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**SECTION 26 05 11**  
**REQUIREMENTS FOR ELECTRICAL INSTALLATIONS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section applies to all sections of Division 26.
- 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, generators, automatic transfer switches, and other items and arrangements for the specified items are shown on drawings.
- C. 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 International Building Code (IBC), 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, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production or listed equipment or materials or periodic evaluation of services, and whose listing states that the equipment, material, or services either meets appropriate designated standards or has been tested and found suitable for a specified purpose.
2. Labeled; Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
3. Certified; equipment or product 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 eight hours of receipt of notification that service is needed. Submit name and address of service organizations.

#### **1.5 APPLICABLE PUBLICATIONS**

- A. Applicable publications listed in all Sections of Division are the latest issue, unless otherwise noted.

#### **1.6 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 or type 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 Project Engineer a minimum of 15 working days prior to the manufacturers making the factory tests.
  2. Two copies of certified test reports containing all test data shall be furnished to the Project 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.

### **1.7 EQUIPMENT REQUIREMENTS**

- A. 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.

### **1.8 EQUIPMENT PROTECTION**

- A. Equipment and materials shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
  - 1. Store equipment indoors in clean dry space with uniform temperature to prevent condensation. Equipment shall include but not be limited to switchgear, switchboards, panelboards, transformers, motor control centers, motor controllers, uninterruptible power systems, enclosures, controllers, circuit protective devices, cables, wire, light fixtures, electronic equipment, and accessories.
  - 2. During installation, equipment shall be protected against entry of foreign matter; and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.
  - 3. Damaged equipment shall be, as determined by the Project Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.
  - 4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
  - 5. 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.

### **1.9 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.
- D. For work on existing stations, arrange, phase and perform work to assure electrical service for other buildings at all times. E. New work shall be installed and connected to existing work neatly, safely and professionally. 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.

#### **1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS**

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working spaces shall not be less than specified in the NEC for all voltages specified.
- 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 quickly for operation, maintenance, or inspections 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.

#### **1.11 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 switchboards and switchgear, panelboards, cabinets, motor controllers (starters), fused and unfused safety switches, automatic transfer switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.
- B. Nameplates for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Nameplates for Essential Electrical System (EES) equipment, as defined in the NEC, shall be laminated red phenolic resin with a white core with engraved

lettering. Lettering shall be a minimum of 1/2 inch [12mm] high. Nameplates shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.

- C. Install adhesive arc flash warning labels on all equipment as required by NFPA 70E. Label shall indicate the arc hazard boundary (inches), working distance (inches), arc flash incident energy at the working distance (calories/cm<sup>2</sup>), required PPE category and description including the glove rating, voltage rating of the equipment, limited approach distance (inches), restricted approach distance (inches), prohibited approach distance (inches), equipment/bus name, date prepared, and manufacturer name and address.

#### **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, VA contract number, VA project number, VA project

title, specification number and applicable paragraphs, and test reports as required.

2. Elementary and interconnection wiring diagrams for communication and signal systems, control systems 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.

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 two copies, electronic pdf format and bound in hardback binders, (manufacturer's standard binders) or an approved equivalent. 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, VA contract number, VA project number, VA project title, specification number and applicable paragraphs. 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 instructions.
  - e. Safety precautions for operation and maintenance.
  - f. Diagrams and illustrations.
  - g. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers and replacement frequencies.
  - h. Performance data.
  - i. 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.

- j. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.

G. Approvals will be based on complete submission of manuals together with shop drawings.

#### **1.13 SINGULAR NUMBER**

- A. 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.

#### **1.15 ACCEPTANCE CHECKS AND TESTS**

- A. The contractor shall furnish the instruments, materials and labor for field tests.

#### **1.16 TRAINING**

- A. Training shall be provided in accordance with Article 1.25, 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 Project Engineer at least 30 days prior to the planned training.

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**SECTION 26 05 12**  
**ELECTRICAL DEMOLITION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Electrical demolition.
- B. Construction Phasing

**PART 2 PRODUCTS**

**2.1 MATERIALS AND EQUIPMENT**

- A. Materials and equipment for patching and extending work: As specified in individual sections.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify field measurements and circuiting arrangements are as shown on the drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents.
- D. Report discrepancies to Project Engineer before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

**3.2 PREPARATION**

- A. Provide temporary wiring and connections to maintain existing access control systems in service during construction.
- C. Existing Electrical Panels and Equipment: Disable system only to make switchovers and connections. Minimize outage duration.
  - 1. Obtain permission from Owner at least 2 weeks before partially or completely disabling panels and equipment.
  - 2. Make temporary connections to maintain service in areas adjacent to work area.

