

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 systems, materials, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, conductors and cable, switchboards, switchgear, panel boards, motor control centers, generators, automatic transfer switches, and other items and arrangements for the specified items are shown on the drawings.
- C. Conductor ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways sized per NEC. Aluminum conductors are prohibited.

1.2 MINIMUM REQUIREMENTS

- A. The International Building Code (IBC), National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), and National Fire Protection Association (NFPA) codes and standards are the minimum requirements for materials and installation.
- B. The drawings and specifications shall govern in those instances where requirements are greater than those stated in the above codes and standards.

1.3 TEST STANDARDS

- A. All materials and equipment shall be listed, labeled, or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety requirements of a NRTL. Materials and equipment which no NRTL accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as ANSI, NEMA, and NETA. Evidence of compliance shall include certified test reports and definitive shop drawings.
- B. Definitions:
 - 1. Listed: Materials and equipment 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 materials and equipment or periodic evaluation of services, and whose listing states that the materials and equipment either meets appropriate designated standards or has been tested and found suitable for a specified purpose.
2. Labeled: Materials and equipment 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 materials and equipment, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
 3. Certified: Materials and equipment which:
 - a. Have been tested and found by a NRTL to meet nationally recognized standards or to be safe for use in a specified manner.
 - b. Are periodically inspected by a NRTL.
 - c. Bear a label, tag, or other record of certification.
 4. Nationally Recognized Testing Laboratory: Testing laboratory which is recognized and approved by the Secretary of Labor in accordance with OSHA regulations.

1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)

- A. Manufacturer's Qualifications: The manufacturer shall regularly and currently produce, as one of the manufacturer's principal products, the materials and equipment specified for this project, and shall have manufactured the materials and equipment for at least three years.
- B. Product Qualification:
 1. Manufacturer's materials and equipment shall have been in satisfactory operation, on three installations of similar size and type as this project, for at least three years.
 2. The Government reserves the right to require the Contractor to submit a list of installations where the materials and Nurse Call equipment 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, contact info, phone numbers and address of service organizations.

1.5 APPLICABLE PUBLICATIONS

- A. Applicable publications listed in all Sections of Division 26 are the latest issue, unless otherwise noted.
- B. Products specified in all sections of Division 26 shall comply with the applicable publications listed in each section.

1.6 MANUFACTURED PRODUCTS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, and for which replacement parts shall be available.
- B. When more than one unit of the same class or type of materials and 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 and terminals 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 Government through the Project Engineer a minimum of 45 working days prior to the manufacturer's performing the factory tests.
 - 2. Two copies of certified test reports shall be furnished to the Project Engineer two weeks prior to final inspection and not more than 90 days after completion of the tests.
 - 3. When materials and equipment fail factory tests, and re-testing and re-inspection is required, the Contractor shall be liable for all additional expenses for the Government to witness re-testing.

1.7 VARIATIONS FROM CONTRACT REQUIREMENTS

- A. Where the Government or the Contractor requests variations from the contract requirements, 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 MATERIALS AND EQUIPMENT PROTECTION

- A. Materials and equipment shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
1. Store materials and equipment indoors in clean dry space with uniform temperature to prevent condensation.
 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 repaired or replaced, as determined by the Project Engineer
 4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
 5. Damaged paint on equipment 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 shall comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J - General Environmental Controls, OSHA Part 1910 subpart K - Medical and First Aid, and OSHA Part 1910 subpart S - Electrical, 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 that affects existing electrical systems, arrange, phase and perform work to assure minimal interference with normal functioning of the facility. 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 interference.

1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working clearances shall not be less than specified in the NEC.
- C. Inaccessible Equipment:
 - 1. Where the Government determines that the Contractor has installed equipment not readily accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
 - 2. "Readily 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, control devices and other significant equipment.
- B. Identification signs for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Identification signs 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 12 mm (1/2 inch) high. Identification signs 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.

1.12 SUBMITTALS

- A. Submit to the Project Engineer in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. The Government's approval shall be obtained for all materials and equipment before delivery to the job site. Delivery, storage or

installation of materials and equipment which has not had prior approval will not be permitted.

- C. All submittals shall include six copies of adequate descriptive literature, catalog cuts, shop drawings, test reports, certifications, samples, and other data necessary for the Government to ascertain that the proposed materials and equipment comply with drawing and specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify specific materials and 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, manuals, pictures, nameplate data, VA contract number, VA project number, VA project title, specification number and applicable paragraphs, and test reports as required. Provide a list of locations where nurse call equipment has been in operation.
 - 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 information for replacement parts and ordering instructions, as recommended by the equipment manufacturer.
- F. Maintenance and Operation Manuals:
 - 1. Submit two copies electronic PDF and eighteen (18) copies bound in hardback binder for systems and equipment specified in the technical sections. Furnish in hardcover 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, material, equipment, building, name of Contractor, and contract name and number, VA contract number, VA project number, VA

- project title. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the material 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.
 - 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 and replacement 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 shop drawings, manuals, test reports, certifications, and samples as applicable.

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.

1.14 ACCEPTANCE CHECKS AND TESTS

- A. The Contractor shall furnish the instruments, materials, and labor for tests.
- B. Where systems are comprised of components specified in more than one section of Division 26, the Contractor shall coordinate the installation, testing, and adjustment of all components between various manufacturer's representatives and technicians so that a complete, functional, and operational system is delivered to the Government.
- C. When test results indicate any defects, the Contractor shall repair or replace the defective materials or equipment, and repeat the tests. Repair, replacement, and retesting shall be accomplished at no additional cost to the Government.

1.15 WARRANTY

- A. All work performed and all equipment and material furnished under this Division shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the Contracting Officer for the Government.

1.16 INSTRUCTION

- A. Instruction to designated Government personnel shall be provided for the particular equipment or system as required in each associated technical specification section.
- B. Furnish the services of competent instructors to give full instruction in the adjustment, operation, and maintenance of the specified equipment and system, including pertinent safety requirements. Instructors shall be thoroughly familiar with all aspects of the installation, and shall be trained in operating theory as well as practical operation and maintenance procedures.
- 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.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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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. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Provide temporary wiring and connections to maintain existing 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. Provide temporary connections to areas that remain in service during construction. All hospital operations shall remain functional at all times.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. The existing nurse call system shall remain in place and fully functional

until the new system has been installed, tested and the Owners have been fully trained in its use. Final system demolition shall occur after all of these conditions have been met, and approval is given by the Project Engineer.

- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces. Patch hole associated with demolition work.
- E. 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.
- F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- G. Repair adjacent construction and finishes damaged during demolition and extension work.
- H. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- I. Install junction boxes in walls, ceilings or floors if required to continue circuiting.
- J. 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 disruption to the daily operations of the hospital. Provide temporary connections to branch circuit devices, light fixtures, panel boards, motor starters, MCC's, 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.

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 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, connection, and testing of the electrical conductors and cables for use in electrical systems rated 600 V and below, indicated as cable(s), conductor(s), wire, or wiring in this section.

1.2 RELATED WORK

- A. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-resistant rated construction.
- B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.
- 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 conductors and cables.
- E. Section 27 52 23, NURSE CALL SYSTEM

1.3 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 FACTORY TESTS

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

1.6 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):
 - D2301-10.....Standard Specification for Vinyl Chloride
Plastic Pressure-Sensitive Electrical
Insulating Tape
 - D2304-10.....Test Method for Thermal Endurance of Rigid
Electrical Insulating Materials

D3005-10.....Low-Temperature Resistant Vinyl Chloride
Plastic Pressure-Sensitive Electrical
Insulating Tape

C. National Electrical Manufacturers Association (NEMA):

WC 70-09.....Power Cables Rated 2000 Volts or Less for the
Distribution of Electrical Energy

D. National Fire Protection Association (NFPA):

70-11.....National Electrical Code (NEC)

E. Underwriters Laboratories, Inc. (UL):

44-10.....Thermoset-Insulated Wires and Cables

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

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

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

486C-04.....Splicing Wire Connectors

486D-05.....Sealed Wire Connector Systems

486E-09.....Equipment Wiring Terminals for Use with
Aluminum and/or Copper Conductors

493-07.....Thermoplastic-Insulated Underground Feeder and
Branch Circuit Cables

514B-04.....Conduit, Tubing, and Cable Fittings

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Conductors and cables shall be in accordance with NEMA, UL, as specified herein, and as shown on the drawings.
- B. All conductors shall be copper.
- C. Single Conductor and Cable:
 - 1. No. 12 AWG: Minimum size, except where smaller sizes are specified herein or shown on the drawings.
 - 2. No. 8 AWG and larger: Stranded.
 - 3. No. 10 AWG and smaller: Solid; except shall be stranded for final connection to motors, transformers, and vibrating equipment.
 - 4. Insulation: THHN-THWN.
- D. Color Code:
 - 1. No. 10 AWG and smaller: Solid color insulation or solid color coating.
 - 2. No. 8 AWG and larger: 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.
 - c. Color using 19 mm (0.75 inches) wide tape.
3. For modifications and additions to existing wiring systems, color coding shall conform to the existing wiring system.
4. Conductors shall be color-coded as follows:

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

5. Color code for isolated power system wiring shall be in accordance with the NEC.

2.2 SPLICES

- A. Splices shall be in accordance with NEC and UL.
- B. Above Ground Splices for No. 10 AWG and Smaller:
 - 1. Solderless, screw-on, reusable pressure cable type, with integral insulation, approved for copper and aluminum conductors.
 - 2. The integral insulator shall have a skirt to completely cover the stripped conductors.
 - 3. The number, size, and combination of conductors used with the connector, as listed on the manufacturer's packaging, shall be strictly followed.
- C. Above Ground Splices for No. 8 AWG to No. 4/0 AWG:
 - 1. Compression, hex screw, or bolt clamp-type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
 - 2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
 - 3. Splice and insulation shall be product of the same manufacturer.
 - 4. All bolts, nuts, and washers used with splices shall be zinc-plated steel.
- D. Plastic electrical insulating tape: Per ASTM D2304, flame-retardant, cold and weather resistant.

2.3 CONNECTORS AND TERMINATIONS

- A. Mechanical type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
- B. Long barrel compression type of high conductivity and corrosion-resistant material, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.
- C. All bolts, nuts, and washers used to connect connections and terminations to bus bars or other termination points shall be zinc-plated steel.

