

**SECTION 27 11 00  
COMMUNICATIONS EQUIPMENT ROOM FITTINGS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies equipment cabinets, interface enclosures, relay racks, and associated hardware in service provider DEMARC, computer and telecommunications rooms.
- B. Telephone system is defined as an Emergency Critical Care Communication System by the National Fire Protection Association (NFPA). Adhere to Seismic reference standards for systems connecting to or extending telephone system and cabling.

**1.2 RELATED WORK**

- A. Wiring devices: Section 26 27 26, WIRING DEVICES.
- B. General electrical requirements that are common to more than one section in Division 27: Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.
- C. Requirements for personnel safety and to provide a low impedance path for possible ground fault currents: Section 27 05 26, GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS.
- D. Lightning protection system: Section 26 41 00, FACILITY LIGHTNING PROTECTION.
- E. Conduits for cables and wiring: Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS.
- F. Low voltage cabling system infrastructure: Section 27 10 00, CONTROL, COMMUNICATION AND SIGNAL WIRING.
- G. Voice communication switching and routing equipment: Section 27 31 00, VOICE COMMUNICATIONS SWITCHING AND ROUTING EQUIPMENT.
- H. Extension of a voice communication switching and routing system: Section 27 31 31, VOICE COMMUNICATIONS SWITCHING AND ROUTING EQUIPMENT EXTENSION.
- I. Emergency 2-way radio equipment: Section 27 32 41, TWO-WAY RADIO EQUIPMENT AND SYSTEMS.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATION.
- B. Separate submittal into sections for each subsystem containing the following:
  - 1. Pictorial layouts of each Telecommunications Room and Cross Connection Space (VCCS, and HCCS termination cabinets), each distribution cabinet layout, and TCO as each is expected to be installed and configured.
  - 2. Equipment technical literature detailing electrical and technical characteristics of each item of equipment to be furnished.

- C. Environmental Requirements: Identify environmental specifications for housing system as initial and expanded system configurations.
  - 1. Floor loading for batteries and cabinets.
  - 2. Minimum floor space and ceiling height.
  - 3. Minimum door size for equipment passage.

**PART 2 - PRODUCTS**

**2.1 EQUIPMENT AND MATERIALS**

- A. Provide components of cabinet system (cabinet, thermal, cable and power management accessories) from a single manufacturer.
- B. Equipment Standards and Testing:
  - 1. Equipment must be listed by a NRTL where a UL standard is in existence; active and passive equipment must conform with each UL standard in effect for equipment, on the submittal date.
  - 2. Each item of electronic equipment must be labeled by a NRTL that warrants equipment has been tested in accordance with, and conforms to specified standards.
- C. Equipment Cabinets (Enclosures):
  - 1. Fully enclose and physically secure internally mounted and connected, active and passive equipment.
  - 2. Types of Equipment Enclosures accepted for specific VA Spectrum Management, FMS and OI&T applications in CFM and Facility Projects:

CABINET	FUNCTION
Communications	FMS Special Communications Equipment
Server / Router	OI&T Data/LAN/WAN Equipment
Seismic	Either FMS or OI&T use, specify need
Environmental	Either FMS or OI&T use, specify need

- 3. Each cabinet to be:
  - a. Provided in head end, MCR, TER, PCR, EMGR, each TR at a minimum.
  - b. Fabricated with minimum 1.59 mm (16 gauge) steel.
  - c. Provided with manufacturer's standard painted finish in a color accepted by COR with concurrence from FMS Service Chief.
  - d. Mounted on floor or wall.
  - e. Lockable; tubular locks keyed alike. Provide six keys to COR for each cabinet.
  - f. Compliant with facility's SMS card access system.

4. Provide equipment mounting shelves; attach to front and rear mounting rails and allowing equipment to be secured to respective mounting rails.
5. Each enclosure to include:
  - a. Floor or wall mounting.
  - b. Knock out holes for conduit connections or cable entrance.
  - c. Front and rear locking doors; wall mounted cabinets require only front locking door.
  - d. Power outlet strips.
6. Provide quiet ventilation fan with non-disposable locally cleanable air filter.
7. Size each cabinet in order to contain and maintain internal mounted equipment items.
8. Provide OEM's fully assembled unit.
9. Provide OEM assembled side-by-side enclosures in a single unit, at locations requiring more than two enclosures.
10. Provide minimum one cabinet with blank rack space, for additional system expansion equipment.
11. Bond to communications circulating grounding system.
12. Technical Characteristics:
  - a. External:
    - 1) Overall Height:
      - a) Communications/Server: Maximum 2,184 mm (86 inches).
      - b) Seismic: Maximum 1,905 mm (75 inches).
    - 2) Overall Depth:
      - a) Communications/Server: Maximum 914 mm (36 inches).
      - b) Seismic: Maximum 762 mm (30 inches).
    - 3) Overall Width - All: Maximum 864 mm (34 inches).
  - b. Front Panel Openings:
    - 1) Width:
      - a) Communications: 482.6 mm (19 inches), per EIA.
      - b) Server: 483 mm (19 inches), per EIA/ECA 310.
    - 2) Height:
      - a) Communications/Server: Maximum 2,000 mm (78-3/4 inches or 45 Rack Units [RU]), per EIA/ECA 310.
  - c. Heavy Duty Cycle: Maximum 544 kilograms (1,200 pounds) capacity.
  - d. Certification:
    - 1) NRTL (i.e. UL): For communications and server cabinets.
13. Cabinet Internal Components:

- a. AC Power:
  - 1) Standard "Quad AC Box":
    - a) Power capacity: 20 Ampere, single phase, 120 VAC continuous duty.
    - b) Wire gauge: #12 AWG, solid copper, connected to room's internal AC Power Panel, or as directed by COR.
    - c) Number of AC power outlets: Minimum 4 receptacles.
    - d) Enclosure: Fully self-contained, metal 102 mm (4 inch) x 102 mm (4 inches) x 64 mm (2-1/2 inches) with cover
    - e) Connection: Minimum 25.4 mm (1 inch) conduit connected to room's AC Power Panel, or as directed by COR
    - f) Number of boxes: One.
    - g) Compliance: NRTL (i.e. UL); NPFA - 70 (NEC).
- b. AC Outlet Strips:
  - 1) Power Capacity: 15 Ampere, single phase, 120 VAC continuous duty.
  - 2) Wire Gauge: Minimum #12 AWG, solid copper.
  - 3) Number of AC Power Outlets: Minimum 10 "U" grounded.
  - 4) Enclosure: Fully self-contained; typically metal.
  - 5) Connecting Wire: Minimum 2 m (6 feet) long, with three prong self-grounding AC plug connected to cabinet's internal AC "Quad" box.
  - 6) Number of Strips: 2.
  - 7) Certification: NRTL (i.e. UL).
- c. AC Power Line Surge Protector and Filter Construction:
  - 1) Input Voltage Range: 120 VAC + 15 percent at 50/60 Hz, single phase.
  - 2) Power Service Capacity: 20 AMP, 120 VAC.
  - 3) Voltage Output Regulation: +5.0 percent, instantaneous of input.
  - 4) Circuit Breaker: 15 AMP; may be self-contained.
  - 5) AC Outlets: Minimum four duplex grounded NEMA 5-20R.
  - 6) Response Time: 5.0 nanosecond.
  - 7) Suppression: Isolate and filter any noise, surge spikes
    - a) Surge: Minimum 20,000 AMP.
    - b) Noise:
      - 1) Common: -40 dB.
      - 2) Differential: -45 dB.
  - 8) Clamping Voltage: Minimum 300 V.
  - 9) Enclosure: One; self-contained.

- 10) Mounting: Internal to cabinet floor or on internal mounting rail shelf, allowing two plugs from two plug strips.
  - 11) AC Power Cord: Required; minimum 1,628 mm (6 feet), three wire (green ground); minimum #14 AWG stranded.
  - 12) Compliance: NRTL (i.e. UL60950-1).
- d. Uninterruptible Power Supply (UPS): Provide each cabinet with an internal UPS which may be combined with surge protector and filter if system's 50 percent expansion requirement is met. Provide at least one hour continuous full load in the event of facility primary or emergency AC power failure.
- 1) UPS to include:
    - a) On-Off Switch: This function is required to be a part of system's electronic supervision requirements.
    - b) First/Fast Charge Unit: Must provide clean predictable charge voltage/current. Function is required to be a part of system's electronic supervision requirements.
    - c) Over Voltage/Current Protect: Cannot short circuit AC power line at any time. This function is required to be a part of system's electronic supervision requirements.
    - d) Trickle Charge Unit: Must be capable of maintaining a suitable internal battery charge without damaging batteries.
    - e) Mounting: Provide per OEM's direction.
    - f) Proper Ventilation: Do not override cabinets' ventilation system.
    - g) Power Change from AC Input: Accomplish change without interruption to communications link or subsystem being protected. Generate visual and aural alarms in electrical supervision system, local and remote, to annunciating panels via direct connection for trouble indication.
  - 2) Specific requirements for current and surge protection to include:
    - a) Voltage Protection: Threshold, line to neutral, starts at maximum 200 Volts peak. Transient voltage cannot exceed 330 Volts peak. Furnish documentation on peak clamping Voltage as a function of transient waveform.
    - b) Peak Power Dissipation: Minimum 35 Joules per phase, as measured for 1.0 millisecond at sub branch panels, 100 Joules per phase at branch panels and 300 Joules per phase at service entrance panels. Typically, power dissipation is 12,000 Watts (W) for 1.0 mS (or 12 Joules). Provide explanation of how ratings were measured or empirically derived.