**3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK**

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets

if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlet boxes which are not removed.

- E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- F. Repair adjacent construction and finishes damaged during demolition and extension work.
- G. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- H. Install junction boxes in walls, ceilings or floors if required to continue circuiting.
- I. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

### **3.4 CONSTRUCTION PHASING**

- A. All work shall be phased to create minimal electrical service and access control system disruption to the daily operations of the hospital. Provide temporary connections to branch circuit devices, access control devices, etc. during switchover operations to keep downtime to any piece of equipment or areas of the building to a minimum.
- B. Switchover work may need to be completed outside of normal work hours to keep disruption to hospital operations minimized.
- C. Phasing schedules are to be submitted to VA Project Engineer at least two weeks prior to any power outages for approval. Outages are to be scheduled at least two weeks prior to the outage date with the VA Project Engineer.

### **3.5 CLEANING AND REPAIR**

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

### **3.6 MATERIAL DISPOSAL**

- A. Material and equipment deemed salvageable by the Owner shall remain the property of Owner. Contractor shall dismantle these items to manageable size and deliver to designated storage area on site. The Owner shall have first right of refusal on all material and equipment.
- B. All other materials and equipment shall become property of Contractor and

must be removed from site and disposed of by approved method.

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**SECTION 26 05 21**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW)**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation, and connection of low voltage and power wiring.

**1.2 RELATED WORK**

- A. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-rated construction.
- B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- D. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.

**1.3 QUALITY ASSURANCE**

- A. Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 FACTORY TESTS**

- A. Power and low voltage cables shall be thoroughly tested at the factory per NEMA WC-70 to ensure that there are no electrical defects. Factory tests shall be certified.

**1.5 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are reference in the text by designation only.
- B. American Society of Testing Material (ASTM):  
D2301-04.....Standard Specification for Vinyl Chloride  
Plastic Pressure-Sensitive Electrical  
Insulating Tape
- C. National Fire Protection Association (NFPA):  
70-08.....National Electrical Code (NEC)
- D. National Electrical Manufacturers Association (NEMA):  
WC 70-09.....Power Cables Rated 2000 Volts or Less for the  
Distribution of Electrical Energy
- E. Underwriters Laboratories, Inc. (UL):

44-05.....	Thermoset-Insulated Wires and Cables
83-08.....	Thermoplastic-Insulated Wires and Cables
467-071.....	Electrical Grounding and Bonding Equipment
486A-486B-03.....	Wire Connectors
486C-04.....	Splicing Wire Connectors
486D-05.....	Sealed Wire Connector Systems
486E-94.....	Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
493-07.....	Thermoplastic-Insulated Underground Feeder and Branch Circuit Cable
514B-04.....	Conduit, Tubing, and Cable Fittings
1479-03.....	Fire Tests of Through-Penetration Fire Stops

## **PART 2 – PRODUCTS**

### **2.1 CONDUCTORS AND CABLES**

- A. Conductors and cables shall be in accordance with NEMA WC-70 and as specified herein.
- B. Single Conductor:
  - 1. Shall be annealed copper.
  - 2. Shall be stranded for sizes No. 8 AWG and larger, solid for sizes No. 10 AWG and smaller.
  - 3. Shall be minimum size No. 12 AWG, except where smaller sizes are allowed herein.
- C. Insulation:
  - 1. THHN-THWN shall be in accordance with NEMA WC-70, UL 44, and UL 83.
- D. Color Code:
  - 1. Secondary service feeder and branch circuit conductors shall be color-coded as follows:

208/120 volt	Phase	480/277 volt
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray *
* or white with colored (other than green) tracer.		

- 2. Use solid color insulation or solid color coating for No. 12 AWG and No. 10 AWG branch circuit phase, neutral, and ground conductors.

3. Conductors No. 8 AWG and larger shall be color-coded using one of the following methods:
  - a. Solid color insulation or solid color coating.
  - b. Stripes, bands, or hash marks of color specified above.
  - c. Color as specified using 0.75 in [19 mm] wide tape. Apply tape in half-overlapping turns for a minimum of 3 in [75 mm] for terminal points, and in junction boxes, pull-boxes, troughs, and manholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable, stating size and insulation type.
4. For modifications and additions to existing wiring systems, color coding shall conform to the existing wiring system.