2.4 CONTROL WIRING

- A. Unless otherwise specified elsewhere in these specifications, control wiring shall be as specified herein, except that the minimum size shall be not less than No. -22 AWG. Low voltage control wiring (48v and lower) may also utilize cables that include twisted pair conductors within an overall jacket per the equipment manufacturers printed requirements.
- B. Control wiring shall be sized such that the voltage drop under in-rush conditions does not adversely affect operation of the controls.

2.5 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 conductors in accordance with the NEC, as specified, and as shown on the drawings.
- B. Install all conductors in raceway systems.
- C. Splice conductors only in outlet boxes, junction boxes, and pullboxes.
- D. Conductors of different systems (e.g., 120 V and 277 V) shall not be installed in the same raceway.
- 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. In panelboards, cabinets, wireways, switches, enclosures, and equipment assemblies, neatly form, train, and tie the conductors with non-metallic ties.
- G. Use expanding foam or non-hardening duct-seal to seal conduits entering a building, after installation of conductors.
- H. Conductor and Cable Pulling:

1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling. Use lubricants approved for the cable.
 2. Use nonmetallic pull ropes.
 3. Attach pull ropes by means of either woven basket grips or pulling eyes attached directly to the conductors.
 4. All conductors in a single conduit shall be pulled simultaneously.
 5. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- I. No more than three branch circuits shall be installed in any one conduit.
 - J. When stripping stranded conductors, use a tool that does not damage the conductor or remove conductor strands.

3.2 FIREPROOFING:

- A. Install fireproofing on low-voltage conductors where the low-voltage conductors are installed in the same manholes with medium-voltage conductors.
- B. Use fireproofing tape and apply the tape in a single layer, half-lapped, or as recommended by the manufacturer. Install the tape with the coated side towards the cable and extend it not less than 25 mm (1 inch) into each duct.
- C. Secure the fireproofing tape in place by a random wrap of glass cloth tape.

3.3 SPLICE AND TERMINATION INSTALLATION

- A. Splices and terminations shall be mechanically and electrically secure, and tightened to manufacturer's published torque values using a torque screwdriver or wrench.
- B. Where the Government determines that unsatisfactory splices or terminations have been installed, replace the splices or terminations at no additional cost to the Government.

3.4 CONDUCTOR IDENTIFICATION

- A. When using colored tape to identify phase, neutral, and ground conductors larger than No. 8 AWG, apply tape in half-overlapping turns for a minimum of 75 mm (3 inches) from terminal points, and in junction boxes, pullboxes, 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.

3.6 EXISTING CONDUCTORS

- A. Unless specifically indicated on the plans, existing conductors shall not be reused.

3.7 CONTROL WIRING INSTALLATION

- A. Unless otherwise specified in other sections, install control wiring and connect to equipment to perform the required functions as specified or as shown on the drawings.
- B. Install a separate power supply circuit for each system, except where otherwise shown on the drawings.

3.8 CONTROL 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.

3.9 ACCEPTANCE CHECKS AND TESTS

- A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
 - 1. Visual Inspection and Tests: Inspect physical condition.
 - 2. Electrical tests:
 - a. After installation but before connection to utilization devices, such as fixtures, motors, or appliances, test conductors phase-to-phase and phase-to-ground resistance with an insulation resistance tester. Existing conductors to be reused shall also be tested.
 - b. Applied voltage shall be 500 V DC for 300 V rated cable, and 1000 V DC for 600 V 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 megaohms for 300 V rated cable and 100 megaohms for 600 V rated cable.
 - c. Perform phase rotation test on all three-phase circuits.

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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 furnishing, installation, connection, and testing of grounding and bonding equipment, indicated as grounding equipment in this section.
- B. "Grounding electrode system" refers to grounding electrode conductors and all electrodes required or allowed by NEC, as well as made, supplementary, and lightning protection system grounding electrodes.
- C. The terms "connect" and "bond" are used interchangeably in this section and have the same meaning.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS:
Requirements that apply to all sections of Division 26.
- B. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES:
Low-voltage conductors.
- C. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit and boxes.
- D. Section 27 52 23, NURSE CALL SYSTEM

1.3 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
 - 1. Shop Drawings:
 - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - b. Submit plans showing the location of system grounding electrodes and connections, and the routing of aboveground and underground grounding electrode conductors.
 - 2. Test Reports:
 - a. Two weeks prior to the final inspection, submit ground resistance field test reports to the Project Engineer
 - 3. Certifications:

- a. Certification by the Contractor that the grounding equipment has been properly installed and tested.

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. 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
 - B8-11.....Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- C. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - 81-83.....IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System Part 1: Normal Measurements
- D. National Fire Protection Association (NFPA):
 - 70-11.....National Electrical Code (NEC)
 - 70E-12.....National Electrical Safety Code
 - 99-12.....Health Care Facilities
- E. Underwriters Laboratories, Inc. (UL):
 - 44-10Thermoset-Insulated Wires and Cables
 - 83-08Thermoplastic-Insulated Wires and Cables
 - 467-07Grounding and Bonding Equipment

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

- A. Equipment grounding conductors shall be insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be identified per NEC.
- B. Bonding conductors shall be bare stranded copper, except that sizes No. 10 AWG and smaller shall be bare solid copper. Bonding conductors shall be stranded for final connection to motors, transformers, and vibrating equipment.

C. Conductor sizes shall not be less than shown on the drawings, or not less than required by the NEC, whichever is greater.

D. Insulation: THHN-THWN.

2.2 GROUND CONNECTIONS

A. Inaccessible Locations: Exothermic-welded type connectors.

B. Above Grade:

1. Bonding Jumpers: Listed for use with aluminum and copper conductors. For wire sizes No. 8 AWG and larger, use compression-type connectors. For wire sizes smaller than No. 8 AWG, use mechanical type lugs. Connectors or lugs shall use zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.
2. Connection to Building Steel: Exothermic-welded type connectors.
3. Connection to Grounding Bus Bars: Listed for use with aluminum and copper conductors. Use mechanical type lugs, with zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.
4. Connection to Equipment Rack and Cabinet Ground Bars: Listed for use with aluminum and copper conductors. Use mechanical type lugs, with zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

2.3 EQUIPMENT RACK AND CABINET GROUND BARS

A. Provide solid copper ground bars designed for mounting on the framework of open or cabinet-enclosed equipment racks. Ground bars shall have minimum dimensions of 6.3 mm (0.25 inch) thick x 19 mm (0.75 inch) wide, with length as required or as shown on the drawings. Provide insulators and mounting brackets.

2.4 GROUND TERMINAL BLOCKS

A. At any equipment mounting location (e.g., backboards and hinged cover enclosures) where rack-type ground bars cannot be mounted, provide mechanical type lugs, with zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

2.5 GROUNDING BUS BAR

A. Pre-drilled rectangular copper bar with stand-off insulators, minimum 6.3 mm (0.25 inch) thick x 100 mm (4 inches) high in cross-section, length as shown on the drawings, with hole size, quantity, and spacing per detail shown on the drawings. Provide insulators and mounting brackets.

PART 3 - EXECUTION**3.1 GENERAL**

- A. Install grounding equipment in accordance with the NEC, as shown on the 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 transformer.
 - 2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
- C. Equipment Grounding: Metallic piping, building structural steel, electrical 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. For patient care area electrical power system grounding, conform to NFPA 99 and NEC.

3.2 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. Metallic 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 an equipment 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. Wireway Systems:

1. Bond the metallic structures of wireway to provide electrical continuity throughout the wireway system, by connecting a No. 6 AWG bonding jumper at all intermediate metallic enclosures and across all section junctions.
2. Install insulated No. 6 AWG bonding jumpers between the wireway system, bonded as required above, and the closest building ground at each end and approximately every 16 M (50 feet).
3. Use insulated No. 6 AWG bonding jumpers to ground or bond metallic wireway at each end for all intermediate metallic enclosures and across all section junctions.
4. Use insulated No. 6 AWG bonding jumpers to ground cable tray to column-mounted building ground plates (pads) at each end and approximately every 15 M (49 feet).

E. 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.

F. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.

3.3 CORROSION INHIBITORS

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

3.4 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.

---END---

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, and connection of conduit, fittings, and boxes, to form complete, coordinated, grounded raceway systems. Raceways are required for all wiring unless shown or specified otherwise.
- B. Definitions: The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

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 and items that are common to more than one section of Division 26.
- 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 27 52 23, NURSE CALL SYSTEM

1.3 QUALITY ASSURANCE

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

1.4 SUBMITTALS

In accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, submit the following:

- A. Manufacturer's Literature and Data: Showing each cable type and rating. The specific item proposed and its area of application shall be identified on the catalog cuts.
- B. Shop Drawings:
 - 1. Size and location of main feeders.
 - 2. Size and location of panels and pull-boxes.
 - 3. Layout of required conduit penetrations through structural elements.

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. American National Standards Institute (ANSI):
 - C80.1-05.....Electrical Rigid Steel Conduit
 - C80.3-05.....Steel Electrical Metal Tubing
 - C80.6-05.....Electrical Intermediate Metal Conduit
- C. National Fire Protection Association (NFPA):
 - 70-08.....National Electrical Code (NEC)
- D. Underwriters Laboratories, Inc. (UL):
 - 1-05.....Flexible Metal Conduit
 - 6-07.....Electrical Rigid Metal Conduit - Steel
 - 50-95.....Enclosures for Electrical Equipment
 - 467-07.....Grounding and Bonding Equipment
 - 514A-04.....Metallic Outlet Boxes
 - 514B-04.....Conduit, Tubing, and Cable Fittings
 - 514C-96.....Nonmetallic Outlet Boxes, Flush-Device Boxes
and Covers
 - 797-07.....Electrical Metallic Tubing
 - 1242-06.....Electrical Intermediate Metal Conduit - Steel
- E. National Electrical Manufacturers Association (NEMA):
 - FB1-07.....Fittings, Cast Metal Boxes and Conduit Bodies
for Conduit, Electrical Metallic Tubing and
Cable

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Conduit Size: In accordance with the NEC, but not less than 0.5 in [13 mm] unless otherwise shown. Where permitted by the NEC, 0.5 in [13 mm] flexible conduit may be used for tap connections to recessed lighting fixtures.
- B. Conduit:
 - 1. Rigid steel: Shall conform to UL 6 and ANSI C80.1.
 - 2. Electrical metallic tubing (EMT): Shall conform to UL 797 and ANSI C80.3. Maximum size not to exceed 4 in [105 mm] and shall be permitted only with cable rated 600 V or less.
 - 3. Flexible galvanized steel conduit: Shall conform to UL 1. Flexible conduit allowed in locations specifically approved by the VA Project Engineer.
- C. Conduit Fittings:
 - 1. Electrical metallic tubing fittings:

- a. Fittings and conduit bodies shall meet the requirements of UL 514B, ANSI C80.3, and NEMA FB1.
 - b. Only steel or malleable iron materials are acceptable.
 - c. Setscrew couplings and connectors: Use setscrews of case-hardened steel with hex head and cup point, to firmly seat in wall of conduit for positive grounding.
 - d. Indent-type connectors or couplings are prohibited.
 - e. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.
2. Flexible steel conduit fittings:
- a. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
 - b. Clamp-type, with insulated throat.
- D. Conduit Supports:
- 1. Parts and Hardware: Zinc-coat or provide equivalent corrosion protection.
 - 2. Individual Conduit Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.
 - 3. Multiple Conduit (trapeze) Hangers: Not less than 1.5 x 1.5 in [38 mm x 38 mm], 12-gauge steel, cold-formed, lipped channels; with not less than 0.375 in [9 mm] diameter steel hanger rods.
 - 4. Solid Masonry and Concrete Anchors: Self-drilling expansion shields, or machine bolt expansion.
- E. Outlet, Junction, and Pull Boxes:
- 1. UL-50 and UL-514A.
 - 2. Cast metal where required by the NEC or shown, and equipped with rustproof boxes.
 - 3. Sheet metal boxes: Galvanized steel, except where otherwise shown.
 - 4. Flush-mounted wall or ceiling boxes shall be installed with raised covers so that the front face of raised cover is flush with the wall. Surface-mounted wall or ceiling boxes shall be installed with surface-style flat or raised covers.