- c) Surge Protector (may be combined with On-Off switch of UPS): Must not short circuit AC power line at any time.
  - 1) Components must be minimum silicon semi-conductors.
  - 2) Secondary stages, if used, may include other types of rugged devices.
  - 3) Indicators: Provide visual device indicating surge suppression component is functioning.
  - 4) Electrical Supervision: Required; must be audible and visual, local and remote to annunciating panels via direct connection for trouble indication.
- d) Provide current and surge protection on ancillary equipment.
- e) Equip each cabinet with the following:
  - 1) Equipment Mounting Rails (Front & Rear): Fully adjustable internal equipment mounting rails allowing front or rear equipment mounting with pre-drilled EIA/ECA 310-E Standard tapped holes. Support entire equipment by supplementary support in addition to face mounting screws on rails.
  - 2) Cabinet Ground: Stainless steel adjustable, lug connected to cabinet's main structure providing an internal cabinet ground for all installed equipment properly bolted to rail and with ground wire connected.
  - 3) Grounding Terminals: A separate mounting hole on equipment mounting rail, with stainless steel connecting bolt bonded by minimum #10 AWG copper wire to cabinet's internal grounding lug.
- 14. Ground Interconnection: Bond cabinet's common grounding lug to room's communications circulating ground busbar with a minimum #4 AWG stranded copper wire.
- 15. Blank Panels: Provide at every unused rack space.
  - a. Match cabinet color.
  - b. Provide panels of 3 mm (1/8 inch) thick aluminum with vertical dimensions in increments of one rack unit (RMU) or 45 mm (1-3/4 inch) with mounting holes spaced to correspond to EIA/ECA 310-E Standard 483 mm (19 inch) rack dimensions.
  - c. Fill large unused openings with single standard large panel instead of numerous types.
  - d. Leave one blank rack space (RMU), covered with a blank panel, between each item of equipment, for minimum internal air flow.
  - e. Leave 356 mm (14 inches)(8.0 RMU) open space, covered with blank cover panel, for additional expansion equipment.
  - f. Wire Management: System that connects each item of installed equipment to room wire management system.
  - g. Knock-out Holes: Provide for cable entrance/exits via conduits, cable duct/trays.

16. Trouble Annunciator Panel: Provide trouble annunciator panel in HE cabinet locations and as shown on drawings compatible with electrical and electronic supervising signals to continuously monitor operating condition for system HE equipment, remote equipment, and interconnecting trunks.
  - a. When system's supervising system detects malfunctioning equipment or trunk line, system must generate an audible and visual signal; provide spare panel.
  - b. Technical Characteristics:
    - 1) Silence Button or Switch: Provide to silence audible signal. Visual signal will continue until supervisory circuit indicating a fault is corrected.
    - 2) Visual Enunciators: Visually show system equipment and trunk-line operating conditions via its supervisory circuit indicating fault condition.
    - 3) Connect each alarm function to report to PCS Console SMS.
- D. Environmental Cabinet:
  1. Enclosure must fully contain installed equipment, including electronics, in same manner as standard cabinet. Provide climate control for installed equipment as if they were in a standalone air handling area, regardless of local area air handling capabilities.
  2. Provide an OEM's fully assembled unit enclosure.
  3. If more than two enclosures are required in any system location, provide OEM-assembled enclosures, in a single unit, side-by-side.
  4. Technical Characteristics:
    - a. Environmental Control: Automatic, heating and cooling as required.
    - b. Temperature Conditions (rated at 1,300 W of install equipment heat generation):
      - 1) Internal Range: Maintains 26.67 degree to 37.78 degree C (80 degree to 100 degree f) of internal heat conditions.
      - 2) External Range: Maximum 37.78 degrees + -3.89 degrees C (100 degrees + 25 degrees F).
    - c. Forced Air Unit: Required with non-disposable air filter; unobstructed and uninterruptible.
    - d. Air Conditioning: As required; fully internal mounted.
    - e. Heater: As required; fully internal mounted.
    - f. UPS: Required; fully internal mounted.
    - g. Front Door: Full length, see through, EMI resistant and lockable, keyed alike with 7-pin tubular lock // and Police Service SMS card access.
    - h. Rear door: Full length, see through, EMI resistant, and lockable keyed alike with 7-pin tubular lock // and Police Service SMS card access.
    - i. Conduit Wiring Entrance: Top or bottom; fully sealed.

- j. Input Power: Minimum 2 each; maximum 120 VAC at 20A, independent circuit, conduit for fixed or armored cable for moveable installations.
  - k. Dimensions:
    - 1) Height: Maximum 1980 mm (78 inches).
    - 2) Width: Maximum 635 mm (25 inches).
    - 3) Depth: Maximum 965 mm (38 inches).
    - 4) Front Panel Opening: 480 mm (19 inches), w/ EIA/ECA 310 mounting hole spacing.
  - l. Trouble Annunciator Panel: Refer to specific requirements in equipment cabinet.
  - m. Audio Monitor Panel: Refer to specific requirements in equipment cabinet.
- E. Wall Mounted Distribution or System Interface Cabinet:
- 1. Construct of minimum 1.59 mm (16 gauge) cold rolled steel, with top, side and bottom panels.
  - 2. Provide double-hinged front door and main cabinet body allowing access to all internal equipment and wiring; mount to solid walls or internal studs.
  - 3. Provide baked-on iron phosphate primer and baked enamel paint finish in a color to be selected by the using FMS Chief or COR.
  - 4. Provide integral and adjustable EIA/ECA 310 standard predrilled rack mounting rails to allow front panel equipment mounting and access.
  - 5. After equipment, doors and panels are installed, snap-in-place chrome trim strip covers all front panel screw fasteners.
  - 6. Provide full-length vertical piano hinge to allow entire front portion of cabinet to “swing out” from wall for access to installed equipment, wires and cable; maintain minimum OSHA Safety clearances and NFPA operational functions.
  - 7. Provide an OEM’s fully assembled unit enclosure.
  - 8. Equip these cabinets same as equipment cabinets, except mount UPS on floor below cabinet with AC power connection in conduit to AC service panel.
  - 9. Technical Characteristics:
    - a. Overall Height: Maximum 1,218 mm (48 inches).
    - b. Overall Depth: Maximum 558 mm (22 inches).
    - c. Overall Width: Maximum 610 mm (24 inches).
    - d. Front Panel Horizontal: Maximum width 483 mm (19 inches).
    - e. Capacity: Maximum 180 kilograms (400 pounds).
    - f. Lockable:
      - 1) Tubular lock with 7-pin security.
      - 2) Key cabinets alike.



3) Police SMS access card system.

F. Stand Alone Open Equipment Rack:

1. Construct of minimum 1.59 mm (16 gauge) cold rolled steel with manufacturer's standard paint finish, in a color to be selected by COR with concurrence from facility's FMS Service Chief.
2. Floor-mount as directed by COR with concurrence from facility's FMS Service Chief.
3. Equip rack same as equipment cabinet, except mount UPS with additional support for weight and AC power connection in conduit to AC service panel.
4. Provide an OEM fully assembled unit.
5. Technical Characteristics:
  - a. Overall Height: Maximum 2,180 mm (85-7/8 inches).
  - b. // Overall Depth: Maximum 650 mm (25-1/2 inches). //
  - c. Overall Width: Maximum 535 mm (21-1/16 inches).
  - d. Front Panel Opening: 483 mm (19 inches), EIA/ECA 310 horizontal width.
  - e. Hole Spacing: Per EIA/ECA 310.
  - f. Load Capacity: Maximum 680.4 kg (1,500 lbs).
  - g. Certifications:
    - 1) EIA/ECA: 310-E.
    - 2) NRTL (i.e. UL): OEM specific.

G. Wire Management Equipment:

1. Provide an orderly horizontal and vertical interface between outside and inside wires and cables, distribution and interface wires and cables, interconnection wires and cables and associated equipment, jumper cables, and provide an uniform connection media for system fire-retardant wires and cables and other subsystems.
2. Interface to each cable tray, duct, wireway, or conduit used in the system.
3. Interconnection or distribution wires and cables must enter system at top (or from a wireway in the floor) via overhead protection system and be uniformly routed down // either or // both sides at same time, of the frames side protection system, then laterally for termination on rear of each respective terminating assembly.
4. Custom configure to meet 30 percent fill system design and user needs.

H. Vertical Cable Managers:

1. Use same make, style and size of vertical cable manager on rack/frame or in between racks/frames when more than one cable manager is used on a rack/frame or group of racks/frames.
2. Match color and cover style of racks/frames and cable managers.

