

SECTION 26 05 11
REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, applies to all sections of Divisions 26, 27, and 28.
- B. Furnish and install electrical wiring, systems, equipment and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, cable, switchboards, switchgear, panelboards, motor control centers, and other items and arrangements for the specified items are shown on drawings.
- C. Electrical service entrance equipment (arrangements for temporary and permanent connections to the power company's system) shall conform to the power company's requirements. Coordinate fuses, circuit breakers and relays with the power company's system, and obtain power company approval for sizes and settings of these devices.
- D. Wiring ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways accordingly sized. Aluminum conductors are prohibited.

1.2 MINIMUM REQUIREMENTS

- A. References to the National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL) and National Fire Protection Association (NFPA) are minimum installation requirement standards.
- B. Drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the above standards.

1.3 TEST STANDARDS

- A. All materials and equipment shall be listed, labeled or certified by a nationally recognized testing laboratory to meet Underwriters Laboratories, Inc., standards where test standards have been established. Equipment and materials which are not covered by UL Standards will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as NEMA, or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.

B. Definitions:

1. Listed; equipment or device of a kind mentioned which:
 - a. Is published by a nationally recognized laboratory which makes periodic inspection of production of such equipment.
 - b. States that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.
2. Labeled; equipment or device is when:
 - a. It embodies a valid label, symbol, or other identifying mark of a nationally recognized testing laboratory such as Underwriters Laboratories, Inc.
 - b. The laboratory makes periodic inspections of the production of such equipment.
 - c. The labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.
3. Certified; equipment or product is which:
 - a. Has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner.
 - b. Production of equipment or product is periodically inspected by a nationally recognized testing laboratory.
 - c. Bears a label, tag, or other record of certification.
4. Nationally recognized testing laboratory; laboratory which is approved, in accordance with OSHA regulations, by the Secretary of Labor.

1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)

- A. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.
- B. Product Qualification:
1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
 2. The Government reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.
- C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of

notification that service is needed. Submit name and address of service organizations.

1.5 MANUFACTURED PRODUCTS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts shall be available.
- B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
 - 1. Components of an assembled unit need not be products of the same manufacturer.
 - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
 - 3. Components shall be compatible with each other and with the total assembly for the intended service.
 - 4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Testing Is Specified:
 - 1. The Government shall have the option of witnessing factory tests. The contractor shall notify the VA through the Resident Engineer a minimum of 15 working days prior to the manufacturers making the factory tests.
 - 2. Four copies of certified test reports containing all test data shall be furnished to the Resident Engineer prior to final inspection and not more than 90 days after completion of the tests.
 - 3. When equipment fails to meet factory test and re-inspection is required, the contractor shall be liable for all additional expenses, including expenses of the Government.

1.6 EQUIPMENT REQUIREMENTS

Where variations from the contract requirements are requested in accordance with Section 00 72 00, GENERAL CONDITIONS and Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

1.7 EQUIPMENT PROTECTION

- A. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain:
 - 1. During installation, enclosures, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing and operating and repainting if required.
 - 2. Damaged equipment shall be, as determined by the Resident Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.
 - 3. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
 - 4. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.8 WORK PERFORMANCE

- A. All electrical work must comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J, OSHA Part 1910 subpart S and OSHA Part 1910 subpart K in addition to other references required by contract.
- B. Job site safety and worker safety is the responsibility of the contractor.
- C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:
 - 1. Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.
 - 2. Electricians must wear personal protective equipment while working on energized systems in accordance with NFPA 70E.
 - 3. Before initiating any work, a job specific work plan must be developed by the contractor with a peer review conducted and documented by the Resident Engineer and Medical Center staff. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used and exit pathways.
 - 4. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the Director of the Medical Center.

- D. For work on existing stations, arrange, phase and perform work to assure electrical service for other buildings at all times. Refer to Article OPERATIONS AND STORAGE AREAS under Section 01 00 00, GENERAL REQUIREMENTS.
- E. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 00 00, GENERAL REQUIREMENTS.
- F. Coordinate location of equipment and conduit with other trades to minimize interferences. See Section 00 72 00, GENERAL CONDITIONS.