PART 3 - EXECUTION

3.1 PENETRATIONS

- A. Cutting or Holes:
- 1. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammers, impact

electric, hand, or manual hammer-type drills are not allowed, except where permitted by the Project Engineers and required by limited working space. Do no cut through structural elements.

- B. Firestop: Where conduits, wireways, and other electrical raceways pass through walls or floors, install a firestop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING.
- C. Waterproofing: At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight, as specified in Section 07 92 00, JOINT SEALANTS.

3.2 INSTALLATION, GENERAL

- A. In accordance with UL, NEC, as shown, and as specified herein.
- B. Essential (Emergency) raceway systems shall be entirely independent of other raceway systems, except where shown on drawings.
- C. Install conduit as follows:
 - 1. In complete mechanically and electrically continuous runs before pulling in cables or wires.
 - 2. Unless otherwise indicated on the drawings or specified herein, installation of all conduits shall be concealed within finished walls, floors, and ceilings.
 - 3. Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new undamaged material.
 - 4. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
 - 5. Cut square, ream, remove burrs, and draw up tight.
 - 6. Independently support conduit at 8 ft [2.4 M] on centers. Do not use other supports, i.e., suspended ceilings, suspended ceiling supporting members, lighting fixtures, conduits, mechanical piping, or mechanical ducts.
 - 7. Support within 12 in [300 mm] of changes of direction, and within 12 in [300 mm] of each enclosure to which connected.
 - 8. Close ends of empty conduit with plugs or caps at the rough-in stage until wires are pulled in, to prevent entry of debris.
 - 9. Conduit installations under fume and vent hoods are prohibited.
 - 10. Secure conduits to cabinets, junction boxes, pull-boxes, and outlet boxes with bonding type locknuts. For rigid and IMC conduit installations, provide a locknut on the inside of the enclosure,

made up wrench tight. Do not make conduit connections to junction box covers.

11. Conduit bodies shall only be used for changes in direction, and shall not contain splices.

D. Conduit Bends:

1. Make bends with standard conduit bending machines.
2. Conduit hickey may be used for slight offsets and for straightening stubbed out conduits.
3. Bending of conduits with a pipe tee or vise is prohibited.

E. Layout and Homeruns:

1. Install conduit with wiring, including homeruns, as shown on drawings.
2. Deviations: Make only where necessary to avoid interferences and only after drawings showing the proposed deviations have been submitted approved by the Project Engineer.

3.3 CONCEALED WORK INSTALLATION

A. Above Furred or Suspended Ceilings and in Walls:

1. Conduit for conductors 600 V and below: EMT. Mixing different types of conduits indiscriminately in the same system is prohibited.
2. Align and run conduit parallel or perpendicular to the building lines.
3. Tightening setscrews with pliers is prohibited.

3.4 EXPOSED WORK INSTALLATION

- A. Unless otherwise indicated on the drawings, exposed conduit is only permitted in mechanical and electrical rooms.
- B. Conduit for Conductors 600 V and Below: EMT. Mixing different types of conduits indiscriminately in the system is prohibited.
- C. Align and run conduit parallel or perpendicular to the building lines.
- D. Install horizontal runs close to the ceiling or beams and secure with conduit straps.
- E. Support horizontal or vertical runs at not over 8 ft [2.4 M] intervals.

3.5 WET OR DAMP LOCATIONS

- A. Unless otherwise shown, use conduits of rigid steel or IMC.
- B. Provide sealing fittings to prevent passage of water vapor where conduits pass from warm to cold locations, i.e., refrigerated spaces, constant-temperature rooms, air-conditioned spaces, building exterior walls, roofs, or similar spaces.

- C. Unless otherwise shown, use rigid steel conduit within 5 ft [1.5 M] of the exterior and below concrete building slabs in contact with soil, gravel, or vapor barriers. Conduit shall be half-lapped with 10 mil PVC tape before installation. After installation, completely recoat or retape any damaged areas of coating.

3.6 CONDUIT SUPPORTS, INSTALLATION

- A. Safe working load shall not exceed one-quarter of proof test load of fastening devices.
- B. Use pipe straps or individual conduit hangers for supporting individual conduits.
- C. Support multiple conduit runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and 200 lbs [90 kg]. Attach each conduit with U-bolts or other approved fasteners.
- D. Support conduit independently of junction boxes, pull-boxes, fixtures, suspended ceiling T-bars, angle supports, and similar items.
- E. Fasteners and Supports in Solid Masonry and Concrete:
 - 1. Existing Construction:
 - a. Steel expansion anchors not less than 0.25 in [6 mm] bolt size and not less than 1.125 in [28 mm] embedment.
 - b. Power set fasteners not less than 0.25 in [6 mm] diameter with depth of penetration not less than 3 in [75 mm].
 - c. Use vibration and shock-resistant anchors and fasteners for attaching to concrete ceilings.
- E. Hollow Masonry: Toggle bolts.
- F. Bolts supported only by plaster or gypsum wallboard are not acceptable.
- G. Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.
- H. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.
- I. Chain, wire, or perforated strap shall not be used to support or fasten conduit.
- J. Spring steel type supports or fasteners are prohibited for all uses except horizontal and vertical supports/fasteners within walls.

3.7 BOX INSTALLATION

- A. Boxes for Concealed Conduits:
 - 1. Flush-mounted.

2. Provide raised covers for boxes to suit the wall or ceiling, construction, and finish.
- B. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling-in operations.
- C. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.
- D. Outlet boxes mounted back-to-back in the same wall are prohibited. A minimum 24 in [600 mm] center-to-center lateral spacing shall be maintained between boxes.
- E. Minimum size of outlet boxes for ground fault interrupter (GFI) receptacles is 4 in [100 mm] square x 2.125 in [55 mm] deep, with device covers for the wall material and thickness involved.
- F. Stencil or install phenolic nameplates on covers of the boxes identified on riser diagrams; for example "SIG-FA JB No. 1."
- G. On all branch circuit junction box covers, identify the circuits with black marker.

- - - E N D - - -

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, connection, and testing of wiring devices.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section of Division 26.
- B. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit and boxes.
- C. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Cables and wiring.
- D. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path to ground for possible ground fault currents.
- E. Section 27 52 23, NURSE CALL SYSTEM

1.3 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
 - 1. Shop Drawings:
 - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - b. Include electrical ratings, dimensions, mounting details, construction materials, grade, and termination information.
 - 2. Manuals:
 - a. Submit two hardcopies and two electronic (PDF) versions, two weeks prior to final inspection two companion copies of complete maintenance and operating manuals, including technical data sheets and information for ordering replacement parts.
 - b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
 - 3.

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 basic designation only.
- B. National Fire Protection Association (NFPA):
 - 70-11.....National Electrical Code (NEC)
 - 99-12.....Health Care Facilities
- C. National Electrical Manufacturers Association (NEMA):
 - WD 1-10.....General Color Requirements for Wiring Devices
 - WD 6-08Wiring Devices - Dimensional Specifications
- D. Underwriter's Laboratories, Inc. (UL):
 - 5-11.....Surface Metal Raceways and Fittings
 - 20-10.....General-Use Snap Switches
 - 231-07.....Power Outlets
 - 467-07.....Grounding and Bonding Equipment
 - 498-07.....Attachment Plugs and Receptacles
 - 943-11.....Ground-Fault Circuit-Interrupters
 - 1449-07.....Surge Protective Devices
 - 1472-96.....Solid State Dimming Controls

PART 2 - PRODUCTS

2.1 RECEPTACLES

- A. General: All receptacles shall comply with NEMA, NFPA, UL, and as shown on the drawings.
 - 1. Mounting straps shall be plated steel, with break-off plaster ears and shall include a self-grounding feature. Terminal screws shall be brass, brass plated or a copper alloy metal.
 - 2. Receptacles shall have provisions for back wiring with separate metal clamp type terminals (four minimum) and side wiring from four captively held binding screws.
 - 3. All receptacles shall be labeled with the panel name and circuit number. Example: 12S1-5. The labels shall be self-adhesive type with clear background and black lettering, 3/16 inch high text.
- B. Duplex Receptacles: Hospital-grade, single phase, 20 ampere, 120 volts, 2-pole, 3-wire, NEMA 5-20R, with break-off feature for two-circuit operation and green dot designator.
 - 1. Bodies shall be ivory in color.

2. Switched duplex receptacles shall be wired so that only the top receptacle is switched. The lower receptacle shall be unswitched.

3. Duplex Receptacles on Emergency Circuit:

a. Bodies shall be red in color with the 'Green Dot' designator.

Wall plates shall be red with the word "EMERGENCY" engraved in 6 mm, (1/4 inch) white letters.

C. Receptacles; 20, 30, and 50 ampere, 250 Volts: Shall be complete with appropriate cord grip plug.

2.2 WALL PLATES

A. Wall plates for switches and receptacles shall be Type 302 stainless steel. Oversize plates are not acceptable.

B. For receptacles or switches mounted adjacent to each other, wall plates shall be common for each group of receptacles or switches.