- I. Horizontal Cable Managers:
  - 1. Use same make and style of cable manager on rack/frame or racks/frames, when more than one horizontal cable manager is used on a rack/frame or group of racks/frames.
  - 2. Match color of racks/frames and cable managers.
- J. Telecommunication Room (TR): In hostile TR locations identified on drawings, where it has been determined by COR that proper TR climate or external signal radiation cannot be maintained or controlled, provide a minimum of two individual and properly sized self-contained climate controlled equipment cabinet enclosures; one designated for voice, // and // one designated for data, and one additional cabinet designated for analog RF // service.
- K. Provide installation hardware when enclosures or racks are attached to structural floor.
- L. Provide noise filters and surge protectors for each equipment interface cabinet, switch equipment cabinet, control console, and local and remote active equipment locations to ensure protection from input primary AC power surges so as a consequence noise glitches are not induced into low voltage data circuits.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Coordinate cabinet installation such that doors fully close and lock, with active and passive equipment installed and connected.
- B. Verify equipment dimensions and brackets allow mounting with cabinet doors closed. Front door or rear door of any cabinet that does not close and lock may result in immediate cancellation of inspections or tests.

### **3.2 INSTALLATION**

- A. Equipment Cabinets:
  - 1. Install cabinets in a manner that complies with OEM instructions, requirements of this specification, and in a manner which does not constitute a safety hazard.
  - 2. Provide weatherproof equipment installed outdoors or install in NEMA 3S rated enclosures with hinged doors and locks with two keys.
  - 3. Install equipment indoors in NEMA 4 rated metal cabinets with hinged doors and locks with two keys.
- B. Grounding:
  - 1. Bond equipment, including identified Government furnished equipment, to ground so total ground resistance measures maximum 0.1 Ohm.
    - a. Install lightning arrestors and grounding in accordance with NFPA.
    - b. Install gas protection devices at nearest point of entrance in buildings where protection is required and on same circuits as MDF in telephone switch room.

- c. Do not use AC neutral, including in power panel or receptacle outlet, for system control, subcarrier or audio reference ground.
    - d. Use of conduit, signal duct or cable trays as system or electrical ground is not permitted.
  2. Connect each equipment grounding terminal to a separate mounting hole on equipment mounting rail, to right as one looks at it from rear, with a minimum #12 AWG stranded copper wire with protective green jacket.
  3. Extend common ground bus of minimum #10 AWG solid copper wire throughout each equipment cabinet and bond to TGB. Provide a separate isolated ground connection from each equipment cabinet ground bus to system ground. Do not tie equipment ground buses together.
  4. Bond equipment to cabinet bus with copper braid equivalent to #12 AWG. Self-grounding equipment enclosures, racks or cabinets, that provide OEM certified functional ground connections through physical contact with installed equipment, are acceptable alternatives.
  5. Bond cable shields to cabinet ground bus with minimum #12 AWG stranded copper wire at only one end of cable run. Insulate cable shields from each other, faceplates, equipment racks, consoles, enclosures or cabinets, except at system common ground point. Bond coaxial and audio cables only at source; in all cases, keep cable shield ground connections to a minimum.
- C. Equipment Assembly:
  1. Cabinets:
    - a. Install and adjust cabinet/frame accessories to position, including thermal management accessories, vertical cable managers, vertical power managers and equipment-mounting rails, using manufacturer's installation instructions prior to buying or placing cabinet for attachment to building and before installing any rack-mount equipment into cabinet. Shelves, horizontal cable managers and filler panels (rack-mount accessories), if used, may be installed after cabinet is placed.
    - b. When used in a multi-cabinet bay, attach cabinets side-by-side using buying kits according to manufacturer's instructions.
    - c. Attach overhead ladder rack or cable tray to ceiling or top of cabinet. Maintain minimum 75 mm (3 inches) clearance between top of cabinet and bottom of ladder rack/cable tray. Position ladder rack/cable tray so that it does not interfere with hot air exhaust through cabinet's top panel. Use radius drops where cable enters or exits ladder rack/cable tray.
    - d. Install ladder rack with side stringers facing rack or cabinet so that ladder forms an inverted U-shape and so that welds between stringers (sides) and cross members (middle) face away from cables.

- e. Secure ladder rack to tops of equipment racks or cabinets using manufacturer's recommended supports and appropriate hardware.
  - f. Attach bonding conductor sized per TIA-607-B between telecommunications grounding busbar and cabinet. Attach bonding conductor to cabinet using a ground terminal block according to manufacturer's installation instructions.
  - g. Provide bonding conductor and other hardware required to make connections between cabinet and telecommunications grounding busbar.
  - h. Install rack mounted equipment normally requiring adjustment or observation so operational adjustments can be conveniently made.
  - i. Mount heavy equipment with rack slides or rails to allow servicing from front of enclosure. Provide support in addition to front panel mounting screws for heavy equipment.
  - j. Provide with cable slack to permit servicing by removal of installed equipment from front of enclosure.
  - k. Install color-matched blank panel spacer 44 mm (1.75 inches) high between each piece of active and passive equipment to ensure adequate air circulation for efficient equipment cooling and air ventilation.
  - l. Provide quiet fans and non-disposable air filters at each console or cabinet.
  - m. Install enclosures and racks plumb and square, permanently attached to building structure and held in place.
  - n. Provide 381 mm (15 inches) of front vertical space opening for additional equipment.
  - o. Install equipment located indoors in metal racks or enclosures with hinged doors to allow access for maintenance without causing interference to other nearby equipment.
  - p. Cables must enter equipment racks or enclosures in such a manner to allow doors or access panels to open and close without disturbing or damaging cables.
  - q. Mount distribution hardware in a manner that allows access to connections for testing and provides room for doors or access panels to open and close without disturbing the cables.
2. Racks:
- a. Assemble racks according to manufacturer's instructions.
  - b. Verify that equipment mounting rails are sized properly for rack-mount equipment before attaching rack to floor.
  - c. Attach assembled racks to floor in four places using appropriate floor mounting anchors. When placed over a raised floor, threaded rods should pass through raised floor tile and be secured in structural floor below.

- d. Bond racks to telecommunications grounding busbar using appropriate hardware provided by contractor.
  - e. Ladder rack may be attached to top of rack to deliver cables to rack. Do not drill rack to attach; use appropriate hardware from rack manufacturer.
  - f. Provide radius drops to guide cable where cable exits or enters side of overhead ladder rack to access a rack, frame, cabinet or wall-mounted rack, cabinet or termination field.
  - g. Evenly distribute equipment load on rack. Place large and heavy equipment towards bottom of rack. Secure equipment to rack with equipment mounting screws.
3. Vertical Cable Managers:
- a. Provide vertical managers so number of cables in each manager does not exceed OEM fill capacity.
  - b. Attach vertical cable managers to side of rack/frame using manufacturer's installation instructions and hardware.
  - c. Attach vertical cable manager to both racks/frames when a single vertical cable manager is used between two racks/frames.
  - d. Dress cables through openings in between T-shaped guides on manager so that cables make gradual bends as they exit or enter cable manager into rack-mount space (RMU). Do not twist, coil or make sharp bends in cables.
  - e. Attach doors to cable manager in closed position after cabling is complete.
4. Horizontal Cable Managers:
- a. Attach horizontal cable managers to rack/frame with minimum four screws according to manufacturer's installation instructions. Center each cable manager within allocated rack-mount space (RMU).
  - b. Provide horizontal managers located so number of cables each manager supports is less than cable manager's cable fill capacity.
  - c. Dress cables through openings in between T-shaped guides on cable manager so that cables make gradual bends as they exit or enter cable manager into rack-mount space (RMU). Do not twist, coil or make sharp bends in cables.
  - d. Attach covers to cable manager in closed position after cabling is complete.
- D. Labeling: Permanently label each enclosure in accordance with TIA-606-B using laser printers or thermal ink transfer process; handwritten labels are not acceptable.
- 1. Equipment: Label system equipment with contrasting plastic laminate or bakelite material on face of unit corresponding to its source.

2. Conduit, Cable Duct, and/or Cable Tray: Label conduit, duct and tray, including utilized GFE, with permanent marking devices or spray painted stenciling a minimum of 3 m (10 feet), identifying system.

--- E N D ---

**SECTION 27 15 00  
COMMUNICATIONS HORIZONTAL CABLING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies a complete and operating voice and digital structured cabling distribution system and associated equipment and hardware to be installed in VA Medical Center, Out Patient Clinic, or here-in-after referred to as the "facility".

**1.2 RELATED WORK**

- A. Wiring devices: Section 26 27 26, WIRING DEVICES.
- B. Lightning protection system: Section 26 41 00, FACILITY LIGHTNING PROTECTION.
- C. General electrical requirements that are common to more than one section in Division 27: Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.
- D. Requirements for personnel safety and to provide a low impedance path for possible ground fault currents: Section 27 05 26, GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS.
- E. Conduits for cables and wiring: Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS.
- F. Low voltage cabling system infrastructure: Section 27 10 00, CONTROL, COMMUNICATION AND SIGNAL WIRING.
- G. Voice communication switching and routing equipment: Section 27 31 00, VOICE COMMUNICATIONS SWITCHING AND ROUTING EQUIPMENT.
- H. Extension of a voice communication switching and routing system: Section 27 31 31, VOICE COMMUNICATIONS SWITCHING AND ROUTING EQUIPMENT EXTENSION.
- I. Emergency radio equipment: Section 27 32 41, TWO-WAY RADIO EQUIPMENT AND SYSTEMS.
- J. High Definition (HDTV) Master Antenna Television (MATV) system and associated equipment: Section 27 41 31, MASTER ANTENNA TELEVISION EQUIPMENT AND SYSTEMS.
- K. Emergency Service Public Address System (PAS) and associated equipment: Section 27 51 16, PUBLIC ADDRESS AND MASS NOTIFICATION SYSTEMS.