## **2.2 SPLICES AND JOINTS**

- A. In accordance with UL 486A, C, D, E, and NEC.
- B. Aboveground Circuits (No. 10 AWG and smaller):
  1. Connectors: Solderless, screw-on, reusable pressure cable type, rated 600 V, 220° F [105° C], with integral insulation, approved for copper and aluminum conductors.
  2. The integral insulator shall have a skirt to completely cover the stripped wires.
  3. The number, size, and combination of conductors, as listed on the manufacturer's packaging, shall be strictly followed.
- C. Aboveground Circuits (No. 8 AWG and larger):
  1. Connectors shall be indent, hex screw, or bolt clamp-type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
  2. Field-installed compression connectors for cable sizes 250 kcmil and larger shall have not fewer than two clamping elements or compression indents per wire.
  3. Insulate splices and joints with materials approved for the particular use, location, voltage, and temperature. Splice and joint insulation level shall be not less than the insulation level of the conductors being joined.
  4. Plastic electrical insulating tape: Per ASTM D2304, flame-retardant, cold and weather resistant.

## **2.3 CONTROL WIRING**

- A. Unless otherwise specified elsewhere in these specifications, control wiring shall be as specified for power and lighting wiring, except that

the minimum size shall be not less than No. 22 AWG. Low voltage control wiring (48 volts and lower) may also utilize cables that include twisted pairs of conductors within an overall jacket.

- B. Control wiring shall be large enough such that the voltage drop under in-rush conditions does not adversely affect operation of the controls.

#### **2.4 WIRE LUBRICATING COMPOUND**

- A. Lubricating compound shall be suitable for the wire insulation and conduit, and shall not harden or become adhesive.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. Install in accordance with the NEC, and as specified.
- B. Install all wiring in raceway systems.
- C. Splice cables and wires only in outlet boxes, junction boxes, and pull-boxes.
- D. Wires of different systems (e.g., 120 V, 277 V) shall not be installed in the same conduit or junction box system.
- E. Install cable supports for all vertical feeders in accordance with the NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.
- F. For panel boards, cabinets, wireways, switches, and equipment assemblies, neatly form, train, and tie the cables in individual circuits.
- G. Wire Pulling:
  - 1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling of cables. Use lubricants approved for the cable.
  - 2. Use nonmetallic ropes for pulling feeders.
  - 3. Attach pulling lines for feeders by means of either woven basket grips or pulling eyes attached directly to the conductors, as approved by the Project Engineer.
  - 4. All cables in a single conduit shall be pulled simultaneously.
  - 5. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- H. No more than three single-phase branch circuits shall be installed in any one conduit.

#### **3.2 SPLICE INSTALLATION**

- A. Splices and terminations shall be mechanically and electrically secure.



- B. Tighten electrical connectors and terminals according to manufacturer's published torque values.
- C. Where the Government determines that unsatisfactory splices or terminations have been installed, remove the devices and install approved devices at no additional cost to the Government.

### **3.3 WIRE IDENTIFICATION**

- A. In each interior pull-box and junction box, install tags on all circuit cables and wires to clearly designate their circuit identification and voltage.

### **3.4 EXISTING WIRING**

- A. Unless specifically indicated on the plans, existing wiring shall not be reused for a new installation.

### **3.5 CONTROL AND SIGNAL WIRING INSTALLATION**

- A. Unless otherwise specified in other sections, install wiring and connect to equipment/devices to perform the required functions as shown and specified.
- B. Except where otherwise required, install a separate power supply circuit for each system so that malfunctions in any system will not affect other systems.
- C. Where separate power supply circuits are not shown, connect the systems to the nearest panel boards of suitable voltages, which are intended to supply such systems and have suitable spare circuit breakers or space for installation.

### **3.6 CONTROL AND SIGNAL SYSTEM WIRING IDENTIFICATION**

- A. Install a permanent wire marker on each wire at each termination.
- B. Identifying numbers and letters on the wire markers shall correspond to those on the wiring diagrams used for installing the systems.
- C. Wire markers shall retain their markings after cleaning.

### **3.7 ACCEPTANCE CHECKS AND TESTS**

- A. Feeders and branch circuits shall have their insulation tested after installation and before connection to utilization devices, such as fixtures, motors, or appliances. Test each conductor with respect to adjacent conductors and to ground. Existing conductors to be reused shall also be tested.
- B. Applied voltage shall be 500VDC for 300-volt rated cable, and 1000VDC for 600-volt rated cable. Apply test for one minute or until reading is constant for 15 seconds, whichever is longer. Minimum insulation

resistance values shall not be less than 25 megohms for 300-volt rated cable and 100 megohms for 600-volt rated cable.