C. In areas requiring tamperproof wiring devices, wall plates shall be Type 302 stainless steel, and shall have tamperproof screws and beveled edges.

D. Duplex Receptacles on Emergency Circuit: Wall plates shall be red nylon with the word "EMERGENCY" engraved in 6 mm (1/4 inch) white letters.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the NEC and as shown as on the drawings.

B. Install wiring devices after wall construction and painting is complete.

C. The ground terminal of each wiring device shall be bonded to the outlet box with an approved green bonding jumper, and also connected to the branch circuit equipment grounding conductor.

D. Provide barriers in multigang outlet boxes to comply with the NEC.

E. Coordinate the electrical work with the work of other trades to ensure that wiring device flush outlets are positioned with box openings aligned with the face of the surrounding finish material. Pay special attention to installations in cabinet work, and in connection with equipment.

F. Exact field locations of floors, walls, partitions, doors, windows, and equipment may vary from locations shown on the drawings. Prior to locating sleeves, boxes and chases for roughing-in of conduit and equipment, the Contractor shall coordinate exact field location of the above items with other trades.

G. Install receptacles 450 mm (18 inches) above floor, and 152 mm (6 inches)

above counter backsplash or workbenches. Install specific-use receptacles at heights shown on the drawings.

- H. Install vertically mounted receptacles with the ground pin up. Install horizontally mounted receptacles with the ground pin to the right.
- I. When required or recommended by the manufacturer, use a torque screwdriver. Tighten unused terminal screws.
- J. Label all receptacles and switch plates with the panel name and circuit number serving it. Example: 10S1-5. Labels to be self adhesive type with clear background and black letters, 3/16 inch high letters.

3.2 ACCEPTANCE CHECKS AND TESTS

- A. Perform manufacturer's required field checks in accordance with the manufacturer's recommendations. In addition, include the following:
 - 1. Visual Inspection and Tests:
 - a. Inspect physical and electrical condition.
 - b. Vacuum-clean surface metal raceway interior. Clean metal raceway exterior.
 - c. Test wiring devices for damaged conductors, high circuit resistance, poor connections, inadequate fault current path, defective devices, or similar problems using a portable receptacle tester. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.
 - 2. Healthcare Occupancy Tests:
 - a. Test hospital grade receptacles for retention force per NFPA 99.

---END---

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.
- E. Backbone fiber optic cable for in building wiring.
- G. Premise testing.
- H. 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.
- C. Section 27 52 23 - Nurse Call System.

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 panels.

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.
- D. Backbone Cabling: Backbone cables shall be routed from the nurse call head end room to the equipment locations as indicated on the drawings and riser diagram. Cables shall be routed in existing cable tray or in new j-hooks.

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 AND FIBER OPTIC 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 and fiber optic cables 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 COMMUNICATIONS JACKS

- 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 equal to Panduit Mini-Com Executive Series faceplates.
 - a. One, two, four and six-port single gang and 10-port double gang faceplates as required. Equal to Panduit part numbers CFPE1-IW, CFPE2-IW, CFPE4-IW, CFPE6-IW, and CFPE10IW-2G.
 - 3. Standard Color: Blue for nurse call devices.
 - 4. See Drawings for quantity of connector modules and modular faceplates.

2.3 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.
 - 14. Plenum rated cable.

2.4 BACKBONE CABLES

- A. Fiber Optic Cables

1. Manufacturer: Optical Cable Corporation (OCC) or equal.
 - a. Interior Cable: OCC DX series, distribution-style with 900um tight buffered fibers, Super/FDDI-grade, type OFNP nonconductive-plenum-rated cable, flame-retardant PVC jacket, plenum rated armor, armored jacket, provide plenum rated interlocked armored jacket with orange color, 6-fiber, multimode 62.5/125 um, complying with TIA-492AAAA; covered with orange cable jacket and complying with relevant portions of and addenda to latest edition of TIA/EIA-568.

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. Equal to Panduit CPP48WBLY 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. Equal to Chatsworth 30530-719, HORZ MGR DBL UNIV 2U 19 IN, horizontal wire management panels shall be provided between pairs of DP48 patch panel frames for front and rear patch cable management and as necessary above and/or below network electronics.
 - f. Equal to 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.
2. Patch Panels for Fiber Optic Cabling: Sized to fit EIA standard 19 inch wide equipment racks; 0.09 inch thick aluminum.
 - a. Equal to Panduit FRME24BL 24-port rack mount fiber panel with FAP-6W ST multimode ST adapter plate. Provide equal to

Panduit FWME8 series wall mount enclosures for wall mount applications.

- b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA/EIA-606 using encoded identifiers.
- c. Provide incoming cable strain relief and routing guides on back of panel.
- d. Provide rear cable management tray at least 8 inches deep with removable cover.
- e. Provide dust covers for unused adaptors.
- f. Patch Cords: Provide one patch cord for each pair of patch panel ports.

2.6 ENCLOSURES

- A. Equipment Racks and Cabinets: CEA-310 standard 19 inch wide component racks.
 - 1. Floor Mounted Racks: 16 gauge steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
 - a. Manufacturer: Equal to Hoffman E4DR19FM38U open 4 post.
 - b. Description: Standard 19" rack meeting EIA-310-D standards. 84" high, aluminum construction, aluminum in color. 45 rack spaces minimum.
 - c. Mounting: Floor mount. Secure to floor and building structure above.
 - d. Wire Management: Provide matching horizontal and vertical wire management for rack and all installed components.
 - e. Provide UL listed horizontal power strip, 30 amp rated, (12) NEMA 5-20R outlets and an integral circuit breaker and 10 foot cord.
 - f. Cable Management: Provide "Cable Drop Out" or "Cable Exit" accessories for connecting the cable tray to the racks. Secure cable tray to each rack.
- B. Plywood Termination Board: ¾ inch thick, fire rated CDX plywood with smooth finish on one side, painted with gray intumescent paint.
Provide plywood from floor to 8' aff on all walls of the new nurse call equipment room.

2.7 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.

2.8 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.
- 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 nurse call network jack shall be provided with its own UTP cable continuous (without splice) from jack to 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.

3.2 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 nurse call network jack and at the patch panels.
- C. All labels shall be a machine label in conformance with ANSI/EIA/TIA 606.
- 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.

- - - E N D - - -

SECTION 27 52 23

NURSE CALL SYSTEM

PART 1 - GENERAL

1. 1 SUMMARY

- A. Work covered by this document includes design, engineering, labor, material and products, equipment warranty and system guarantee, training and services for, and incidental to, the complete installation of new and fully operating National Fire Protection Association (NFPA) - Life Safety Code 101.3-2 (a) Labeled and (b) Listed, Emergency Service Nurse-Call and/or Life Safety listed Code Blue Communication System and associated equipment (here-in-after referred to as the System) provided in approved locations indicated on the contract drawings. These items shall be tested and certified capable of receiving, distributing, interconnecting and supporting Nurse-Call and/or Code Blue communications signals generated local and remotely as detailed herein.
- B. Provide a complete working Nurse Call System based upon the specification outlined here to include all necessary devices that provide the functions listed in this specification. This facility will be referenced as the OWNER in this specification.
- C. The Contractor for this project will be required to coordinate with concurrent construction projects in progress at the Fargo VAMC site. Coordinate closely with other Contractors and trades where work areas may overlap.
- D. The System shall be delivered free of engineering, manufacturing, installation, and functional defects. It shall be designed, engineered and installed for ease of operation, maintenance, and testing.
- E. The term "provide", as used herein, shall be defined as: designed, engineered, furnished, installed, certified, tested, and guaranteed by the Contractor.
- F. Specification Order of Precedence: In the event of a conflict between the text of this document and the Project's Contract Drawings outlined and/or cited herein; THE TEXT OF THIS DOCUMENT TAKES PRECEDENCE. HOWEVER, NOTHING IN THIS DOCUMENT WILL SUPERSEDE APPLICABLE EMERGENCY LAWS AND REGULATIONS, SPECIFICALLY NATIONAL AND/OR LOCAL LIFE AND PUBLIC SAFETY CODES. The Local Fire Marshall and/or VA Public Safety Officer are the only authorities that may modify this document's

EMERGENCY CODE COMPLIANCE REQUIREMENTS, on a case by case basis, in writing and confirmed by VA's Project Manager (PM), Resident Engineer (RE) and TVE-0050P3B. The VA PM is the only approving authority for other amendments to this document that may be granted, on a case by case basis, in writhing with technical concurrences by VA's PM, RE, TVE-0050P3B and identified Facility Project Personnel.

- G. The Original Equipment Manufacturer (OEM) and Contractor shall ensure that all management, sales, engineering and installation personnel have read and understand the requirements of this specification before the system is designed, engineered, delivered and provided. The Contractor shall furnish a written statement stating this requirement as a part of the technical submittal that includes each name and certification, including the OEMs. The Contractor is cautioned to obtain in writing, all approvals for system changes relating to the published contract specifications and drawings, from the PM and/or the RE before proceeding with the change.
- H. If an operational function is specified that requires hardware or software to complete that specific function, then consider that software or hardware part of this specification. The cost of any omissions of software or hardware necessary to complete all operational functions outlined in this specification shall be borne by the contractor providing this system.
- I. All Nurse Call System devices shall be UL-1069 listed. This includes routers, hubs, switches, and room control devices. The nurse call network shall be an FDA Registered Class II (or higher) medical device and the system's manufacturer shall be an FDA Registered Operator. Field wiring shall be CAT 6e cable, control wiring for power distributions and very long runs, and utilize fiber optic cable when distances exceed normal Ethernet limitations. All station equipment shall use plug on connectors and all switches, routers and controllers shall utilize standard RJ-45 modular connections. All remote devices utilizing standard structured cabling shall be capable of PoE (Power over Ethernet) or power supplied within the CAT 6e cable jacket. Systems which require separate DC power to devices, remote power supplies, or heavy DC wiring to each individual room shall not be accepted. Wiring shall be capable of either being installed in conduit, j-hooks or cable trays. Existing cable tray may be used for installation of new nurse call network connections. Nurse

Communications cabling may be run along with other low voltage and data cables where permitted by code. Nurse Communications cabling to be separated out from any high voltage AC or DC wiring that exceeds 90 volts, or which violates any national or local electrical code.