1.9 EQUIPMENT INSTALLATION AND REQUIREMENTS

- A. Equipment location shall be as close as practical to locations shown on the drawings. Locate equipment anywhere in the electrical room or within 3 m (10 ft.) of location shown, whichever is greater, at the direction of the project engineer shall be done at no additional cost to the Government to allow equipment to be installed in an appropriate location where existing obstructions of foreign systems cannot be relocated to accommodate electrical work.
- B. Working spaces shall not be less than specified in the NEC for all voltages specified. The contractor shall maintain all working space and dedicated equipment space as required by NFPA 70 (NEC) Article 110.26 for all electrical equipment. Equipment locations shall be adjusted to allow for proper clearances if existing conditions do not allow for proper clearances in the location shown on the contract documents.
- C. Inaccessible Equipment:
 - 1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
 - 2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

1.10 COORDINATION DRAWINGS FOR ELECTRICAL INSTALLATION

- A. Prepare Coordination Drawings for all electrical rooms and closets and for standby generator rooms and for all major electrical equipment to a 1/4-inch-equals-1-foot (1:50) scale or larger. Detail and dimension major elements, components, and systems of electrical equipment and materials in relation to each other and to other systems, installations, and building components. Indicate locations and space requirements for

installation, access, and working clearance. Include floor plans, elevations and details as require indicating:

1. Clearances in accordance with NFPA 70 (NEC) to meet safety requirements and for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
 2. Equipment support details.
 3. Sizes and locations of required concrete pads and bases.
 4. Existing obstructions and foreign systems that will not be relocated.
- Indicate measures to remedy these items, such as drip pans.

- B. The equipment arrangements shown on the plans are based on dimensions from a specific manufacturer. Similar equipment from other acceptable manufacturers may have different dimensions or clearance requirements. It is the responsibility of the Contractor, prior to bid or proposal, to verify that the Contractor's selections for equipment will fit in indicated spaces, with the required clearances. If customization or special construction of equipment or components is required to adapt an item to its indicated space or arrangement, that customization or special construction shall be included in the bid or proposal pricing. If customization, special construction, or changes to other building systems and components are required to install an item in its indicated space or arrangement, changes, including design fees if required, shall be included in the bid or proposal pricing. After the submission of a bid or proposal, any customization or special construction of equipment or components, or any change from one manufacturer to another, or any other cost that is required to satisfy space or clearance constraints shall be the responsibility of the Contractor, and shall result in no additional cost to the Owner.
- C. Coordination drawings shall be independently produced by the Contractor based on actual dimension of equipment, actual dimensions of construction, and actual site conditions.

1.11 EQUIPMENT IDENTIFICATION

- A. In addition to the requirements of the NEC, install an identification sign which clearly indicates information required for use and maintenance of items such as panelboards, cabinets, motor controllers (starters), safety switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices, transfer switches and other significant equipment.
- B. Identify the electrical equipment listed below with permanently attached plastic laminated plates with 13mm (0.5 in) minimum lettering for the

name and 6.5mm (0.25 in) minimum lettering for all additional information on the face of each. Attach with sheet metal screws or rivets. Plates shall include the identifying information listed for each class of equipment. Letters shall be white for all labels, except yellow labels shall have black letters. Labels faces shall be black for the normal system and the color specified in Part C for the essential system.

1. Switchboards

- a. Name
- b. Voltage (e.g. 480Y/277V or 208Y/120V)
- c. Feeder conductor size and number of sets
- d. Individually label each device in switchboard with name or description.

2. Panelboards

- a. Name
- b. System or branch
- c. Voltage
- d. Fed from (panelboard or switchboard name, indicate transformer kVA if applicable)
- e. Feeder conductor size and number of sets if greater than one.

3. Transformers

- a. Name
- b. System or branch
- c. Voltage, primary / secondary
- d. Fed from (panelboard or switchboard name)
- e. Feeder conductor sizes and number of sets if greater than one

4. Contactors, motor starters, safety switches and disconnects, and individually mounted circuit breakers

- a. Name of load
- b. System or branch
- c. Voltage
- d. Fed from (panelboard or switchboard name)
- e. Feeder conductor size and number of sets if greater than one.

5. Transfer Switches

- a. Name
- b. System or branch
- c. Voltage
- d. Fed from (emergency and normal sources)
- e. Feeder conductor sizes and number of sets if greater than one.

6. Relays

- a. Name of load
 - b. Fed from (panelboard or switchboard name)
- 7. Shunt trip push buttons
 - a. Name of load
 - b. Fed from (panelboard or switchboard or individually mounted circuit breaker)
 - c. Location of circuit breaker.
- C. Pull and junction boxes for essential system circuits shall be spot painted so they can be readily identified. Color as indicated below. Labels for equipment on the essential system shall use the same colors as indicated.
 - 1. Life safety branch - yellow
 - 2. Critical branch - orange
 - 3. Equipment system - green
 - 4. Fire alarm system - red
 - 5. Other essential system supplied by the standby generator (not listed above) - purple
- D. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape (equal to Brother P-touch electronic labeling system) on face of plate, and use durable wire markers, tags, or indelible ink on reverse side of plate. Labels and wire marker or tag samples must be approved by the COTR.