- C. Perform phase rotation test on all three-phase circuits.
- D. The contractor shall furnish the instruments, materials, and labor for all tests.

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**SECTION 26 05 26**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the general grounding and bonding requirements for electrical equipment and operations to provide a low impedance path for possible ground fault currents.
- B. "Grounding electrode system" refers to all electrodes required by NEC, as well as made, supplementary, and lightning protection system grounding electrodes.
- C. The terms "connect" and "bond" are used interchangeably in this specification and have the same meaning.

**1.2 RELATED WORK**

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.
- B. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.

**1.3 QUALITY ASSURANCE**

- A. Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 APPLICABLE PUBLICATIONS**

Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

- A. American Society for Testing and Materials (ASTM):
  - B1-07.....Standard Specification for Hard-Drawn Copper Wire
  - B3-07.....Standard Specification for Soft or Annealed Copper Wire
  - B8-04.....Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

81-1983.....IEEE Guide for Measuring Earth Resistivity,  
Ground Impedance, and Earth Surface Potentials  
of a Ground System

C2-07.....National Electrical Safety Code

C. National Fire Protection Association (NFPA):

70-08.....National Electrical Code (NEC)

99-2005.....Health Care Facilities

D. Underwriters Laboratories, Inc. (UL):

44-05 .....Thermoset-Insulated Wires and Cables

83-08 .....Thermoplastic-Insulated Wires and Cables

467-07 .....Grounding and Bonding Equipment

486A-486B-03 .....Wire Connectors

## **PART 2 - PRODUCTS**

### **2.1 GROUNDING AND BONDING CONDUCTORS**

- A. Equipment grounding conductors shall be UL 44 or UL 83 insulated stranded copper, except that sizes No. 10 AWG [6 mm<sup>2</sup>] and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG [25 mm<sup>2</sup>] and larger shall be identified per NEC.
- B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes No. 10 AWG [6 mm<sup>2</sup>] and smaller shall be ASTM B1 solid bare copper wire.
- C. Conductor sizes shall not be less than shown on the drawings, or not less than required by the NEC, whichever is greater.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Ground in accordance with the NEC, as shown on drawings, and as specified herein. B. System Grounding:
  - 1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
  - 2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
- C. Equipment Grounding: Metallic structures, including ductwork and building steel, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits, shall be bonded and grounded.
- D. Special Grounding: For patient care area electrical power system grounding, conform to NFPA 99 and NEC.

### 3.2 SECONDARY VOLTAGE EQUIPMENT AND CIRCUITS

#### A. Panelboards:

1. Connect the various feeder equipment grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
2. Provide ground bars, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.
3. Connect metallic conduits that terminate without mechanical connection to the housing, by grounding bushings and grounding conductor to the equipment ground bus.

### 3.3 RACEWAY

#### A. Conduit Systems:

1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor.
2. Non-metallic conduit systems, except non-metallic feeder conduits that carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment, shall contain an equipment grounding conductor.
3. Conduit that only contains a grounding conductor, and is provided for its mechanical protection, shall be bonded to that conductor at the entrance and exit from the conduit.
4. Metallic conduits which terminate without mechanical connection to an electrical equipment housing by means of locknut and bushings or adapters, shall be provided with grounding bushings. Connect bushings with a bare grounding conductor to the equipment ground bus.

#### B. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders and power and lighting branch circuits.

#### C. Boxes, Cabinets, Enclosures, and Panelboards:

1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes (except for special grounding systems for intensive care units and other critical units shown).
2. Provide lugs in each box and enclosure for equipment grounding conductor termination.

#### D. Receptacles shall not be grounded through their mounting screws. Ground receptacles with a jumper from the receptacle green ground terminal to the device box ground screw and a jumper to the branch circuit equipment grounding conductor.

**3.4 CORROSION INHIBITORS**

- A. When making ground and ground bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

**3.5 CONDUCTIVE PIPING**

- A. Bond all conductive piping systems, interior and exterior, to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.

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**SECTION 26 29 21  
DISCONNECT SWITCHES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation, and connection of low voltage disconnect switches.

**1.2 RELATED WORK**

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.
- B. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES 600 VOLTS AND BELOW: Cables and wiring.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground faults.
- D. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.