**1.3 SUBMITTALS**

- A. In addition to requirements of Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS provide:
  - 1. Pictorial layout drawing of each telecommunications room, showing termination cabinets, each distribution cabinet and rack, as each is expected to be installed and configured.
  - 2. List of test equipment as per 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.

B. Certifications:

1. Submit written certification from OEM indicating that proposed supervisor of installation and proposed provider of contract maintenance are authorized representatives of OEM. Include individual's legal name and address and OEM warranty credentials in the certification.
2. Pre-acceptance Certification: Submit in accordance with test procedures.
3. Test system cables and certify to COR before proof of performance testing can be conducted. Identify each cable as labeled on as-installed drawings.
4. Provide current and qualified test equipment OEM training certificates and product OEM installation certification for contractor installation, maintenance, and supervisory personnel.

- C. Closeout Submittal: Provide document from OEM certifying that each item of equipment installed conforms to OEM published specifications.

**1.4 WARRANTY**

- A. Work subject to terms of Article "Warranty of Construction," FAR clause 52.246-21.

**PART 2 - PRODUCTS**

**2.1 PERFORMANCE AND DESIGN CRITERIA**

- A. Provide complete system including "punch down" and cross-connector blocks voice and data distribution sub-systems, and associated hardware including telecommunications outlets (TCO); copper and fiber optic distribution cables, connectors, "patch" cables, "break out" devices and equipment cabinets, interface cabinets, and radio relay equipment rack.
- B. Industry Standards:
1. Cable distribution systems provided under this section are connected to systems identified as critical care performing life support functions.
  2. Conform to National and Local Life Safety Codes (whichever are more stringent), NFPA, NEC, this section, Joint Commission Life Safety Accreditation requirements, and OEM recommendations, instructions, and guidelines.
  3. Provide supplies and materials listed by a nationally recognized testing laboratory where such standards are established for supplies, materials or equipment.
  4. Refer to industry standards and minimum requirements of Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and guidelines listed.
  5. Active and passive equipment required by system design and approved technical submittal; must conform to each UL standard in effect for equipment, when technical submittal was reviewed and approved by Government or date when COR accepted system equipment to be replaced. Where a UL standard is in existence for equipment to be used in completion of this contract, equipment must bear approved NRTL label.



- C. System Performance: Provide complete system to meet or exceed TIA Category 6 or on a case by case basis Category 6A for specialized powered systems' requirements.
- D. Provide continuous inter- and/or intra-facility voice, data, and analog service.
  - 1. Provide voice and data cable distribution system based on a physical "Star" topology.
  - 2. Provide separate cable distribution system for emergency, safety and protection systems (i.e. emergency bypass phones; police emergency voice communications from parking lots and stairwells personal protection, duress alarms and annunciation systems; etc.)
  - 3. Contact SMCS 005OP2H3 (202-462-5310) for specific technical assistance and approvals.
- E. Specific Subsystem Requirements: Provide products necessary for a complete and functional voice, data, analog and videotele communications cabling system, including backbone cabling system, patch panels and cross-connections, horizontal cabling systems, jacks, faceplates, and patch cords.
- F. Coordinate size and type of conduit, pathways and firestopping for maximum 40 percent cable fill with subcontractors.
- G. Terminate all interconnecting twisted pair, fiber-optic or coaxial cables on patch panels or punch blocks. Terminate unused or spare conductors and fiber strands. Do not leave unused or spare twisted pair wire, fiber-optic or coaxial cable unterminated, unconnected, loose or unsecured.
- H. Color code distribution wiring to conform to ANSI/TIA 606-B and construction documents, whichever is more stringent. Label all equipment, conduit, enclosures, jacks, and cables on record drawings, to facilitate installation and maintenance.
- I. In addition to requirements in Section 27 05 11, REQUIREMENTS FOR COMMUNICATION INSTALLATIONS, provide stainless steel faceplates with plastic covers over labels.

## **2.2 EQUIPMENT AND MATERIALS**

- A. Where system connects to an existing specific voice (telephone) equipment and system operational performance standards.
- B. Cable Systems - Twisted Pair, Fiber optic, Coaxial and Analog:
  - 1. General:
    - a. Provide cable (i.e. backbone, and horizontal cabling) conforming to accepted industry standards with regards to size, color code, and insulation.
    - b. Some areas can be considered "plenum". Comply with all codes pertaining to plenum environments. It is contractor's responsibility to review the VA's cable requirements with COR and OI&T Service prior to installation to confirm type of environment present at each location.

- c. Provide proper test equipment to confirm that cable pairs meet each OEM's standard transmission requirements, and ensure cable carries data transmissions at required speeds, frequencies, and fully loaded bandwidth.
  2. Telecommunications Rooms (TR):
    - a. In TR's served with UTP and STP fiber optic, coaxial and analog backbone cables, terminate UTP and STP cable on RJ-45, 8-pin connectors of separate 48-port modular patch panels, 110A or equivalent type punch down blocks that are dedicated to voice and data applications.
    - b. Provide 24 port fiber optic modular patch panels with "LC" or OEM specified couplers dedicated for voice, data and FMS applications.
    - c. Provide connecting cables required to extend backbone cables (i.e. patch cords, twenty-five pair, etc.), to ensure complete and operational distribution systems.
    - d. In TR's, which are only served by a UTP and STP backbone cable, terminate cable on separate modular connecting devices, Type 110A punch down blocks (or equivalent), dedicated to data applications.
  3. Backbone Copper Cables:
    - a. Riser Cable:
      - 1) Provide communication riser cables listed in NEC Table 800, 154(a) for the purpose and suited for electrical connection to a communication network. (Provide 100 Pair between 4th floor and 5th floor DATA Closets)
      - 2) Provide STP or Unshielded Twisted Pair (UTP), minimum 24 American Wire Gauge (AWG) solid, thermoplastic insulated conductors for communication (analog RF coaxial cable is not to be provided in riser systems) riser cables with a thermoplastic outer jacket.
      - 3) Label and test complete riser cabling system.
  4. Horizontal Cable: Installed from TCO jack to the TR patch panel.
    - a. Tested to ANSI/TIA-568-C.2 Category 6, 6A requirements including NEXT, ELFEXT (Pair-to-Pair and Power Sum), Insertion Loss (attenuation), Return Loss, and Delay Skew.
    - b. Minimum Transmission Parameters: 500 MHz.
    - c. Provide four pair 0.205 mm<sup>2</sup> (24 AWG) cable
    - d. Terminate all four pairs on same port at patch panel in TR.
    - e. Terminate all four pairs on same jack, at work area Telecommunication Outlets (TCO):

- 1) Jacks: Minimum three eight-pin RJ-45 ANSI/TIA-568-C.2 Category 6 and 6A Type jacks at TCO.
  - a) Top Port: RJ-45 jack compatible with RJ-11 plug for voice.
  - b) Bottom Two Ports: Unkeyed RJ-45 jacks for data.
- C. Cross-Connect Systems (CCS):
  1. Copper Cables: Provide copper CCS sized to connect cables at TR and allow for a minimum of 50 percent anticipated growth.
  2. Maximum DC Resistance per Cable Pair: 28.6 Ohms per 305 M (1,000 feet).
  3. Fiber Optic Cables:
    - a. Provide fiber CCS sized to connect cables at TR and allow for a minimum of 50 percent anticipated growth.
    - b. Install fiber optic cable slack in protective enclosures.
- D. Telecommunication Room (TR):
  1. Terminate backbone and horizontal, copper, coaxial and analog cables on appropriate cross-connection systems (CCS) containing patch panels, punch blocks, and breakout devices provided in enclosures and tested, regardless of installation method, mounting, termination, or cross-connecting used. Provide cable management system as a part of each CCS.
  2. Coordinate location in TR with FMS equipment (i.e. fire alarm, nurse call, code blue, video, public address, radio entertainment, intercom, and radio paging equipment).
- E. Coaxial and Analog Cables: Bond equipment to ground per TIA standards, such that all grounding systems comply with all applicable National, Regional, and Local Building and Electrical codes.
  1. Provide current arrester for each copper or coaxial cable that enters from outside of a building regardless if cable is installed underground or aerial.
  2. Provide a gas surge protector/module and bond to earth ground.
- F. Main Cross-connection Subsystem (MCCS): MCCS is common point of distribution for inter- and intra-building copper and fiber optic backbone system cables, and connections to the voice (telephone) and data cable systems.
- G. Voice (or Telephone) Cable Cross-Connection Subsystem:
  1. Provide Insulation Displacement Connection (IDC) hardware.
  2. Provide the following for each Category 5E (or on a case by case basis Category 6// 6A// for specialized powered systems technically accepted by SMCS 005OP2H3, (202) 461-5310, OI&T and FMS Services and COR) Cabling System termination; // cross-connection wires, // RJ-45 patch cord connector to RJ-45 patch cord connector //, hybrid modular cord to IDC patch cord connector//.