- J. The system must be UL 1069 listed as a Nurse Communications Network. Systems listed by other nationally recognized testing laboratory may not be accepted. The system shall be capable of interconnecting with the hospital's LAN (Local Area Network). This connection shall be minimal and utilize only one Ethernet 100 Mbps (or optionally 1 GB) connection to accomplish all ADT, hospital information, reporting software and information exchange. The HL-7 standard shall be utilized for receipt of patient information from the ADT system.
- K. All software applications shall be HIPAA and PIPEDA compliant and shall allow for patient name aliases and alternative display methods. Complex user names, expiring passwords, granular permission settings and role based security shall be standard. All databases shall be ODBC compliant, MS SQL 2005.
- L. Overall Nurse Communications Network shall utilize VoIP communications between all major components: nurse consoles, staff terminals, telephones and controllers. Any nurse call console and staff terminal must be able to answer any patient call placed in the network.
- M. The contractor shall provide an IP based, wireless telephone system and alarm management middleware system to be integrated with the nurse call system. The equipment shall be included in the Base Bid and installed under the provisions of this section, and shall be deleted under Deduct Alternate #6. The Contractor shall provide all required software, servers, routers, licensing and other miscellaneous items for a complete and functional system.
- N. The capability to assign patients to staff shall be via a networked software infrastructure on contractor provided workstations, quantity of two (2). It shall also be possible to have multiple users logging onto system via barcode or other standard human interface devices. Log on process identifies user and the current device used that day. Systems not utilizing bar code or HID sign on and/or only single PC assignment from nurses' station will not be accepted under this specification.
- O. Ethernet ports will be provided by the contractor for HL-7 integration to the entire network. The Contractor shall provide a server for those

specific nurse call options that are selected. All servers will be installed in the facilities main basement computer room. The Network shall be expandable to any combination of over 15,000 bed, duty, or staff stations and 120,000 sub-stations connected as a contiguous interconnected system. Multiple buildings and intra-building connections may be linked together utilizing a fiber connection. Audio communications between devices shall be digital and virtually non-blocking, so as to provide fast, instantaneous communications without queuing or delay.

- P. The Network shall be capable of backward compatibility to prior generation of Nurse/Patient Communications system manufactured by same vendor via a network adapter module. This module will allow calls from the prior generation system to appear and go into audio communication from the common consoles, staff terminals, duty stations, zone lights and PC displays as well as allow patient to staff assignment via a common client application.

1. 2 REFERENCES

- A. Underwriter's Laboratories UL-1069 current release
- B. Canadian Standards Association
- C. National Electrical Code
- D. NFPA 70 and 99
- E. U.S. Dept. of Labor Occupational Safety and Health Administration
- F. State Hospital Code Joint Commission of Hospitals - Nurse Call Requirements
- G. NEMA installation standards

1. 3 RELATED SECTIONS

- A. 01 33 23 - Shop Drawings
- B. 07 84 00 - Firestopping
- C. 26 05 19 - Low Voltage Electrical Power Conductors and Cables
- D. 26 05 11 - Requirements for Electrical Installations
- E. 26 05 26 - Grounding and Bonding for Electrical Systems
- F. 26 05 33 - Raceways and Boxes
- G. 27 10 05 - Computer Network and Telephone Wiring

1. 4 QUALIFICATIONS

- A. Authorized Distributor for product supplied. Authorized Distributor Letter from manufacturer required upon request of specifying authority.
- B. The OEM shall have had experience with three (3) or more installations of Nurse Call systems of comparable size and interfacing complexity

with regards to type and design as specified herein. Each of these installations shall have performed satisfactorily for at least one (1) year after final acceptance by the user. Include the names, locations and point of contact for these installations as a part of the submittal.

- C. The Contractor shall submit certified documentation that they have been an authorized distributor and service organization for the OEM for a minimum of three (3) years. The Contractor shall be authorized by the OEM to pass thru the OEM's warranty of the installed equipment to VA. In addition, the OEM and Contractor shall accept complete responsibility for the design, installation, certification, operation, and physical support for the System. This documentation, along with the System Contractor and OEM certifications must be provided in writing as part of the Contractor's Technical submittal.
- D. The Contractor's Communications Technicians assigned to the System shall be fully trained, qualified, and certified by the OEM on the engineering, installation, operation, and testing of the System. The Contractor shall provide formal written evidence of current OEM certification(s) for the installer(s) as a part of the submittal or to the RE before being allowed to commence work on the System.
- E. The Contractor shall display all applicable national, state and local licenses.
- F. The Contractor shall submit copy (s) of Certificate of successful completion of OEM's installation/training school for installing technicians of the System's Nurse Call and/or
- G. Code Blue equipment being proposed.
- H. Applicable state licenses.
- I. Certificate of successful completion of manufacturer's installation/training school for installing technicians of the equipment being proposed. Letter from manufacturer stating technician qualifications.
- J. Certificate of completion of network certifications (i.e. Cisco or Microsoft).

1.5 SCHEDULING

- A. After the award of contract, the Contractor shall prepare a detailed schedule (aka milestone chart) using "Microsoft Project" software or equivalent. The Contractor Project Schedule (CPS) shall indicate detailed activities for the projected life of the project. The CPS

shall consist of detailed activities and their restraining relationships. It will also detail manpower usage throughout the project.

- B. It is the responsibility of the Contractor to coordinate all work with the other trades for scheduling, rough-in, and finishing all work specified. The owner will not be liable for any additional costs due to missed dates or poor coordination of the supplying contractor with other trades.

1.6 SYSTEM DESCRIPTION

- A. System hardware shall consist of a nurse call network comprised of VoIP nurse consoles, PC consoles, nurse call network controllers, patient stations, power supplies, battery back-up, dome lights, entertainment cords, call cords, pull cord stations, emergency push button stations, wiring and other options such as bed side-rail interfaces, computer interfaces, VoIP staff terminals, and network adapter module as shown on drawings and described herein. All necessary equipment required to meet the intent of these specifications, whether or not enumerated within these specifications, shall be supplied and installed to provide a complete and operating nurse/patient communications network.
- B. System hardware and firmware shall be the product of a single, reputable manufacturer with a proven history of product reliability and sole control over all source code. Manufacturer shall provide, free of charge, product firmware/software upgrades for a period of one year from date of installation for any product feature enhancements. Manufacturer shall provide a 5 year warranty on all manufactured hardware. All programming and firmware changes shall be accomplished on a working system without interruption to the normal operation of the system. Therefore, all system switches and controllers, which hold this firmware and system parameters must have DUAL storage. While updates are being made to one set of firmware, the system shall be working and fully functional on the original firmware (i.e. A and B memory blocks). It shall be possible to switch to the NEW system control software modules by a single system command. In the event of an error or failure in the update process, the system shall revert back to the previous firmware.
- C. All programming and firmware changes shall be accomplished on a working system without interruption to the normal operation of the system. Therefore, all system switches and controllers, which hold this

firmware and system parameters must have DUAL storage. While updates are being made to one set of firmware, the system shall be working and fully functional on the original firmware (i.e. A and B memory blocks). It shall be possible to switch to the NEW system control software modules by a single system command. In the event of an error or failure in the update process, the system shall revert back to the previous firmware.

- D. All communications shall be full duplex audio, not only on handsets, but all loud speaking devices, including patient, staff, duty, staff terminals, and pillow speakers. Systems that do not have full duplex audio or do not have separate microphone and speaker capability within the pillow speakers will not be accepted.
- E. All wall mounted stations shall be flush mounted.
- F. All flush mount station buttons shall use a bio-seal cover to facilitate the use of disinfectant cleaners.
- G. Entire Network shall be supervised, including all sub-stations. Reporting of station failure shall be to any designated console, PC, e-mail, or wireless device. Up to 100 different staff levels may be defined within the nurse call network to facilitate work flow within and outside of normal nurse call activity.
- H. Nurse call network shall support a VLAN configuration to separate activity in the nurse call network from other hospital LAN traffic.
- I. The nurse call network shall support a GUI interface that sits on the nurse call LAN. This interface consists of multiple modules such as staff assignment, PC call display, call detail recording, exception reporting, etc.
- J. The nurse call network shall support call processes to facilitate work flow and call escalations to various staff and or groups.
- K. Nurse call network shall support any Real Time Locating System (RTLS) via an open architectural interface.
- L. Nurse call network shall support any telephone or pager device via an open architectural interface.
- M. Nurse call network shall support any ADT system via an open architectural interface.
- N. Nurse call network shall support any data backup system.

1.7 SUBMITTALS

- A. Each submittal shall consist of the following:
 - 1. Name of supplying contractor and project name.

2. In the following order, a listing of: component quantities, equipment manufacturer, model number, and description of each component being supplied.
3. Recently dated (within one year from submittal date) support letter from manufacturer stating that the supplying contractor is an Authorized Distributor of the product being supplied.
4. Statement that warranty hardware from manufacturer for 5 years or statement of vendor extending manufacturer's original warranty to 5 years.
5. Copy of the installing technician(s) certificate of completion from the manufacturer's training school for the equipment being proposed.
6. Provide a list of recommended spare parts to maintain all systems specified after the warranty period.
7. One catalog sheet per product of equipment. Each catalog sheet shall describe mechanical, electrical and functional equipment specifications. The catalog sheet must also include a photograph of the product. Where multiple products are listed on a page, circle or highlight the one proposed to be used.
8. Provide all inter-equipment wiring diagrams and floor plan drawings necessary to install the equipment being supplied. These drawings will show all wiring types by wire gauge, conductors and wire manufacturer. These drawings must be updated prior to completion of any work to reflect changes that may have been made during actual installation. Drawings as part of the submittal shall include the floor plan, all device locations and all wiring requirements and conduit sizes. Drawings to be submitted in ACAD version compatible with version in use at the Fargo VA.

1.8 WARRANTY

- A. The supplying contractor shall provide a warranty on the system which shall include all necessary labor and equipment to maintain the

system(s) in full operation for a period of one year from the date of acceptance.

B. In addition, the equipment (parts) warranty for all core system components including control/switching equipment, power supplies, patient stations, sub-stations, and nurse consoles shall extend to a total of at least five (5) years. Warranty for ancillary devices such as pillow speakers and call cords shall extend to a total of at least two (2) years.

C. Manufacturer shall provide, free of charge, product firmware upgrades throughout the 1 year warranty period for any product feature fixes.