**1.3 QUALITY ASSURANCE**

- A. Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. Shop Drawings:
  - 1. Clearly present sufficient information to determine compliance with drawings and specifications.
  - 2. Include electrical ratings, dimensions, mounting details, materials, enclosure types, and fuse types and classes.
  - 3. Show the specific switch and fuse proposed for each specific piece of equipment or circuit.
- C. Manuals:
  - 1. Provide complete maintenance and operating manuals for disconnect switches, including technical data sheets, wiring diagrams, and information for ordering replacement parts. Deliver four copies to the Project Engineer two weeks prior to final inspection.
  - 2. Terminals on wiring diagrams shall be identified to facilitate maintenance and operation.
  - 3. Wiring diagrams shall indicate internal wiring and any interlocking.

## 1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. National Electrical Manufacturers Association (NEMA):
  - FU 1-07.....Low Voltage Cartridge Fuses
  - KS 1-06.....Enclosed and Miscellaneous Distribution  
Equipment Switches (600 Volts Maximum)
- C. National Fire Protection Association (NFPA):
  - 70-08.....National Electrical Code (NEC)
- D. Underwriters Laboratories, Inc. (UL):
  - 98-04.....Enclosed and Dead-Front Switches
  - 248-00.....Low Voltage Fuses
  - 977-94.....Fused Power-Circuit Devices

## PART 2 - PRODUCTS

### 2.1 DOUBLE THROW SWITCHES

- A. Double throw switches shall be Square D 92251 series rated at 240 volts AC or approved equal.
- B. Enclosure shall be NEMA 1 general purpose.
- C. Switch shall have exterior operating handle with three positions including an OFF position. The handle shall have provisions for padlocking in all three positions.
- D. Switch shall be rated for 30 amperes unless noted otherwise.
- E. Switch that switch both the neutral and line voltage poles between the two sources.

### 2.2 IDENTIFICATION SIGNS

- A. Install nameplate identification signs on each disconnect switch to identify the equipment controlled and power sources (each circuit with panel name).
- B. Nameplates shall be laminated black phenolic resin with a white core, with engraved lettering, a minimum of 6 mm (1/4-inch) high. Secure nameplates with screws.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install disconnect switches in accordance with the NEC and as shown on the drawings.



- B. Label each double throw switch with the panel names and circuit numbers contained and the item served (91S11-2,4,6 & EB91S2-2,4,6; Water Heater). Labels shall be self-adhesive type to match those existing at the hospital. Coordinate exact requirements with the Project Engineer.
- C. Provide arc flash labels in accordance with NFPA 70E. Labels shall be self-adhesive type to match those existing at the hospital. Coordinate exact requirements with the Project Engineer.

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**SECTION 27 10 05**  
**COMPUTER NETWORK AND TELEPHONE WIRING SYSTEM**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

This section includes the furnishing and installation of the following:

- A. Raceway distribution system.
- B. Computer and telephone wiring.
- C. Workstation communications outlets.
- D. Horizontal cabling patch panels.
- E. Premise testing.
- F. Equipment.

**1.2 RELATED SECTIONS**

- A. Section 26 05 11 - Requirements for Electrical Installations
- B. Section 26 05 33 - Raceway and Boxes for Electrical Systems
- C. Section 26 27 26 - Wiring Devices.

**1.3 REFERENCES**

- A. ANSI/TIA/EIA 568A - B.1, B.2, B3 Commercial Building Telecommunications Cabling Standard.
- B. ANSI/TIA/EIA 569A Commercial Building Standard Telecommunications Pathways and Spaces.
- C. ANSI/TIA/EIA 606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
- D. NFPA 70 National Electrical Code.
- E. BICSI TDMM (Building Industry Consulting Service International, Telecommunications Distribution Methods Manual and Telecommunications Cabling Installation Manual).

**1.4 PROJECT RECORD DOCUMENTS**

- A. Submit record documents under provisions of Section 26 05 11.
- B. As-built record drawings to be provided to Owner/Engineer before final payment.

**1.5 SHOP DRAWINGS**

- A. Submit in accordance with Section 01 33 23.
- B. Submit conductor, jacks, and patch panel.

**1.6 SYSTEM DESCRIPTION**

- A. Horizontal and workstation pathways conform to ANSI/EIA/TIA 569A, using raceway and patch panels as indicated.
- B. Premise Wiring: Horizontal and workstation complete from communication room to each outlet, using conductors and other equipment as specified.

- C. All premise wiring to be of one manufacturer.

#### **1.7 QUALITY ASSURANCE**

- A. Perform work in accordance with BICSI TDMM and ANSI/EIA/TIA standards.