- a. Provide terminations to be accessible without need for disassembly of IDC wafer. Provide IDC wafers removable from their mounts to facilitate testing on either side of connector.
  - b. Provide removable designation strips or labels to allow for inspection of terminations.
  - c. Provide cable management system as a part of IDC.
3. Provide IDC connectors capable of re-terminations, without damage, a minimum of 200 IDC insertions or withdrawals on either side of connector panel.
  4. Install using only non-impact terminating tool having both a tactile and an audible feedback to indicate proper termination.
  5. Provide inputs from // PBX//, FTS, Local Voice (Telephone) System, or diverse routed voice distribution systems on left side of IDC (110A blocks with RJ45 connections are acceptable alternates to IDC) of MCCS.
  6. Provide system outputs from MCCS to voice backbone cable distribution system on the right side of same IDC (or 110A blocks) of MCCS.
  7. Do not split pairs within cables between different jacks or connections.
  8. Provide UTP cross connect wire to connect each pair of terminals plus an additional 50 percent spare.
- H. Data Cross-Connection Subsystems:
1. Provide patch panels with modular RJ45 female to 110 connectors for cross-connection of copper data cable terminations and system ground with cable management system.
  2. Provide patch panels conforming to EIA/ECA 310-E dimensions and suitable for mounting in standard equipment racks, with 48 RJ45 jacks aligned in two horizontal rows per panel. Provide RJ45 jacks of modular design and capable of accepting and functioning with other modular (i.e. RJ11) plugs without damaging jack.
    - a. Provide system inputs from servers, data LAN, bridge, or interface distribution systems on top row of jacks of appropriate patch panel.
    - b. Provide backbone cable connections on bottom row of jacks of same patch panel.
    - c. Provide patch cords for each system pair of connection jacks with modular RJ45 connectors provided on each end to match panel's modular RJ45 female jack's being provided.
- I. Horizontal Cabling (HC):
1. Horizontal cable length to farthest system outlet to be maximum of 90 m (295 ft).
  2. Splitting of pairs within a cable between different jacks is not permitted.

## **2.3 DISTRIBUTION EQUIPMENT AND SYSTEMS**

- A. Telecommunication Outlet:

1. TCO consists of minimum one voice (telephone) RJ45 jack and two data RJ45 jacks mounted in a separate steel outlet box 100 mm (4 inches) x 100 mm (4 inches) x 63 mm (2-1/2 inches) minimum with a labeled stainless steel faceplate. Where shown on drawings, provide a second steel outlet box minimum 100 mm (4 inches) x 100 mm (4 inches) x 63 mm (2-1/2 inches), with a labeled faceplate, adjacent to first box to ensure system connections and expandability requirements are met.
2. Provide RJ-45/11 compatible female type voice (telephone) multi-pin connections.
3. Provide wall outlet with a stainless steel face plate and sufficient ports to fit voice (telephone) multi-pin jack, data multi-pin jacks and plastic covers for labels when mounted on outlet box provided (minimum 100mm (4 inches) x 100mm (4 inches) for single and 100mm (4 inches) x 200mm (8 inches) for dual outlet box applications.

B. Backbone Distribution Cables:

1. Meet TIA transmission performance requirements of Voice Grade Category 6.
2. Provide cable listed for environments where it is installed.
3. Technical Characteristics:
  - a. Length: As required, in minimum 1 kilometer (3,000 ft.) reels.
  - b. Size:
    - 1) Minimum 0.205 mm<sup>2</sup> (24 AWG) interior installations.
  - c. Color Coding: American Telephone and Telegraph Company Standard; Bell System Practices Outside Plant Construction and Maintenance Section G50.607.3, Issue 2 February, 1959.
  - d. Minimum Bend Radius: 10X cable outside diameter.
  - e. Impedance: 120 Ohms + 15 percent.
  - f. DC Resistance: Maximum 8.00 ohms/100 m
  - g. Maximum attenuation for 100m at 20° C:

Frequency (MHz)	Category 3 (dB)	// Category 5e (dB)//	//Category 6 (dB)//	//Category 6A (dB)//
.772	2.2	-	-	-
1	2.6	//2.0//	//2.0//	//2.1//
4	5.6	//4.1//	//3.8//	//3.8//
8	8.5	//5.8//	//5.3//	//5.3//
10	9.7	//6.5//	//6.0//	//5.9//
16	13.1	//8.2//	//7.6//	//7.5//

Frequency (MHz)	Category 3 (dB)	// Category 5e (dB)//	//Category 6 (dB)//	//Category 6A (dB)//
20		//9.3//	//8.5//	//8.4//
25		//10.4//	//9.5//	//9.4//
31.25		//11.7//	//10.7//	//10.5//
62.5		//17.0//	//15.4//	//15.0//
100		//22.0//	//19.8//	//19.1//
200			//29.0//	//27.6//
250			//32.8//	//31.1//
300				//34.3//
400				//40.1//
500				//45.3//

4. Data Multi-Conductor:

- a. Unshielded UTP cable with solid conductors.
- b. Able to handle the power and voltage used over the distance required.
- c. Meets TIA transmission performance requirements of Category 6.
- d. Technical Characteristics:
  - 1) 0.205 mm<sup>2</sup> (24 AWG) cable
  - 2) Working Shield: 350 V.
  - 3) Bend Radius: 10 times cable outside diameter.
  - 4) Impedance: 100 Ohms + 15%, BAL.
  - 5) Bandwidth: 500 MHz.
  - 6) DC Resistance: Maximum 9.38 Ohms/100M (328 ft.) at 20 degrees C.
  - 7) Maximum Mutual Capacitance: 5.6 nF per 100 m (328 ft.).
  - 8) Shield Coverage:
    - a) Overall Outside (if OEM specified): 100 percent.
    - b) Individual Pairs (if OEM specified): 100 percent.
  - 9) Maximum attenuation for 100m (328 ft.) at 20° C:

Frequency (MHz)	Category 5e (dB)	//Category 6 (dB)//	//Category 6A (dB)//
1	2.0	//2.0//	//2.1//

Frequency (MHz)	Category 5e (dB)	//Category 6 (dB)//	//Category 6A (dB)//
4	4.1	//3.8//	//3.8//
8	5.8	//5.3//	//5.3//
10	6.5	//6.0//	//5.9//
16	8.2	//7.6//	//7.5//
20	9.3	//8.5//	//8.4//
25	10.4	//9.5//	//9.4//
31.25	11.7	//10.7//	//10.5//
62.5	17.0	//15.4//	//15.0//
100	22.0	//19.8//	//19.1//
200		//29.0//	//27.6//
250		//32.8//	//31.1//
300			//34.3//
400			//40.1//
500			//45.3//

C. Outlet Connection Cables:

1. Voice (Telephone):

- a. Provide a connection cable for each TCO voice (telephone) jack in system with 10 percent spares able to connect voice (telephone) connection cable from voice (telephone) instrument to TCO voice (telephone) jack. Do not provide voice (telephone) instruments or equipment.
- b. Technical Characteristics:
  - 1) Length: Minimum 1.8 m (6 feet).
  - 2) Cable: Voice Grade.
  - 3) Connector: RJ-11/45 compatible male on each end.
  - 4) Size: Minimum 24 AWG.
  - 5) Color Coding: Required, telephone industry standard.

2. Data:

- a. Provide a connection cable for each TCO data jack in system with 10 percent spares to connect a data instrument to TCO data jack. Do not provide data terminals/equipment.
- b. Technical Characteristics:
  - 1) Length: Minimum 1.8 m (6 feet).
  - 2) Cable: Data grade Category 6 for specialized powered systems accepted by SMCS 005OP2H3 (202) 461-5310, IT and FMS Services and COR.
  - 3) Connector: RJ-45 male on each end.
  - 4) Color Coding: Required, data industry standard.
  - 5) Size: Minimum 24 AWG.

D. System Connectors:

1. Modular (RJ-45/11 and RJ-45): Provide voice and high speed data transmission applications type modular plugs compatible with voice (telephone) instruments, computer terminals, and other type devices requiring linking through modular telecommunications outlet to the system compatible with UTP cables.
  - a. Technical Characteristics:
    - 1) Number of Pins:
      - a) RJ-45: Eight.
      - b) RJ-11/45: Compatible with RJ-45.
    - 2) Color: Blue
    - 3) Dielectric: Surge.
    - 4) Voltage: Minimum 1,000V RMS, 60 Hz at one minute.
    - 5) Current: 2.2A RMS at 30 Minutes or 7.0A RMS at 5.0 seconds.
    - 6) Leakage: Maximum 100  $\mu$ A.
    - 7) Connections:
      - a) Initial contact resistance: Maximum 20 milli-Ohms.
      - b) Insulation displacement: Maximum 10 milli-Ohms.
      - c) Interface: Must interface with modular jacks from a variety of OEMs. RJ-11/45 plugs provide connection when used in RJ-45 jacks.
      - d) Durability: Minimum 200 insertions/withdrawals.

E. Conduit and Signal Ducts:

1. Conduit:
  - a. Provide conduit or sleeves for cables penetrating walls, ceilings, floors, interstitial space, fire barriers, etc.
  - b. Minimum Conduit Size: 19 mm (3/4 inch).