D. The contractor shall respond and correct on-site trouble calls, during the standard work week to:

1. A routine trouble call within one (1) working day of its report. A routine trouble is considered a trouble which causes a pillow speaker or cord set, one (1) master nurse control station, patient station, emergency station, or dome light to be inoperable.
2. Routine trouble calls in critical emergency health care facilities (i.e., cardiac arrest, intensive care units, etc.) shall also be deemed as an emergency trouble call. The RE (or Facility Contracting Officer) shall notify the Contractor of this type of trouble call.
3. An emergency trouble call within four hours of its report. An emergency trouble is considered a trouble which causes a sub-system (ward), distribution point, terminal cabinet, or code one system to be inoperable at any time.
4. If a Nurse Call and/or Code Blue/ component failure cannot be corrected within four (4) hours (exclusive of the standard work time limits), the Contractor shall be responsible for providing alternate nurse call equipment. The alternate equipment/system shall be operational within a maximum of 20 hours after the four (4) hour trouble shooting time and restore the effected location operation to meet the System performance standards. If any sub-system or major system trouble cannot be corrected within one working day, the Contractor shall furnish and install compatible substitute equipment returning the System or sub-system to full operational capability, as described herein, until repairs are complete.

E. After the acceptance of the system(s) service shall be provided for emergency service and routine service. Emergency service shall be provided 24 hours a day. When a total or catastrophic failure of equipment is reported to contractor, within 2 hours of notification, a service person will be on site. Routine service shall be provided within 4 business hours (9 a.m. to 5 p.m., Monday through Friday, excluding holidays) of notification. When a minor failure of equipment is reported to contractor, a service person will be on site within 24 hours of notification.

1.9 MAINTENANCE

A. Provide necessary spare parts after commissioning of system(s) and prior to final payment.

1.10 PROJECT CLOSE-OUT

A. Prior to final inspection and acceptance of the work, remove all debris, rubbish, waste material, tools, construction equipment, machinery and surplus materials from the project site and thoroughly clean your work area.

B. Before the project closeout date, the Contractor shall submit:

1. OEM Equipment Warranty Certificates.
2. Evidence of compliance with requirements of governing authorities such as the Low Voltage Certificate of Inspection.
3. Project record documents.
4. Instruction manuals and software that is a part of the system.
5. System Guaranty Certificate.

C. Contractor shall submit written notice that:

1. Contract Documents have been reviewed.
2. Project has been inspected for compliance with contract.
3. Work has been completed in accordance with the contract.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The products specified shall be new and of the standard manufacture of a single reputable manufacturer.

B. Rauland-Borg Corporation Responder 5 or equal.

2.2 GENERAL REQUIREMENTS

A. Coordinate features and select interface components to form an integrated Nurse Call system. Match components and interconnections between the systems for optimum performance of specified functions.

- B. Expansion Capability: The Nurse Call equipment interfaces and cables shall be able to increase number of enunciation points in the future by a minimum of 50 percent (%) above those indicated without adding any internal or external components or main trunk cable conductors.
- C. Equipment: Active electronic type shall use solid-state components, fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied between 110 to 130 VAC, 60 Hz supplied from the Facility's Emergency Electrical Power System.
- D. Meet all FCC requirements regarding equipment listing, low radiation and/or interference of RF signal(s). The system shall be designed to prevent direct pickup of signals from within and outside the building.
- E. Each Code Blue System shall be designed to provide continuous electrical supervision of the complete and entire system (i.e. dome light bulbs [each light will be considered supervised if they use any one or a combination of (UL) approved electrical supervision alternates, as identified in UL-1069, 1992 revision], wires, contact switch connections, circuit boards, data, audio, and communication busses, main and UPS power, etc.). All alarm initiating and signaling circuits shall be supervised for open circuits, short circuits, and system grounds. Main and UPS power circuits shall be supervised for a change in state (i.e. primary to backup, low battery, UPS on line, etc.). When an open, short or ground occurs in any system circuit, an audible and visual fault alarm signal shall be initiated at the nurse control station and all remote locations.
- F. The Contractor is responsible for pricing all accessories and miscellaneous equipment required to form a complete and operating system.

2.3 REMOVAL OF EXISTING PRODUCT

- A. Remove all existing product and deliver to the OWNER, or at the direction of the OWNER, properly dispose of same. Existing system shall remain in place and fully functional until new system has been installed, tested for proper function, and staff have been fully trained in its use. Final approval of Owner/Engineer required before existing system is removed.
- B. Per National Electrical Code, remove all unused wiring utilized by the removed nurse call system.

- C. The OWNER will continue to occupy the areas where equipment will be replaced. Supplying contractor will need to coordinate work with Owner Representatives prior to removal or replacement of any equipment. The entire existing nurse call equipment must be maintained and operational during installation and testing of the new nurse call system.

2.4 NURSE CALL NETWORK WIRING

- A. All Nurse Call Network wiring shall be CAT 6e. Plenum wire shall be used. System shall be capable of injecting DC power into a CAT 6e run, for additional rooms, or long runs, by running a separate DC cable pair to a remote location. See Section 27 10 05 for cabling requirements.
- B. Fiber optic cable shall be utilized for network connections that exceed standard 100 meter distances for network links over unshielded twisted pair cabling. The contractor shall provide fiber/copper media converters as required for any equipment requiring a network connection that exceeds this distance from the network switch. See Section 27 10 05 for cabling requirements.

2.5 NURSE CALL CONTROLLER(S)

- A. Furnish as needed in each nursing unit a nurse call network controller. Each controller shall provide the following:
 - 1. Non-blocking, duplex communications between consoles and rooms, sub stations and duplex pillow speakers, within each 6 station loop. Provide four loops for a total of 12 speech paths.
 - 2. CAT 6e wiring standard utilizing PoE (Power over Ethernet) between console and nurse call controllers and local wiring to power room station equipment and dome lights.
 - 3. VoIP audio to Nurse Call Network, VoIP Nurse Console, VoIP staff terminal, wired or wireless phones via SIP protocol. VoIP digital audio stream out to rooms without IP overhead signaling.
 - 4. Up to 96 corridor lights can be operated with a single controller.
- B. Controller must be life safety grade meaning that it shall not require regular rebooting for continued basic functions of system and it shall be possible for controller to act as a stand-alone controller should loss of network communication occur. Personal Computers may not be used for this purpose. PCs will only be allowed outside of the UL-listed nurse call network on the customer supported LAN.

- C. Nurse call controller(s) are connected to the Nurse Call LAN via Ethernet switches. All required switches shall be provided by the Contractor.

2.4 VoIP NURSE CONSOLES MASTER STATION

- A. Furnish as shown on plans, a UL-1069 listed VoIP nurse console capable of the following functions:
 - 1. Full duplex audio
 - 2. Color display
 - 3. 12 or 24 hours time display and synchronization to hospital standard network time from the nurse call gateway server including any daylight savings time changes supported by the network.
 - 4. Display up to 3 incoming calls each with an individual elapsed timer which increments time since call was placed. Also provide the ability to scroll to see all in coming calls.
 - 5. Power over Ethernet powered connection to UL-1069 listed Ethernet controller. No local power supplies required.
 - 6. Choice of hands-free duplex communications through built in speaker and separate microphone or private handset conversation.
 - 7. Ability to create up to 32 soft keys, user-configurable, with 4 buttons, 8 screens deep.
 - 8. Console shall be interactive with an associated PC workstation (Contractor provided) without the necessity of any interconnection to the PC. The work process relationship shall be software defined through the network connections.
 - 9. Optional tone/mute of calls in progress.
 - 10. Ability to block all nurse call loudspeaker paging to facilitate a low noise patient environment. Password protection can be enabled to only allow authorized access to audio paging.
 - 11. Ability to swing an individual room or any group of rooms by touching one labeled touch point. Room(s) and consoles may be located anywhere within hospital nurse/patient communications network.
 - 12. Console can be programmed to be the receiver of any call that is not answered by another console, or can be programmed to receive any call from a console that has failed or has been unplugged, or otherwise not receiving the call (call orphaning).
 - 13. Ability to dial through built in key pad.

14. Self-contained unit, desk or wall-mountable.
15. Support manual Staff Follow functions. When Staff Follow is enabled, call-tones for a prescribed area will automatically be forwarded to the room station speaker where staff members are located. Staff location may be determined manually by entering the room number into the console or automatically using staff register stations or registration via RTLS. Pressing the call button on that station shall silence the tones. When a new call is placed, the tones shall automatically be restored.

2.5 PC CONSOLE DISPLAY

- A. Provide a PC console display on any Contractor provided PC that meets the system manufacturer's minimum specifications, whether it utilizes touch screen or standard mouse control. When a PC is "associated" with a VoIP console described previously, it shall have full interoperability to provide user with easy to follow on screen functions, such as display of call priority, room and patient information. Selecting a touch point or by mouse click shall provide an automated service reminder. While in audio contact with the patient, an enriched display shall show all user defined display information, such as caregiver assigned, and pertinent patient information.
- B. The following additional functions shall be provided at each one of these users' screens:
 1. Full display of all calls, including corridor light color sequence.
 2. Complete electronically generated census of patients showing assigned caregiver, current patient needs as sent by service reminder process, time patient has been waiting for call answering, or need, list of caregivers on duty and staff location (when RTLS option available).
 3. Ability to text message to any single individual, group of users, or all users, a text message to a pager or wireless phone display.
 4. Ability to display calls in a centralized display format (i.e. Centralized Code Blue display).
 5. Ability to display all staff information, staff status and wireless extension.

2.6 STAFF TOUCHSCREEN TERMINAL

- A. Furnish as shown on plans, as part of the nurse call communications network, a UL 1069 listed VoIP Staff Touchscreen Terminal. This dynamic device shall serve as a patient or procedure room communications tool while providing staff with "soft" touch-points to initiate an instantaneous notification of an in room need. Additionally this terminal may be used as a functional nurse call console.
- B. The following functions shall be provided:
 - 1. Color touchscreen display.
 - 2. Ability to create up to 60 soft keys, user-configurable, up to 8 screens per terminal.
 - a. Sends specific need for that location. Examples: Emergency, Staff Assist, Cleaning Needed, Lifting Help, Transport, Order, Stat Order, Rounding, etc.
 - b. Speed dial to any location
 - 3. Power over Ethernet powered connection to UL-1069 listed Ethernet switch. Local power not required.
 - 4. Full duplex audio
 - 5. Hands-free duplex communications through built in speaker and separate microphone.
 - 6. Display up to 3 incoming calls each with an individual elapsed timer which increments time since call was placed. Also provide the ability to scroll to see all incoming calls.
 - 7. Ability to dial through touch key pad.
 - 8. Ability to capture an individual nursing unit, selected units, or all units in hospital by touching single custom labeled touch point.