#### **1.8 QUALIFICATIONS**

- A. Installer: Company specializing in installing data communications wiring with minimum of three years project experience and BICSI certified as an installer at start of installation.
- B. Installer: Must submit documentation of qualifications before start of installation.

#### **1.9 REGULATORY REQUIREMENTS**

- A. Conform to requirements of NFPA 70 and applicable building codes.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and indicated.

#### **1.10 MAINTENANCE/WARRANTY**

- A. Manufacturer shall warranty and provide maintenance service for 15 years minimum on the network system and a lifetime for products used in the system.
- B. Submit documentation stating warranty at project closeout.

#### **1.11 COPPER CONDUCTOR CABLE TESTING**

- A. Contractor shall perform and document all conductor tests. Return one copy of testing report to the Engineer and one copy to the Owner.
- B. All Category 6 Enhanced conductors shall be tested and certified for ANSI/EIA/TIA, 568A, TSB-67 standards and ANSI/TIA/EIA-TSB-95.
- C. All copper station runs must be tested after final installation and termination. All data cable runs shall be documented with a hard copy printout of the test results. This printout shall be bound and delivered to the Owner prior to final payment.
- D. The Owner requires that the Scope/HP Wirescope 350 Level III, or approved equal tester be utilized for all copper data testing.
- E. The Owner requires that the company/individual testing the cable be manufacturer certified for products provided.

### **PART 2 - PRODUCTS**

#### **2.1 CONDUIT AND OUTLETS**

- A. As specified in Section 26 05 33 - Conduit Systems.
- B. Conduit Size: Minimum 3/4 inch with larger sizes where noted on Drawings.
- C. Four-inch square box with single gang plaster ring.

#### **2.2 OUTLET COVER PLATES**

- A. As specified in Section 26 27 26 - Wiring Devices.
- B. Cover Plate: Ivory.

### **2.3 WORKSTATION COMMUNICATIONS OUTLETS**

- A. Connector modules shall be equal to Panduit CJ6X88TGEI to match existing Fargo VAMC standard.
  - 1. ANSI/TIA/EIA-T568B wiring configuration.
  - 2. Category 6 Enhanced (500 MHz) power sum connector.  
Modular faceplates shall be Panduit Mini-Com Executive Series faceplates.
    - a. One, two, four and six-port single gang and 10-port double gang faceplates as required. Panduit part numbers CFPE1-IW, CFPE2-IW, CFPE4-IW, CFPE6-IW, and CFPE10IW-2G.
  - 3. Standard Color: Orange for data connectors, ivory for telephone connectors.
  - 4. See Drawings for quantity of connector modules and modular faceplates.

### **2.4 COPPER CONDUCTOR**

- A. Manufacturer: Equal to General Genspeed 6000E.
  - 1. Category 6 Enhanced.
  - 2. Four twisted pair non-shielded.
  - 3. 23 gauge solid copper conductors.
  - 4. U.L. listed MPP/CMP.
  - 5. Conductor Resistance: 9.38 ohms/100m nom. @ 20 degrees C.
  - 6. Impedance:
    - a. 100±15 ohms 1-100 MHz.
    - b. 100±22 ohms 101-250 MHz.
    - c. 100±32 ohms 250-500 MHz.
  - 7. ACR based on Power Sum NEXT
    - a. ≥ 15.8 dB/100m @ 200 MHz.
    - b. ≥ 10.7 dB/100m @ 250 MHz.
  - 8. Delay Skew ≤ 35 ns/100m.
  - 9. NVP = 70% speed of light.
  - 10. Plenum rated cable.

### **2.5 CROSS CONNECTION EQUIPMENT**

- 1. Patch Panels for Copper Data Cabling: Sized to fit EIA standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.

- a. Panduit CPP48WBLV 48-port all metal modular patch panel frames, populated with Panduit CJ6X88TGEI modular connectors (as listed in 2.3) Category 6 enhanced power sum connectors.
- b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
- c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA/EIA-606 using encoded identifiers.
- d. Provide incoming cable strain relief and routing guides on back of panel.
- e. Chatsworth 30530-719, HORZ MGR DBL UNIV 2U 19 IN, horizontal wire management panels shall be provided between pairs of CPP48 patch panel frames for front and rear patch cable management and as necessary above and/or below network electronics.
- f. Panduit type WMPV22E, VTR CBL MGT 4X FRT/REAR 22RU vertical wire management panels shall be provided on the left and right sides of each rack.
- g. Provide incoming cable strain relief and routing guides on back of panel.
- h. Provide rear cable management tray at least 8 inches deep with removable cover.
- i. Provide dust covers for unused adaptors.
- j. Patch Cords: Provide one patch cord for each pair of patch panel ports.