- c. Provide separate conduit and signal ducts for each cable type installation.
  - d. When metal (plastic covered, flexible cable protective armor, etc.) systems are authorized to be provided for use in system, follow installation guidelines and standard specified in Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS and NEC.
  - e. Maximum 40 percent conduit fill for cable installation.
2. Signal Duct, Cable Duct, or Cable Tray: Use existing signal duct, cable duct, and cable tray, when identified and accepted by COR.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install for ease of operation, maintenance, and testing.
- B. Install system to comply with NFPA 70 National Electrical Code, NFPA 99 Health Care Facilities, NFPA 101 Life Safety Code, Joint Commission Manual for Health Care Facilities, and original equipment manufacturers' (OEM) installation instructions.
- C. Cable Systems Installation:
  1. Install system cables in cable duct, cable tray, cable runway, conduit or when specifically approved, flexible NEC Article 800 communications raceway. Confirm drawings show sufficient quantity and size of cable pathways. If flexible communications raceway is used, install in same manner as conduit.
  2. Coordinate outside plant and backbone cables to furnish number of cable pairs for system requirements and obtain approval of COR and IT Service prior to installation.
  3. Bond to ground metallic cable sheaths, etc. (i.e. risers, underground, horizontal, etc.).
  4. Install temporary cable to not present a pedestrian safety hazard and be responsible for all work associated with removal. Temporary cable installations are not required to meet Industry Standards; but, must be reviewed and accepted by COR, IT Service, FMS and SMCS 005OP2H3 (202-461-5310) prior to installation.
- D. Labeling:
  1. Industry Standard: Provide labeling in accordance with ANSI/TIA-606-B.
  2. Print lettering of labels with laser printers or thermal ink transfer process; handwritten labels are not acceptable.
  3. Label both ends of all cables in accordance with industry standard. Provide permanent Labels in contrasting colors and identify according to system "Record Wiring Diagrams".
  4. Termination Hardware: Label workstation outlets and patch panel connections using color coded labels with identifiers in accordance with industry standard and record on "Record Wiring Diagrams".

E. Interim Inspection:

1. Verify that equipment provided adheres to installation requirements of this section. Interim inspection must be conducted by a factory-certified representative and witnessed by COR.
2. Check each item of installed equipment to ensure appropriate NRTL label.
3. Verify cabling terminations in telecommunications rooms and at workstations adhere to color code for T568B, T568A pin assignments and cabling connections comply with TIA standards.
4. Visually confirm marking of cables, faceplates, patch panel connectors and patch cords.
5. Notify COR of the estimated date the contractor expects to be ready for interim inspection, at least 20 working days before requested inspection date, so interim inspection does not affect systems' completion date.
6. Provide results of interim inspection to COR. If major or multiple deficiencies are discovered, COR can require a second interim inspection before permitting contractor to continue with system installation.
7. Do not proceed with installation until COR determines if an additional inspection is required. In either case, re-inspection of deficiencies noted during interim inspections must be part of the proof of performance test.

F. Pretesting:

1. Pretest entire system upon completion of system installation.
2. Verify during system pretest, utilizing the accepted equipment, that system is fully operational and meets system performance requirements of this section.
3. Provide COR four copies of recorded system pretest measurements and the written certification that system is ready for formal acceptance test.

G. Acceptance Test:

1. After system has been pretested and the contractor has submitted pretest results and certification to COR, then schedule an acceptance test date and give COR 30 days' written notice prior to date acceptance test is expected to begin.
2. Test only in presence of a COR.
3. Test utilizing approved test equipment to certify proof of performance.
4. Verify that total system meets the requirements of this section.
5. Include expected duration of test time, with notification of the acceptance test.

H. Verification Tests:

1. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors, and between conductors and shield, if cable has an overall shield. Test cables after termination and prior to cross-connection.

I. Performance Testing:

1. Perform Category 6, 6A for specialized powered systems accepted by SMCS 005OP2H3, (202) 461-5310, IT and FMS Services and COR) tests in accordance with TIA-568-B.1 and TIA-568-B.2. Include the following tests - wire map, length, insertion loss, return loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, propagation delay and delay skew.
- J. Total System Acceptance Test: Perform verification tests for UTP copper cabling systems after complete telecommunication distribution system and workstation outlet are installed.

### **3.2 MAINTENANCE**

- A. Accomplish the following minimum requirements during one year warranty period:
  1. Respond and correct on-site trouble calls, during standard work week:
    - a. A routine trouble call within one working day of its report. A routine trouble is considered a trouble which causes a system outlet, station, or patch cord to be inoperable.
    - b. Standard work week is considered 8:00 A.M. to 5:00 P.M., Monday through Friday exclusive of Federal holidays.
  2. Respond to an emergency trouble call within six hours of its report. An emergency trouble is considered a trouble which causes a subsystem or distribution point to be inoperable at any time.
  3. Respond on-site to a catastrophic trouble call within four hours of its report. A catastrophic trouble call is considered total system failure.
    - a. If a system failure cannot be corrected within four hours (exclusive of standard work time limits), provide alternate equipment, or cables within four hours after four hour trouble shooting time.
    - b. Routine or emergency trouble calls in critical emergency health care facilities (i.e., cardiac arrest, intensive care units, etc.) are also be deemed as a catastrophic trouble.
  4. Provide COR written report itemizing each deficiency found and the corrective action performed during each official reported trouble call. Provide COR with sample copies of reports for review and approval at beginning of total system acceptance test.

--- E N D ---

**SECTION 27 51 16  
PUBLIC ADDRESS AND MASS NOTIFICATION SYSTEMS**

**PART 1 - GENERAL**

**1.1 SECTION SUMMARY**

- A. Work covered by this document includes design, engineering, labor, material and products, equipment warranty and system warranty, 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 Public Address System (PAS) and associated equipment (here-in-after referred to as the System) in approved locations indicated on the contract drawings. These items shall be tested and certified capable of receiving, distributing, interconnecting and supporting PAS communications signals generated local and remotely as detailed herein.
- B. Work shall be complete, Occupational Safety and Health Administration (OSHA), National Recognized Testing Laboratory (NRTL – i.e. Underwriters Laboratory [UL]) Listed and Labeled; and VA Central Office (VACO), Telecommunications Voice Engineering (TVE 005OP3B) tested, certified and ready for operation.
- C. 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.
- D. The term “provide”, as used herein, shall be defined as: designed, engineered, furnished, installed, certified, and tested, by the Contractor.
- E. 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 PM, RE and TVE-005OP3B. *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 writing with technical concurrences by VA’s RE, TVE-005OP3B and identified Facility Project Personnel.
- F. 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 attesting this requirement as a part of the technical submittal that includes each name and certification, including the OEMs.

## 1.2 RELATED SECTIONS

- A. 01 33 23 – Shop Drawings, Product Data and Samples.
- B. 07 84 00 – Firestopping.
- C. 26 05 21 – Low – Voltage Electrical Power Conductors and Cables (600 Volts and Below).
- D. 26 41 00 – Facility Lightning Protection.
- E. 27 05 11 – Requirements for Communications Installations.
- F. 27 05 26 – Grounding and Bonding for Communications Systems.
- G. 27 05 33 – Raceways and Boxes for Communications Systems.
- H. 27 10 00 – Structured Communications Cabling Equipment and Systems.
- I. 27 11 00 – Communications Cabling Interface and Equipment Rooms Fittings.
- J. 27 15 00 – Horizontal and Vertical Communications Cabling Equipment and Systems.

## 1.3 DEFINITIONS

- A. Provide: Design, engineer, furnish, install, connect complete, test, certify and warranty.
- B. Work: Materials furnished and completely installed.
- C. Review of contract drawings: A service by the engineer to reduce the possibility of materials being ordered which do not comply with contract documents. The engineer's review shall not relieve the Contractor of responsibility for dimensions or compliance with the contract documents. The reviewer's failure to detect an error does not constitute permission for the Contractor to proceed in error.
- D. Headquarters Technical Review, for National and VA communications and security, codes, frequency licensing, standards, guidelines compliance:
  - Office of Telecommunications
  - Special Communications Team (005OP2B)
  - 1335 East West Highway – 3rd Floor
  - Silver Spring, Maryland 20910
  - (O) 301-734-0350, (F) 301-734-0360
- E. Engineer: West Plains Engineering  
Sioux Falls, SD
- F. Owner: Royal C. Johnson Memorial Veteran's Hospital  
Sioux Falls, SD VA
- G. General Contractor (GC):
- H. Contractor: Successful bidder

#### 1.4 REFERENCES

- A. The installation shall comply fully with all governing authorities, laws and ordinances, regulations, codes and standards, including, but not limited to:
1. United States Federal Law:
    - a. Departments of:
      - 1) Commerce, Consolidated Federal Regulations (CFR), Title 15 – Under the Information Technology Management Reform Act (Public Law 104-106), the Secretary of Commerce approves standards and guidelines that are developed by the:
        - a) Chapter II, National Institute of Standards Technology (NIST – formerly the National Bureau of Standards). Under Section 5131 of the Information Technology Management Reform Act of 1996 and the Federal Information Security Management Act of 2002 (Public Law 107-347), NIST develops – Federal Information Processing Standards Publication (FIPS) 140-2—Security Requirements for Cryptographic Modules.
        - b) Chapter XXIII, National Telecommunications and Information Administration (NTIA – aka ‘Red Book’) Chapter 7.8 / 9; CFR, Title 47 Federal communications Commission (FCC) Part 15, Radio Frequency Restriction of Use and Compliance in “Safety of Life” Functions & Locations
      - 2) FCC - Communications Act of 1934, as amended, CFR, Title 47 – Telecommunications, in addition to Part 15 – Restrictions of use for Part 15 listed Radio Equipment in Safety of Life / Emergency Functions / Equipment/ Locations (also see CFR, Title 15 – Department of Commerce, Chapter XXIII – NTIA):
        - a) Part 15 – Restrictions of use for Part 15 listed Radio Equipment in Safety of Life / Emergency Functions / Equipment/Locations.
        - b) Part 58 – Television Broadcast Service.
        - c) Part 90 – Rules and Regulations, Appendix C.
        - d) Form 854 – Antenna Structure Registration.
      - 3) Health, (Public Law 96-88), CFR, Title 42, Chapter IV Health & Human Services, CFR, Title 46, Subpart 1395(a)(b) JCAHO “a hospital that meets JCAHO accreditation is deemed to meet the Medicare conditions of Participation by meeting Federal Directives:”
        - a) All guidelines for Life, Personal and Public Safety; and, Essential and Emergency Communications.