2.7 CAREGIVER ASSIGNMENTS AND SIGNING ON and OFF DUTY

- A. Provide software to make caregiver to patient assignments from Contractor Provided PC workstation (quantity of (2), within the hospital by easy user sign on. Assignment process shall be intuitive and indicate to that Supervisor making the assignment, each caregiver's patient load based on number of patients and patient difficulty. These assignments shall stay in queue until each individual signs on duty. The assignment is released when the caregiver goes off duty.
- B. The following additional functions shall be provided:
 - 1. Unlimited assignment of caregivers to patients, patients to caregivers.

2. Group assignments.
3. Assignments may be made up to 7 days in advance.
4. Easy display of prior day's assignment and easy click to accept if you want to keep assignment the same.
5. Display pertinent HL-7 fields for patient.
6. Allow for assigning advanced call escalation for un-answered calls.
7. Staff member shall have ability to use Bar Code for ID and wireless devices.
8. User's assignment can print out to a local printer.
9. User shall have the ability to go ON and OFF break forwarding their device to another caregiver and reflecting this activity in the reporting software.

2.8 PATIENT STATIONS

- A. Provide single patient or dual patient station as shown on plans.
- B. Each patient station shall be capable of the following functions:
 1. Separate speaker and microphone for full duplex audio.
Entertainment audio to be muted when intercom in use.
 2. One DIN pillow speaker receptacle per bed that shall have a tilt design, with automatic release of pillow speaker plug when pillow speaker cord is pulled at any angle.
 3. Station shall support an optional module to feature bed side rail control on station to indicate bed connection. LED on station shall indicate bed connection(s).
 4. Built in lighting control that interfaces directly to low voltage controllers.
 5. One universal 1/4" jack for auxiliary alarm input/call cord per bed. Call priority of these receptacles shall be independent of any other button or receptacle.
 6. Cancel button shall cancel any call on this station and any other station in room that is programmed for universal room cancel.
 7. Two programmable buttons - Staff Assist and Code Blue.
 8. Continuous supervision.
 9. Ability to program on a per patient station basis, each bed and entertainment/call cord receptacle to custom call priorities.
- C. Supply Clear Button Cover to prevent accidental initiation of the additional programmable buttons. Cover is easy to install and has an easy to lift cover to access the buttons.

- D. Psychiatric Care 4B Patient Station: Provide custom stainless steel, vandal resistant device with tamper proof screws. Device shall have call button with cancel switch with light indicating call in progress.

2.9 DUTY STATION

- A. Provide as shown on plans a duty station. Unit shall provide remote annunciation of assigned patient stations and sub-stations via 4 LED's and 12 call tones. Duty station faceplate LED's shall mimic corridor light activity for the assigned nursing area. Also provides two-way duplex intercom to the assigned nurse console(s) through separate speaker and microphone. Call tones generated at duty station must be identical and repeat in synch with tones produced at closest nurse console. It shall be possible to mute the call in tone, without cancelling call. The next call in, assigned to this duty station, will un-mute the station. Muting feature may be defeated in those jurisdictions that do not allow muting of duty station. The duty station shall be capable of being programmed for a specific time that a day/night mode takes place, allowing a volume change to the call-in tones. This feature is required to minimize noise for patients. Unit shall mount in a standard 3-gang electrical box.
- B. Psychiatric Care 4B Patient Duty Station: Provide custom stainless steel, vandal resistant device with tamper proof screws.

2.10 SUB-STATIONS

- A. Provide as shown on plans, sub-stations which shall be flush mounted in a single gang box. All substation cancel buttons will follow the cancel policy as defined in the system configuration. Typically canceling a high priority call can only be accomplished by the station initiating a call, while lower priority calls may be cancelled by any associated station in the room.
- B. Individual sub-stations shall be:
 - 1. Pull cord station shall be water resistant with a replaceable PVC pull-cord, and easily cleaned surface. The pull-cord shall have a large, easy to pull plastic "bell" attached. This station may only be cancelable with the room and not cancelable from the nurse console. Provide with speaker and microphone for communications to the patient. Provide with call in pushbutton, which can be programmed separate from the pull cord to indicate a different call process.

2. Staff Assist/Code Blue call button stations shall be water resistant, back lit status light and have the ability for a user defined customized call label corresponding to the 990 call priorities available within the system. An elapsed timer may be activated by any call button to start a count up timer on any clock that accepts remote activation. Provide red activation button
3. 4-button Staff Station shall have four backlit buttons that allow by default three levels of staff and one Staff Assist Button. Any button can be configured as a staff registration or call button to provide maximum flexibility. Although this station trims out to a double gang faceplate, the mounting is in a single gang box.
4. A two jack auxiliary alarm station shall allow the connection of external patient monitoring devices via two (2) 1/4 inch jacks. This allows individual annunciation of patient alarms to nurse call consoles and wireless devices. Each jack may be programmed for one of 990 call processes and may be configured for latching or non-latching. A call in timer may be set within system configuration to buffer a device that produces intermittent alarms.
5. Provide where necessary an Logical Input Station which allows any dry contact closure from an external device to activate a call into the nurse communications network.
6. Provide where necessary a Logical Output Station that allows external devices to be controlled from the nurse call network. Either dry contacts or a driver voltage output shall be available.

2.11 CORRIDOR LIGHTS

- A. Provide as shown on plans, the proper type of corridor light or domeless controller. Corridor lights shall contain four sections, each lighted by a long life, RGB LED capable of producing 7 colors. Each section shall have a diffusion lens which allows for 180 degree horizontal visibility of call lights. The corridor lights shall be capable of the following:
 1. All segments of corridor light can indicate a call in any of the following 7 colors: Blue, Red, White, Green, Orange, Yellow, or Pink.

2. Custom call patterns (any combination of light segments, such as all segments blue for code blue).
 3. Flash any single color or strobe the sections of the light in any color pattern.
- B. Intelligence in the corridor light and domeless controller shall support multiple room devices and allow for the ability of any room station to be associated with any other room in the system. This allows special functions where needed, such as associated call stations and cancelling options, (i.e. door monitoring).
 - C. Staff registration shall be indicated by a custom color associated with that staff level (i.e. Green = Nurse, Orange = LPN, Yellow = Aide).
 - D. In the unexpected event of communications loss with the nurse call controller, corridor lights shall enter a local room failsafe mode showing all calls in the hallway via the LED indicators.
 - E. Corridor lights and controllers may be hot-swapped on the room-to-room communication line without the loss of communications to other devices on the local network.

2.12 PATIENT ENTERTAINMENT SPEAKER/CALL CORDS

- A. Provide one (1) pillow speaker per bed station as shown on the drawings. The pillow speaker shall have a mating 9 pin din plug and nurse call button. TV control shall be programmed as a system function to allow pillow speakers to work with any standard hospital grade TV. Lighting control is optional to control up to two lights, provide as indicated on the drawings All pillow speakers to have call assurance and monitor LED's.
- B. Pillow speaker shall provide Digital TV control with full duplex communications via built in microphone and separate speaker. There shall be three additional buttons for the use by the patient for special needs, such as "pain", "water", and "toilet". The system shall have the ability to discern the difference between these calls and send it to the appropriate care level. Buttons for up/down volume, up/down channel. TV mute, closed caption and TV on/off shall be standard. A direct entry key pad gives patient ability to enter channel number.

2.13 INITIATION, ANNUNCIATION AND RESPONSE

- A. Light and Tones:
 1. Calls may be initiated through:

2. Patient station.
 3. Staff station.
 4. Code Blue station.
 5. Toilet Emergency Station pull cord/push button.
 6. Shower Emergency Station pull cord.
 7. Bed Pillow speaker.
 8. Bed Push-button cordset.
 9. Hospital Bed Integrated controls.
- B. Once a call is initiated, it must be annunciated at the following locations:
1. The Corridor, Intersectional and Room dome light associated with the initiating device.
 2. A local master control station indicating the call location and priority.
 3. Each duty station.
 4. Each staff station.
 5. Each remote location.
 6. All calls must be displayed until they are cleared by the nursing staff ONLY from the initiating device location.
 7. System shall provide for transfer of one or more individual or groups of stations from one master station to another without mechanical switches or additional wiring of the stations. The transfer may be initiated manually by the nurse or automatically at certain times of the day.

2.14 DIGITAL MESSAGE SYSTEM

- A. The nurse call system shall include a digital message system with a series of prerecorded announcements, customizable to Fargo VA room numbers and locations. Each Code Blue button shall generate a unique pre-recorded message which shall announce that a Code Blue Station has been activated, and the room number of the Code Blue Station in alarm. The digital message system shall be connected to the facility overhead paging system on a priority input, and shall announce these messages facility-wide. The digital message system shall be monitored for troubles and fault conditions, which will annunciate over any master nurse station.
- B. The digital message system shall provide at a minimum the number of digital messages to accommodate Code Blue buttons as indicated on the drawings, plus spare capacity of 25%.

- C. The digital message system shall provide a balanced analog audio output for connections to the facility overhead paging system.

2.15 DATABASE MANAGEMENT

- A. Provide standard ODBC (MS SQL 2005) compliant databases. Databases shall be able to be backed up using facilities standard backup processes and disaster recovery methods.

2.16 REPORTING SOFTWARE

- A. Provide software that may be accessed by any networked PC work station that gives management patient call details in clear readable format. HL-7 integration shall make all pertinent patient details available, including the ability to search by patient name and/or patient ID number for those nurse call records associated for that patient during their stay, regardless of room/bed occupied.
- B. In addition, the reporting software shall provide the following functions:
 - 1. Standard, global reports.
 - 2. Individual user reports.
 - 3. Reports shall be viewed in Adobe Acrobat Reader.
 - 4. Any trained individual may utilize standard ODBC compliant reporting software to generate more enhanced reporting.

2.17 WIRELESS IP TELEPHONE SYSTEM

- A. Manufacturer: Equal to Cisco. Wireless telephones shall be included in the base bid and deleted under Deduct Alternate #6. The wireless telephone system shall be connected to the existing VA telephone system to allow calls between the wireless system and campus extensions or to outside telephone lines. The existing VA wireless data network shall be utilized for handset IP communications, the contractor shall provide all additional wired connections between the new wireless handset and the existing campus PBX system.
- B. The Cisco wireless telephone system shall be integrated with the new Nurse Call system to allow handsets to receive nurse call alarms, and to provide two-way communication between the local nurse call device and the wireless handset assigned to that device. Calls shall have the ability to be escalated to other handsets as required.
- C. Quantity of (45): Equal to Cisco 7925G Series, FIPS 140-2 certified wireless handsets. Provide each handset with extended use battery pack, zCover CI925 Series or equal silicone carrying case/holster kit,

17" removable tech lanyard and all required software licensing for operation.