## **2.6 FIRESTOP**

- A. Provide a firestop system with an "F" rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.
  - 1. For penetrations by non-combustible items including steel pipe, copper pipe, rigid steel conduit, and electrical metallic tubing (EMT), the following are acceptable:
    - a. Hilti FS 601 elastomeric firestop sealant or Fs 605 HP firestop sealant.
    - b. 3M fire barrier CP25.
    - c. Nelson CLK firestop sealant.
  - 2. For fire-rated construction joints and other gaps, the following may be used:

- a. Hilti FS 601.
  - b. 3M fire barrier CP25.
  - c. Nelson CLK firestop sealant.
- 3. For penetrations by combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable, or cable bundles, and plastic pipe (closed piping systems), the following are acceptable:
  - a. Hilti FS 611A intumescent firestop sealant.
  - b. 3M fire barrier CP 25.
  - c. 3M fire barrier FS-195 wrap strip.
  - d. Nelson FSP firestop putty, PCS pipe choke system.
- 4. For large complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways or raceways, the following are acceptable:
  - a. Hilti FS 635, trowelable firestop compound.
  - b. 3M fire barrier CS-195 composite sheet.
  - c. Nelson CPS composite sheet, CMP firestop compound.

## **2.7 COMPUTER CABLE SUPPORT HANGERS**

- A. J-hooks shall be equal to Erico Caddy Fastener type CableCat.
  - 1. Erico Caddy Fastener type CableCat Cat21 J-hook shall be used for up to 50 4-pair communication cables.
  - 2. Manufacturer guidelines shall be used for supporting/mounting CableCats.
  - 3. Cable shall be supported at no greater than four-foot intervals.
  - 4. Utilize cable hooks only to span across corridors or rooms to route cables to cable tray as shown on the plans.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Support raceways under the provisions of Section 26 05 11.
- B. Install cable from all computer and telephone outlets to rack.
- C. Install modular outlets at all locations shown on the Drawings. Terminate wiring at both ends.
- D. Provide cable supports as required in a neat workmanlike manner.
- E. Color coding of wiring is to be consistent between connector modules and connector blocks.
- F. All cabling shall consist of 4 pair, 1 cable per jack.

- G. Install cable in accordance with manufacturer's instructions and in accordance with ANSI/EIA/TIA 568A standards. Cable maximum bend radius shall not exceed four (4) times the outside cable diameter.
- H. Bridged taps/splices are not allowed as part of the horizontal wiring system.
- I. Each workstation jack shall be provided with its own UTP cable continuous (without splice) from jack to computer rack.
- J. All penetrations through fire barrier walls or floors shall consist of a conduit sleeve and shall be sealed with an industry approved fire barrier caulk or compound reamed and bushed.
- K. All vertical/horizontal sleeves shall be sized according to station count passing through each. Sized for maximum 60 percent fill.
- L. Install cable support hooks a maximum of 4'-0" on center above ceiling.
- M. All vertical/horizontal raceways shall be sized according to station count passing through each. Sized for maximum 60 percent fill.
- N. Install a 3/4 inch conduit, minimum from each workstation outlet continuous to the nearest cable tray location in the corridor ceiling.
- O. Terminate all data cabling on data rack patch panels. Field verify if existing space is available on existing patch panels for new cables. Provide new patch panels if necessary to accommodate new cables.

### **3.2 GANGING WORKSTATION JACKS**

- A. Where indicated, workstation jacks may be ganged under a common one gang wall plate. Where the plans show multiple outlets at one location they may be ganged into one wall plate.

### **3.3 LABELING**

- A. All horizontal cabling shall be labeled at both ends with permanent tag indication from which jack the cable originated.
- B. Machine labels shall be installed on each workstation jack faceplate and at the patch panels.
- C. All labels shall be a machine label in conformance with ANSI/EIA/TIA 606.
- D. Numbering of workstation jacks shall be consistent and match existing Veterans Administration standard.
- E. Labeling to be verified with Engineer and Owner.

### **3.4 CUTTING, PATCHING AND FINISHING**

- A. Perform all cutting, patching and finishing required for installation of electrical work. Restore surfaces to original condition.

B. Cutting, patching and finishing work is subject to the direction and approval of the Engineer.

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**SECTION 28 13 16**  
**ACCESS CONTROL AND SECURITY**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Access control devices.
- B. Access control panels.

