Building floor where electrical equipment is located;

Electrical system type: NP (normal power), EP (emergency power), LS (life safety branch), CB (critical branch), EB (equipment system branch);

System voltage: M (medium voltage), H (277/408V) or L (120/208V);

Individual equipment identification: A, B, C, etc.

* + - * 1. In general, provide the following information for the types of electrical equipment as listed:

Switchgears, Switchboards, Distribution Panels and Motor Control Centers: On mains, identify the piece of equipment, the source, and voltage characteristics (i.e., 480/277\/ 3PH 4W). For each branch circuit protective device, identify the load served.

Transformers, Individual Starters, Contactors, Disconnect Switches, Transfer Switches and Similar Equipment: Identify the device designation, voltage characteristics source and load served.

Panelboards: Identify panelboard designation, voltage characteristics, and source designation.

* + - * 1. Panelboards: Prepare a neatly typed circuit directory behind clear heat-resistant plastic in a metal frame tack welded to the inside of the door for each panelboard. Identify circuits by equipment served and by building room numbers as indicated on the Construction Documents where room numbers exist. Indicate spares and spaces with light, erasable pencil marking. Adhesive mounted directory pocket is not acceptable. Removing and attaching panel schedules from the Drawings is not acceptable.
				2. Panelboards, Pull, Junction and Outlet Boxes:

With ½ inch high permanent lettering, identify conduits connected to panelboards, pull, junction and outlet boxes with the complete circuit number of the conductors contained therein. Neutral conductors shall be identified by wire marker tags in the panelboards, pull, junction and outlet boxes. Where multiple circuits are contained in a box, identify the circuit conductors with permanent tags which indicate circuit designation.

Emergency circuits (only) shall be marked in red boxes and covers (or colors designated for one of three emergency branches for hospital and patient care areas) and circuit designation marked on the face.

Fire alarm circuits (only) shall be marked with half red covers and “Fire Alarm” marked on the face.

* + - * 1. Equipment and raceways over 600 Volts: Provide “WARNING - HIGH VOLTAGE - KEEP OUT” signs on all equipment. With 2 inch-high white lettering on yellow plastic, mark all exposed raceways containing conductors operating in excess of 600 volts every 100 feet and at each wall or floor penetration with the words "WARNING - HIGH VOLTAGE”.
				2. Equipment and raceways below 600 Volts: Provide “WARNING – LOW VOLTAGE – KEEP OUT” signs on all equipment. With 2 inch-high white lettering on blue plastic, mark all exposed raceways containing conductors operating in less than 600 volts every 100 feet and at each wall or floor penetration with the words “WARNING – LOW VOLTAGE”.
				3. Power receptacles, wall switches and dedicated outlets. Identify circuits as per Specification Section 26 27 26.
				4. Dedicated outlets: Dedicated is understood to be specific equipment listed by equipment number in the panel schedules or identified on the Drawings. Dedicated also includes computer outlets.
				5. Remote Ballasts: For remote ballasts not within five (5) feet of their associated lighting fixture, provide appropriate permanent lettering on both the ballasts and the light fixture to identify which are mated to the other.
			1. INDUSTRIAL CONTROL PANELS
				1. The scope of the work does not intend to cover the Integrated Automation System, neither the design for a functional process control system. It is not intended to apply to the wirings that form an integral part of the equipment, such as motors, controllers, or factory assembled control equipment or listed utilization equipment. It intends to provide the guideline for constructing Industrial Control Panels defined by NFPA 70 Article 409.
				2. The electrical requirements pertaining to, but not limited to, branch circuits, luminaires, motor circuits and controllers, air-conditioning and refrigerating equipment, hazardous locations, short-circuit and ground-fault protection, overcurrent/overload protection, industrial machinery, etc. shall be in accordance with the applicable requirements from the specific articles in NFPA 70 Article 409 Table 409.3.
				3. Industrial Control Panels shall be built in accordance with the requirements of Division 25 Integrated Automation System, and shall utilize components that are UL listed, UL recognized, or specified by MDACC specifications. Component manufacturers shall have an established network of product distribution for parts replacement. The nearest distribution point shall be within 50 miles of the Project Site.
				4. Multi-section industrial control panels shall be bonded together with an equipment grounding conductor or an equivalent equipment grounding bus sized in accordance with NFPA 70 Article 250. Equipment grounding conductors shall be connected to this equipment grounding bus or to equipment grounding termination point provided in a single-section industrial control panel.
				5. NFPA 70 Article 110 Table 110.20 shall be used as the basis for selecting industrial control panel enclosures for use in specific locations other than hazardous (classified) locations. Industrial control panel enclosures shall not be used as junction boxes, auxiliary gutters, or raceways for conductors feeding through or tapping off to other switches or overcurrent devices or other equipment, unless the conductors fill less than 40 percent of the cross-sectional area of the wiring space.
				6. The phase arrangement on 3-phase horizontal common power and vertical buses shall be A, B, C from front to back, top to bottom, or left to right, as viewed from the front of the industrial control panel.
				7. Spacing between live bare metal parts in feeder circuits shall not be less than specified in NFPA 70 Article 430 [Table 430.97](http://codesonline.nfpa.org/a/c.ref/2011_tab_NFPA-70_430.97/table).
				8. Control panel internal wiring shall be installed neatly in panduit system.
1. EXECUTION
	* + 1. demolition
				1. Unless otherwise noted, remove all electrical materials and equipment from areas indicated for demolition. Removal of equipment shall not interfere with existing operations.
				2. Remove conduit and wire back to panelboards or to nearest junction box that is not being removed and needs to remain in service. Wire shall be removed back to point of origin. Turn off circuit breakers or switches serving abandoned circuits and tag breaker or switch and label in panel schedule as “Spare”.
				3. Materials and equipment to be removed, except items specifically noted to be relocated or delivered to the Owner, become property of the Contractor and shall be immediately removed from the Project Site. If the Owner identifies other items during construction, those items become Owner property and will be turned over to the Owner.
				4. Electrical services and controls to items being removed shall be disconnected and removed from the Project Site.
				5. All fluorescent lighting fixtures being removed from the Project Site that will not be turned over to the Owner shall have any PCB-containing ballasts removed from the fixtures for environmental disposal. Ballasts shall remain intact with wire leads at least twelve (12) inches long.
				6. Contractor shall ensure that light switches within the Work area remain operational. Where temporary 120 volt light strings are installed, a switch shall be provided for the light strings near the Project entry door.
			2. INSTALLATION
				1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
				2. Installation shall be in accordance with manufacturer’s published recommendations.
				3. Cooperation with Other Trades: Cooperate with trades of adjacent, related or affected materials or operations, and with trades performing continuations of this Work in order to effect timely and accurate placing of Work and to coordinate, in proper and correct sequence, the Work of such trades.
				4. Workmanship: Work shall be performed by competent workers skilled in their trade. This installation must be complete.
				5. Housekeeping Pads: Unless otherwise noted. Install 3 1/2 inch thick concrete foundation pads for indoor floor-mounted equipment, except where direct floor mounting is required. Pour pads on roughened floor slabs, sized so that outer edges extend a minimum of 3 inches beyond equipment. Trowel pads smooth and chamfer edges to a 1 inch bevel. Secure equipment to pads as recommended by the manufacturer.
				6. Setting of Equipment: Equipment must be leveled and set plumb. Sheet metal enclosures mounted against a wall must be separated from the wall not less than 1/4 inch by means of corrosion-resistant spacers or by 3 inches of air for freestanding units. Use corrosion resistant bolts, nuts and washers to anchor equipment. Provide Drawings and layout Work showing exact size and location of sleeves, openings or inserts for electrical equipment in slabs, walls, partitions and chases in sufficient time to be coordinated with Work under other divisions.
				7. Sealing of Equipment: Seal openings into equipment to prevent entrance of animals, birds and insects.
				8. Motors: Electrical Work includes the electrical connection of all motors, except those that are wired as a part of equipment.
				9. Concealed Work: Conceal all electrical Work in walls, floors, chases, under floors, underground, and above ceilings except:

Where shown or specified to be exposed. Exposed is open to view.

Where exposure is necessary to the proper function.

Where size of materials and equipment preclude concealment.

* + - * 1. Application: Unless otherwise indicated, power will be utilized as follows:

480 volts, three phase: Motors ¾ horsepower and larger and electric heating equipment.

120 volts, single phase: Motors ½ horsepower and smaller.

120 volts, single phase: Incandescent lighting and fluorescent task lighting.

277 volts, single phase: Fluorescent and high-intensity-discharge lighting and electric heating equipment.

120 volts, single phase: Convenience outlets.

208 volts, single and three phase: Power outlets.

* + - * 1. Transformers: Use transformers to change the service to the required utilization voltages.
				2. Provide final electrical connections to equipment furnished under other divisions and by the Owner. Furnish detailed Shop Drawings of equipment indicating the exact number and location of rough-in points. Such final Shop Drawings may indicate adjustments in total number and exact location of rough-in points, and in equipment dimensions. Making adjustments to field conditions is considered a part of the Work required.

Roughing-in: When roughing-in electrical branch circuits to various items of equipment, terminate at proper points as indicated on detailed equipment Shop Drawings or as directed by Owner. Do not rely on Drawings accompanying these Specifications for rough-in locations, only for general routing of circuiting.

Final Connections: Laboratory casework, medical equipment, and food service equipment will include service fittings such as switches, duplex receptacles, lighting fixtures, etc., on the casework or equipment. Provide branch circuit connections to meet service fitting requirements.

* + - * 1. Refer to Divisions 07 and 09 for sealing and firestopping requirements where raceways penetrate smoke, fire, and sound rated walls.
				2. All unused openings such as but not limited to, knockouts on panels and boxes, surface wireway openings, busway openings, circuit breaker empty slots shall be covered with approved cover plates.
				3. Temporary power equipment and distribution for construction shall not occupy building spaces or block pathways that are designated for permanent installation of other trades according to design drawings.

END OF SECTION 26 01 00