1.12 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. The Government's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.
- C. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Government to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.
- D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
 - 1. Mark the submittals, "SUBMITTED UNDER SECTION_____".

2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
 3. Submit each section separately.
- E. The submittals shall include the following:
1. Information that confirms compliance with contract requirements.
Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
 2. Elementary and interconnection wiring diagrams for communication and signal systems, control system and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
 3. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.
- F. Manuals: Submit in accordance with Section 01 00 00, GENERAL REQUIREMENTS.
1. Maintenance and Operation Manuals: Submit as required for systems and equipment specified in the technical sections. Furnish four copies, bound in hardback binders, (manufacturer's standard binders) or an approved equivalent. Furnish one complete manual as specified in the technical section but in no case later than prior to performance of systems or equipment test, and furnish the remaining manuals prior to contract completion.
 2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment.
 3. Provide a "Table of Contents" and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
 4. The manuals shall include:
 - a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
 - b. A control sequence describing start-up, operation, and shutdown.
 - c. Description of the function of each principal item of equipment.
 - d. Installation and maintenance instructions.
 - e. Safety precautions.

- f. Diagrams and illustrations.
 - g. Testing methods.
 - h. Performance data.
 - i. Lubrication schedule including type, grade, temperature range, and frequency.
 - j. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
 - k. Appendix; list qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.
- G. Approvals will be based on complete submission of manuals together with shop drawings.
- H. After approval and prior to installation, furnish the Resident Engineer with one sample of each of the following:
- 1. A 300 mm (12 inch) length of each type and size of wire and cable along with the tag from the coils of reels from which the samples were taken.
 - 2. Each type of conduit coupling, bushing and termination fitting.
 - 3. Conduit hangers, clamps and supports.
 - 4. Duct sealing compound.
 - 5. Each type of receptacle, toggle switch, outlet box, manual motor starter, device plate, engraved nameplate, wire and cable splicing and terminating material and single pole molded case circuit breaker.
 - 6. Each type of light fixture shown on the drawings.

1.13 SINGULAR NUMBER

Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.14 WIRE COUNTS

- A. Branch circuits do not have wire counts indicated on the drawings. The contractor shall provide phase conductors, neutrals, switch legs, and equipment grounding conductors as required for a complete, functional installation. Shared neutrals are acceptable where permitted by the NEC. All power/receptacle/lighting branch circuits (and switch legs) and all patient care area branch circuits shall have code-sized insulated equipment grounding conductors. Where 3-way or 4-way switching is not clear, contact the Engineer.

1.15 DEMOLITION

- A. Where electrical work to remain is damaged or disturbed in the course of the Work, remove damaged portions and install new product of equal capacity, quality and functionality.
- B. Accessible Work Indicated to be Demolished: Remove exposed electrical installation in its entirety.
- C. Abandoned Work: Cut and remove buried raceway and wiring indicated to be abandoned in place (2 inches) 50 mm below the surface of adjacent construction. Cap and patch surface to match existing finish. No accessible work shall be abandoned unless specifically indicated as such on the contract documents.
- D. Removal: Materials and equipment removed shall be handled as specified in Section 010000, General Requirements and Section 017419 Construction Waste Management. In addition to the requirements of those sections, the following items shall be offered to be retained by the Government as directed by the COTR. Any items that the Government does not elect to retain shall become the property of the Contractor and be disposed as indicated in Sections 010000 and 017419. Any items indicated on the drawings to remain the property of the Government shall remain the Governments property and not become the property of the contractor. The following items shall be offered to the Government to retain:
- Disconnects of 100A (amperes) Motors and larger
 - Fire Alarm Devices
 - Nurse Call System Components
 - Special Lighting Fixtures
 - Special Receptacles
 - Transformers
 - Telecommunications System Components
 - Signal Systems Components
 - Power components installed to provide temporary construction electrical service (if not the property of the Contractor)
 - Emergency engine-generator sets
- E. Temporary Disconnection: Remove, store, protect, clean, reinstall, reconnect, and make operational components indicated for relocation.
- F. Visit the site before bidding to observe existing conditions.
- G. Where a circuit is interrupted by removal of a device or fixture from that circuit, install wire and conduit as required to restore service to the remaining devices and fixtures on that circuit.

H. Before any circuit is turned off for demolition, the contractor shall notify and obtain approval from the maintenance department.

1.17 TRAINING

- A. Training shall be provided in accordance with Article, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.
- B. Training shall be provided for the particular equipment or system as required in each associated specification.
- C. A training schedule shall be developed and submitted by the contractor and approved by the Resident Engineer at least 30 days prior to the planned training.

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