**1.2 RELATED REQUIREMENTS**

- A. Section 08 71 00 - Door Hardware.
- B. Section 26 05 21 - Low Voltage Electric Power Conductors and Cables.
- C. Section 26 05 33 - Raceway and Boxes for Electrical Systems.

**1.3 REFERENCES**

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011.

**1.4 SYSTEM DESCRIPTION**

- A. Extension of the existing door access control system to numerous doors as shown on the drawings. New access control panel are to be added and existing control panels upgraded to accommodate the new card readers. All new system components shall be compatible with the existing facility access control system and system software.

**1.5 SUBMITTALS**

- A. See Section 01 33 23 for submittal procedures.
- B. Shop Drawings: Provide system wiring diagram showing each device and wiring connections required. Submit drawings in ACAD format showing all devices and wiring requirements.
- C. Product Data: Provide electrical characteristics and connection requirements.
- D. Manufacturer's Installation Instructions: Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- E. Project Record Documents: Record actual locations of all system components.
- F. Operation Data: Operating instructions.
- G. Maintenance Data: Maintenance and repair procedures.

**1.6 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities and an authorized installer within 100 miles of Project.

- C. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and indicated.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

A. Access Control and Security System:

1. SimplexGrinnell Software House or approved equal.

### **2.2 COMPONENTS**

A. Access Control Panel:

1. Product: Simplex Grinnell Software House i-Star Pro Controller or approved equal.
2. Description: 16 card reader capacity control panel with 64 MB of on board memory, battery backup, local area network compatible. Control panels shall accommodate 16 card readers, door position monitoring inputs for 16 doors and request to exit sensors for 16 doors. Provide new control panels to replace existing where noted and to accommodate the new card readers shown on the drawings with spare capacity.

B. Encoded Card Readers:

1. Product: HID RP40-6125CGN000DG30 for the 5" by 5" locations or the HID RP15-6145CGN000DG30 for the narrow mullion mount locations.
2. Description: Proximity card reader, indoor/outdoor rated, 5"x 5" square polycarbonate housing with approximately a 8" read range. The card reader shall be fully compatible with the PIV badges being used at the VA hospital.

C. Encoded Card Readers with Keypad:

1. Product: HID 6136CGN000D00G30 with integral keypad.
2. Description: Proximity card reader with integral 10 button keypad, indoor/outdoor rated, 5"x 5" square polycarbonate housing with approximately a 8" read range. The card reader shall be fully compatible with the PIV badges presently being used at the VA hospital.

D. Request to Exit Sensors:

1. Product: Bosch DS160 or approved equal.
2. Description: Surface mount with passive infrared sensor with a 8' by 10' coverage pattern. White plastic enclosure.

E. Door Position Switches:

1. Product: General Electric 1076D series or approved equal.
2. Description: 1 inch diameter steel door contact with DPDT contacts, white in color.

F. System Cable:

1. Product: Communications Supply Corporation or equal.
2. Plenum rated cable with aluminum foil shield , copper drain wire, yellow PVC jacket. Cable shall include integral #18-4/C unshielded, #22-3PR shielded, #22-2/C unshielded, and #22-4/C unshielded conductors for card reader, REX and door contact functions.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Use multi-conductor cable for connections to all of the access control components at each door. Install all wiring in conduit, ¾ inch minimum.
- C. Make conduit and wiring connections to door hardware devices furnished and installed under Section 08 71 00.
- D. Provide a connection from each control panel to the VA Hospital local area network system in the nearest IRM closet using category 6e cable in accordance with section 27 10 05.
- E. Provide a 120 volt power connections to each control panel and electric strike or latch power supply to the nearest emergency power (equipment branch) circuit connected to a transfer switch as shown on the drawings.
- F. Existing Power Door Operators: Where card readers are being added to doors with existing power door operators, the access control system shall deactivate the push pad adjacent to the card reader normally. When a valid card is presented, the push pad shall be activated to the door can be operated with the push pad after the electric latch is operated. The interior or push pad on the opposite side of the door shall be wired to operate the both the door operator and latch bolt when the push pad is depressed. Provide all required relays.

#### **3.2 FIELD QUALITY CONTROL**

- A. Manufacturer Services: Furnish services of technician to supervise installation, adjustments, final connections, system testing, and to train Owner personnel.

#### **3.3 CLOSEOUT ACTIVITIES**

- A. Demonstrate normal and abnormal modes of operation for both the access control and security systems, and required response to each.

#### **3.4 MAINTENANCE**

- A. Furnish service and maintenance of access control and security system for one year from Date of Substantial Completion.

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