- D. Quantity of (5): 5-bay charging stations equal to zCover Multicharger Series, compatible with wireless handsets and batteries.
- E. Provide equal to Cisco Unified Communications Call Manager Server Software, latest version, with all necessary licensing for quantity of wireless handsets listed above, and communications to existing VA telephone system and new nurse call system as described in this section.
- F. Server: Provide Equal to Cisco 8X5XNBD UCS C220 M3 Series server, (8) 300 GB SAS 15K RPM drives, dual Intel Xeon E5 2643 3.3 Ghz processors, (8) 8 GB 1600Mhz DIMMs, MegaRAID CV Series RAID controller.
- G. Provide Equal to Cisco 2901 Series integrated services router, with PVDM3 Series 64 channel high density DSP module, (2) VIC3-4FXS/DID, (1) VWIC-3-1MFT/E1 interface cards or equal, and all necessary power supplies and licensing.
- H. New servers, routers and other miscellaneous hardware shall be installed in the existing server racks in the Data Center located in the basement. Coordinate with VA OI&T staff prior to installation for exact rack location.

2.18 NURSE CALL AND ALARM MANAGEMENT MIDDLEWARE SYSTEM

- A. Provide a complete and functional, enterprise level, alarm management software platform equal to Extension Healthcare Engage Series. This system is included in the base bid, and deleted under Deduct Alternate #6.
- B. The system shall be capable of exchanging data with various subsystems including scheduling systems, patient tracking systems, Cisco Unified Communications/Call Manager, Nurse Call systems, XML/RSS services, Vista BMS, and Vista CPRS.
- C. The system shall interface with industry standard data formats such as HL7, SMTP, TAP, XMPP and web services (SOAP/REST).
- D. The system shall provide detailed, HIPPA regulated contextual messaging to the wireless handset displays described in Paragraph 2.17. Messages shall include at a minimum the patient name and room number, type of alarm and medical record information for a minimum of 100 unique patient rooms or other nurse call device ID locations, with the capability to be expanded with additional software modules or

licensing. The exact nurse call endpoints to be integrated with the alarm management system shall be coordinated with the Owner.

- E. The system shall be expandable to provide text messages from other hospital subsystems information such as lab results, patient arrival information, and medication orders.

2.19 SPARE PARTS

A. Provide spare parts as indicated:

1. Patient Stations: (10).
2. Dome Lights: (10).
3. Duty Stations: (5).
4. Pull cord stations: (10).
5. Call cords: (10)
6. Soft touch pad: (12).
7. Pillow speakers: (5)
8. Pillow speaker 12' extension cables: (5).
9. Breath-call Call Cord: 9' cable, 1 /4" plug, air activated nurse call device. Provide with bedrail or headboard clamp and (12) replacement straw/filters for each breathcord provided.
 - a. Quantity: Provide (6) total breathcords kits.

PART 3 - EXECUTION

3. 1 SUPERVISION

- A. Only factory certified installers shall install service and maintain the specified network system.
- B. Manufacturer shall have the equipment manufacturer's engineer or their designated agent inspects the installation and operation of this network to determine that the network complies with all standards.

3.2 INSTALLATION

- A. Execute work in accordance with National, State and local codes, regulations and ordinances.
- B. Install work neatly, plumb and square and in a manner consistent with standard industry practice. Carefully protect work from dust, paint and moisture as dictated by site conditions. The Contractor will be fully responsible for protection of his work during the construction phase up until final acceptance by the Owner.
- C. Install equipment according to OEM's recommendations. Provide any hardware, adaptors, brackets, rack mount kits or other accessories recommended by OEM for correct assembly and installation.

- D. Secure equipment firmly in place, including receptacles, speakers, equipment racks, system cables, etc.
 - 1. All supports, mounts, fasteners, attachments and attachment points shall support their loads with a safety factor of at least 5:1.
 - 2. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems.
 - 3. Any suspended equipment or associated hardware must be certified by the OEM for overhead suspension.
 - 4. The Contractor is responsible for means and methods in the design, fabrication, installation and certification of any supports, mounts, fasteners and attachments.
- E. Finishes for any exposed work such as plates, racks, panels, speakers, etc. shall be approved by the Architect, Owner and TVE 0050P3B.
- F. Coordinate cover plate sizes and requirements with field conditions. Size and install cover plates as necessary to hide joints between back boxes and surrounding wall. Where cover plates are not fitted with connectors, provide grommets in size and quantity required. Do not allow cable to leave or enter boxes without cover plates installed.
- G. Active electronic component equipment shall consist of solid state components, be rated for continuous duty service, comply with the requirements of FCC standards for telephone and data equipment, systems, and service.
- H. Color code all distribution wiring to conform to the Nurse Call Industry Standard, EIA/TIA, and this document, whichever is the more stringent. At a minimum, all equipment, cable duct and/or conduit, enclosures, wiring, terminals, and cables shall be clearly and permanently labeled according to and using the provided record drawings, to facilitate installation and maintenance.
- I. Product Delivery, Storage and Handling:
 - 1. Delivery: Deliver materials to the job site in OEM's original unopened containers, clearly labeled with the OEM's name and equipment catalog numbers, model and serial identification numbers. The RE may inventory the cable, patch panels, and related equipment.
 - 2. Storage and Handling: Store and protect equipment in a manner, which will preclude damage as directed by the RE.
- J. Equipment Racks/Cabinets:

1. Fill unused equipment mounting spaces with blank panels or vent panels. Match color to equipment racks/cabinets.
2. Provide security covers for all devices not requiring routine operator control.
3. Provide vent panels and cooling fans as required for the operation of equipment within the OEM' specified temperature limits. Provide adequate ventilation space between equipment for cooling. Follow manufacturer's recommendations regarding ventilation space between amplifiers.
4. Provide insulated connections of the electrical raceway to equipment racks.
5. Ensure a minimum of 36 inches around each cabinet and/or rack to comply with OSHA Safety Standards. Cabinets and/or Racks installed side by side - the 36" rule applies to around the entire assembly

3. 2 TRAINING

- A. Contractor shall provide thorough training of all nursing staff assigned to those nursing units receiving new networked nurse/patient communications equipment. This training shall be developed and implemented to address two different types of staff. Floor nurses/staff shall receive training from their perspective, and likewise, unit secretaries (or any person whose specific responsibilities include answering patient calls and dispatching staff) shall receive operational training from their perspective. Provide separate training sessions for Biomed and facilities technical staff for in depth training for maintenance and operation of system.
- C. Provide the following minimum training times and durations:
 1. 18 hours for nursing staff and supervisors- split evenly over 3 weeks and day and night shifts, coordinate schedule with Owner.
 2. 12 additional hours during the opening week for nursing staff and supervisors - both day and night shifts, coordinate schedule with Owner.
 3. 12 hours for Biomed, maintenance staff and system administrators, coordinate schedules with Owner.

3. 3 WIRING

- A. Contractor shall terminate all wiring with manufacturer approved connectors. The use of wire nuts is prohibited.

- B. All wiring shall be free from shorts and faults. Wiring shall be UL listed, NEC and NFPA 70, approved.
- C. Nurse patient communications network wiring shall not be run in the same conduit with other systems (i.e. Class 1 AC power distribution, fire alarm, entertainment systems, lighting controls, etc.).
- D. Do not splice wiring anywhere along the entire length of the run. Make sure cables are fully insulated and shielded from each other and from the raceway for the entire length of the run.
- E. Do not pull wire through any enclosure where a change of raceway alignment or direction occurs. Do not bend wires to less than radius recommended by manufacturer.
- F. Replace the entire length of the run of any wire or cable that is damaged or abraided during installation. There are no acceptable methods of repairing damaged or abraided wiring.
- G. Use wire pulling lubricants and pulling tensions as recommended by the OEM.
- H. Use grommets around cut-outs and knock-outs where conduit or chase nipples are not installed.
- I. Do not use tape-based or glue-based cable anchors.
- J. Ground shields and drain wires to the Facility's signal ground system as indicated by the drawings.
- K. Field wiring entering equipment racks shall be terminated as follows:
 - 1. Provide OEM directed service loops at harness break-outs and at plates, panels and equipment. Loops should be sufficient to allow plates, panels and equipment to be removed for service and inspection.
 - a. Line level and speaker level wiring may be terminated inside the equipment rack using specified terminal blocks (see "Products.") Provide 15% spare terminals inside each rack. Microphone level wiring may only be terminated at the equipment served.
 - b. If specified terminal blocks are not designed for rack mounting, utilize ¾" plywood or 1/8" thick aluminum plates/blank panels as a mounting surface. Do not mount on the bottom of the rack.
 - c. Employ permanent strain relief for any cable with an outside diameter of 1" or greater.
- L. Make all connections as follows:

1. Make all connections using rosin-core solder or mechanical connectors appropriate to the application.
2. For crimp-type connections, use only tools that are specified by the manufacturer for the application.
3. Use only insulated spade lugs on screw terminals. Spade lugs shall be sized to fit the wire gauge. Do not exceed two lugs per terminal.
4. Wire nuts, electrical tape or "Scotch Lock" connections are not acceptable for any application.
5. Run cabling parallel to walls and building structure.
6. Do not lay cables on top of light fixtures, ceiling tiles, mechanical equipment, or ductwork. Maintain at least 2'-0" clearance from all shielded electrical apparatus.
7. All cables shall be tested after the total installation is fully complete. All test results are to be documented. All cables shall pass acceptable test requirements and levels. Contractor shall remedy any cabling problems or defects in order to pass or comply with testing. This includes the re-pull of new cable as required at no additional cost to the Owner.
8. Ends of cables shall be properly terminated on both ends per industry and OEM's recommendations.

3. 4 PROTECTION OF NETWORK DEVICES

- A. Contractor shall protect network devices during unpacking and installation by wearing manufacturer approved ESD wrist straps tied to chassis ground. The wrist strap shall meet OSHA requirements for prevention of electrical shock, should technician come in contact with high voltage.

3. 5 CLEANING AND PATCHING

- A. It shall be the responsibility of the contractor to keep their work area clear of debris and clean area daily at completion of work.
- B. It shall be the responsibility of the contractor to patch and paint any wall or surface that has been disturbed by the execution of this work.
- C. The Contractor shall replace ACT ceiling grid damaged during this project.

3. 6 DRAWINGS

- A. Provide as built drawings of all installed network components and associated wiring on building plans. Final payment for work will not be authorized unless these drawings are supplied.

- B. Provide as built drawings in Autocad, compatible with current version in use at Fargo VAMC.
- C. Drawings shall include a complete, updated riser diagram showing all devices, nurse call panels, wiring etc.

END