- 4) Labor, CFR, Title 29, Part 1910, Chapter XVII - Occupational Safety and Health Administration (OSHA), Occupational Safety and Health Standard:
  - a) Subpart 7 - Definition and requirements (for a NRTL – 15 c's, for complete list, contact ([http://www.osha.gov/dts/otpca/nrtl/faq\\_nrtl.html](http://www.osha.gov/dts/otpca/nrtl/faq_nrtl.html)):
    - 1) UL:
      - a) 44-02 – Standard for Thermoset-Insulated Wires and Cables.
      - b) 65 – Standard for Wired Cabinets.
      - c) 83-03 – Standard for Thermoplastic-Insulated Wires and Cables.
      - d) 467-01 – Standard for Electrical Grounding and Bonding Equipment
      - e) 468 – Standard for Grounding and Bonding Equipment.
      - f) 486A-01 – Standard for Wire Connectors and Soldering Lugs for Use with Copper Conductors
      - g) 486C-02 – Standard for Splicing Wire Connectors.
      - h) 486D-02 – Standard for Insulated Wire Connector Systems for Underground Use or in Damp or Wet Locations.
      - i) 486E-00 – Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors.
      - j) 493-01 – Standard for Thermoplastic-Insulated Underground Feeder and Branch Circuit Cable.
      - k) 514B-02 – Standard for Fittings for Cable and Conduit.
      - l) 1069 – Hospital Signaling and Nurse Call Equipment.
      - m) 1333 – Vertical (Riser) Fire Rating.
      - n) 1449 – Standard for Transient Voltage Surge Suppressors.
      - o) 1479-03 – Standard for Fire Tests of Through-Penetration Fire Stops.
      - p) 1863 – Standard for Safety, Communications Circuits Accessories.
      - q) 2024 – Standard for Optical Fiber Raceways.
      - r) 60950-1/2 – Information Technology Equipment – Safety.
    - 2) Canadian Standards Association (CSA): same tests as for UL.
    - 3) Communications Certifications Laboratory (CCL): same tests as for UL.
    - 4) Intertek Testing Services NA, Inc. (ITSNA formerly Edison Testing Laboratory [ETL]): same tests as for UL.
  - b) Subpart 35 – Compliance with NFPA 101 – Life Safety Code.
  - c) Subpart 36 - Design and construction requirements for exit routes.
  - d) Subpart 268 - Telecommunications.
  - e) Subpart 305 - Wiring methods, components, and equipment for general use.

- 5) Department of Transportation, CFR, Title 49 (Public Law 89-670), Part 1, Subpart C – Federal Aviation Administration (FAA):
  - a) Standards AC 110/460-ID & AC 707 / 460-2E – Advisory Circulars for Construction of Antenna Towers.
  - b) Forms 7450 and 7460-2 – Antenna Construction Registration.
- 6) Veterans Affairs (Public Law No. 100-527), CFR, Title 38, Volumes I & II:
  - a) Office of Telecommunications:
    - 1) Handbook 6100 – Telecommunications.
      - a) Spectrum Management FCC & NTIA Radio Frequency Compliance and Licensing Program.
      - b) Special Communications Proof of Performance Testing, VACO Compliance and Life Safety Certification(s).
    - b) Office of Cyber and Information Security (OCIS):
      - 1) Handbook 6500 - Information Security Program.
      - 2) Wireless and Handheld Device Security Guideline Version 3.2, August 15, 2005.
    - c) VA's National Center for Patient Safety – Veterans Health Administration Warning System, Failure of Medical Alarm Systems using Paging Technology to Notify Clinical Staff, July 2004.
    - d) VA's Center for Engineering Occupational Safety and Health, concurrence with warning identified in VA Directive 7700.
  - e) Office of Construction and Facilities Management (CFM):
    - 1) Master Construction Specifications (PG-18-1).
    - 2) Standard Detail and CAD Standards (PG-18-4).
    - 3) Equipment Guide List (PG-18-5).
    - 4) Electrical Design Manual for VA Facilities (PG 18-10), Articles 7 & 8.
    - 5) Minimum Requirements of A/E Submissions (PG 18-15):
      - a) Volume B, Major New Facilities, Major Additions; and Major Renovations, Article VI, Paragraph B.
      - b) Volume C - Minor and NRM Projects, Article III, Paragraph S.
      - c) Volume E - Request for Proposals Design/Build Projects, Article II, Paragraph F.
    - 6) Mission Critical Facilities Design Manual (Final Draft – 2007).
    - 7) Life Safety Protected Design Manual (Final Draft – 2007).
    - 8) Solicitation for Offerors (SFO) for Lease Based Clinics – (05-2009).



- b. Federal Specifications (Fed. Specs.):
  - 1) A-A-59544-00 - Cable and Wire, Electrical (Power, Fixed Installation).
- 2. United States National Codes:
  - a. American Institute of Architects (AIA): Guidelines for Healthcare Facilities.
  - b. American National Standards Institute/Electronic Industries Association/Telecommunications Industry Association (ANSI/EIA/TIA):
    - 1) 568-B - Commercial Building Telecommunications Wiring Standards:
      - a) B-1 – General Requirements.
      - b) B-2 – Balanced twisted-pair cable systems.
      - c) B-3 - Fiber optic cable systems.
    - 2) 569 - Commercial Building Standard for Telecommunications Pathways and Spaces.
    - 3) 606 – Administration Standard for the Telecommunications Infrastructure of Communications Buildings.
    - 4) 607 – Commercial Building Grounding and Bonding Requirements for Telecommunications.
    - 5) REC 127-49 – Power Supplies.
    - 6) RS 160-51 – Sound systems.
    - 7) RS 270 – Tools, Crimping, Solderless Wiring Devices, Recommended Procedures for User Certification.
    - 8) SE 101-A49 – Amplifier for Sound Equipment
    - 9) SE 103-49 – Speakers for Sound Equipment
  - c. American Society of Mechanical Engineers (ASME):
    - 1) Standard 17.4 – Guide for Emergency Personnel.
    - 2) Standard 17.5 – Elevator & Escalator Equipment (prohibition of installing non-elevator equipment in Elevator Equipment Room / Mechanical Penthouse).
  - d. American Society of Testing Material (ASTM):
    - 1) D2301-04 - Standard Specification for Vinyl Chloride Plastic Pressure Sensitive Electrical Insulating Tape.
  - e. Building Industries Communications Services Installation (BICSI):
    - 1) All standards for smart building wiring, connections and devices for commercial and medical facilities.
    - 2) Structured Building Cable Topologies.
    - 3) In consort with ANSI/EIA/TIA.
  - f. Institute of Electrical and Electronics Engineers (IEEE):

- 1) SO/TR 21730:2007 - Use of mobile wireless communication and computing technology in healthcare facilities - Recommendations for electromagnetic compatibility (management of unintentional electromagnetic interference) with medical devices.
  - 2) 0739-5175/08/©2008 IEEE – Medical Grade – Mission Critical – Wireless Networks.
  - 3) C62.41 – Surge Voltages in Low-Voltage AC Power Circuits.
- g. NFPA:
- 1) 70 - National Electrical Code (current date of issue) – Articles 517, 645 & 800.
  - 2) 75 - Standard for Protection of Electronic Computer Data-Processing Equipment.
  - 3) 77 – Recommended Practice on Static Electricity.
  - 4) 99 - Healthcare Facilities.
  - 5) 101 - Life Safety Code.
  - 6) 1600 – Disaster Management, Chapter 5.9 – Communications and Warning
3. State Hospital Code(s).
  4. Local Town, City and/or County Codes.
  5. Accreditation Organization(s):
    - a. Joint Commission on Accreditation of Hospitals Organization (JCAHO) – Section VI, Part 3a – Operating Features.

## 1.5 QUALIFICATIONS

- A. The OEM shall have had experience with three (3) or more installations of systems of comparable size and 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.
- B. 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.
- C. 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.

- D. The Contractor shall display all applicable national, state and local licenses.
- E. The Contractor shall submit copy (s) of Certificate of successful completion of OEM's installation/training school for installing technicians of the System's PA equipment being proposed.

#### **1.6 CODES AND PERMITS**

- A. Provide all necessary permits and schedule all inspections as identified in the contract's milestone chart, so that the system is proof of performance tested and ready for operation on a date directed by the Owner.
- B. The contractor is responsible to adhere to all codes described herein and associated contractual, state and local codes.
- C. The Contractor shall display all applicable national, state and local licenses and permits.

#### **1.7 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.

#### **1.8 REVIEW OF CONTRACT DRAWINGS AND EQUIPMENT DATA SUBMITTALS**

(Note: The Contractor is encouraged, but not required, to submit separate technical submittal(s) outlining alternate technical approach(s) to the system requirements stated here-in as long as each alternate technical document(s) is complete, separate, and submitted in precisely the same manner as outlined herein. VA will review and rate each received alternate submittal, which follows this requirement, in exactly the same procedure as outlined herein. Partial, add-on, or addenda type alternates will not be accepted or reviewed.)

- A. Submit at one time within 10 days of contract awarding, drawings and product data on all proposed equipment and system. Check for compliance with contract documents and certify compliance with Contractor's "APPROVED" stamp and signature.
- B. Support all submittals with descriptive materials, i.e., catalog sheets, product data sheets, diagrams, and charts published by the manufacturer. These materials shall show conformance to specification and drawing requirements.

- C. Where multiple products are listed on a single cut-sheet, circle or highlight the one that you propose to use. Provide a complete and thorough equipment list of equipment expected to be installed in the system, with spares, as a part of the submittal. Special Communications (TVE-005OP3B) will not review any submittal that does not have this list.
- D. Provide four (4) copies to the PM for technical review. The PM will provide a copy to the offices identified in Paragraph 1.3.C & D, at a minimum for compliance review as described herein where each responsible individual(s) shall respond to the PM within 10 days of receipt of their acceptance or rejection of the submittal(s).
- E. Provide interconnection methods, conduit (where not already installed), junction boxes (J-Boxes), cable, interface fixtures and equipment lists for the: ENR(s) ( aka DMARC), TER, TCR, MCR, MCOR, PCR, ECR, Stacked Telecommunications Rooms (STR), Nurses Stations (NS), Head End Room (HER), Head End Cabinet (HEC), Head End Interface Cabinet (HEIC) and approved TCO locations Telecommunications Infrastructure Plant (TIP) interface distribution layout drawing, as they are to be installed and interconnected to teach other (REFER TO APPENDIX B – SUGGESTED TELECOMMUNI-CAITONS ONE LINE TOPOLOGY pull-out drawing).
- F. Headend and each interface distribution cabinet layout drawing, as they are expected to be installed.
- G. Equipment OEM technical literature detailing the electrical and technical characteristics of each item of equipment to be furnished.
- H. Engineering drawings of the System, showing calculated of expected signal levels at the headend input and output, each input and output distribution point, and signal level at each telecommunications outlet.
- I. Surveys Required as a Part of The Technical Submittal:
  - 1. The Contractor shall provide the following System survey(s) that depict various system features and capacities required in addition to the on-site survey requirements described herein. Each survey shall be in writing and contain the following information (the formats are suggestions and may be used for the initial Technical Submittal Survey requirements), as a minimum:
    - a. PA Cable System Design Plan:
      - 1) An OEM and contractor designed functioning PA System cable plan to populate the entire TIP empty conduit/pathway distribution systems provided as a part of Specification 27 11 00 shall be provided as a part of the technical proposal. A specific functioning PA: cable, interfaces, J-boxes and back boxes shall coincide with the total growth items as described herein.

**1.9 PROJECT RECORD DOCUMENTS (AS BUILTS)**

- A. Throughout progress of the Work, maintain an accurate record of changes in Contract Documents. Upon completion of Work, transfer recorded changes to a set of Project Record Documents.
- B. The floor plans shall be marked to include the following:
  - 1. All device locations with UL labels affixed.
  - 2. Conduit locations.
  - 3. Each interface and equipment specific location.
  - 4. Telecommunication Outlet (s –TCO) equipment and specific location
  - 5. TIP Wiring diagram(s).
  - 6. Warranty certificate.
  - 7. System test results.
  - 8. System Completion Document(s) or MOU.

**1.11 USE OF THE SITE**

- A. Use of the site shall be at the GC's direction.
- B. Coordinate with the GC for lay-down areas for product storage and administration areas.
- C. Coordinate work with the GC and their sub-contractors.
- D. Access to buildings wherein the work is performed shall be directed by the GC.

**1.12 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft.
- B. Store products in original containers.
- C. Coordinate with the GC for product storage. There may be little or no storage space available on site. Plan to potentially store materials off site.
- D. Do not install damaged products. Remove damaged products from the site and replaced with new product at no cost to the Owner.

**1.13 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. Warranty certificate.
  - 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.
- 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 / FUNCTIONAL REQUIREMENTS**

### **2.0 GENERAL REQUIREMENTS FOR EQUIPMENT AND MATERIALS**

- A. Furnish and install a complete and fully functional and operable Nurse Call System for each location shown on the contract drawings and TCOs **WHOSE EMPTY CONDUIT SYSTEM WAS PROVIDED AS A PART OF SPECIFICATION 27 11 00.**
- B. Coordinate features and select interface components to form an integrated PA system. Match components and interconnections between the systems for optimum performance of specified functions.
- C. Meet all FCC requirements regarding 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 structure.
- D. Deliver a fully functioning and operable PA in the specific locations shown on the drawings.

### **2.1 SYSTEM DESCRIPTION**

- A. Furnish and install a complete and fully functional and operable extension to the existing HF Radio System. Provide additional require conduit(s) according to Specification 27 11 00.
- B. The Contractor is responsible for interfacing the **MATV, RED, Patient Bed Service Walls, SSC Room** systems with the System and shall be the interface points for connection of the radio interface cabling from the interface unit(s). The interface unit(s) shall be provided by the Contractor.
- C. The Contractor shall continually employ interfacing methods that are approved by the OEM and VA. At a minimum, an acceptable interfacing method requires not only a physical and mechanical connection, but also a matching of signal, voltage, and processing levels with regard to signal quality and impedance. The total PA system shall be configured and installed so that the combination of equipment actually employed does not produce any undesirable visual or aural effects such as signal distortions, noise pulses, glitches, hum, transients, images, etc. The interface points must adhere to all standards described herein for the full separation of Critical Care and Life Safety systems.
- D. It is not acceptable to utilize the telephone cable system for the control of radio signals and equipment. The System Contractor shall connect the Telephone System Remote Control System

to the Radio System Paging Control Unit ensuring that all NFPA and UL Critical Care and Life Safety Circuit and System separation guidelines are satisfied. The System Contractor is not allowed to make any connections to the Telephone System. The Owner shall arrange for the interconnection between the PA and Telephone Systems with the appropriate responsible parties.

- E. System hardware shall consist of a **standalone (separate)** PA communications network comprised of amplifiers, mixers, speakers, volume controls, test sets, telephone private branch exchange (PBX) interface equipment, equipment cabinets/racks, wiring and other options such as, sub zoning in addition to “all call” functions, computer interfaces, printer interfaces and wireless network interfaces, **(when specifically approved by 005OP3B and VA Headquarters Spectrum Management 005OP2B – herein after referred to as 005OP2B)** as shown on drawings. 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.
- F. Systems firmware shall be the product of a reputable firmware OEM of record 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 two (2) years from date of acceptance by VA for any product feature enhancements. System configuration programming changes shall not require any exchange of parts and shall be capable of being executed remotely via a modem connection (when specifically approved first by 005OP3B).
- G. The PA Head End Equipment shall be located in Telecommunications **PBX/Telephone Room**. The PA shall cover floor(s) **and areas**. The PA shall provide zoned, one-way voice paging through distributed, ceiling mounted loudspeakers. Voice input into the PA shall be by zone using the telephone system. **The Nurse Call / Code Blue System may interface the PA system when specifically approved by VA Headquarters 005OP3B during the project approval process prior to contract bidding.**
- H. The System shall utilize microprocessor components for all signaling and programming circuits and functions. Self contained or on board system program memory shall be non-volatile and protected from erasure from power outages for a minimum of 24 hours.
- I. The System is defined as Emergency Service and the Code Blue functions is defined as Life Safety/Support by NFPA (re Part 1.1.A) and so evaluated by JCAHCO. **Therefore, the system shall have a minimum of two (2) additional remote enunciation points in order to satisfy NFPA’s Life Safety Code 101 where each enunciation point shall fully function independent of the Facility’s PBX.**
  - 1. These two (2) additional remote locations shall be fully manned:

- a. As long as other identified VA Medical / Servicing Facilities are open for servicing patients.
  - b. One (1) global (aka "all call") hard wired zone shall be provided that connects to every system speaker.
2. The System shall allow voice pages to be made within a single zone, across programmed multiple zones or a global page (all zones) by using preset codes entered into the keypad of any telephone instrument attached to the PBX.
- J. The System shall interface with the Facility's existing PAS so that a global page (aka "all call" page) is communicated to the existing PAS and the new System of this project. Arrangements for interconnection of the System and the telephone system(s) shall be coordinated with the owner and the PBX provider.
  - K. The system shall be designed to provide continuous electrical supervision of the complete and entire system (i.e. light bulbs, wires, contact switch connections, master control stations, wall stations, 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 main supervisory panel, nurse control station and all remote amplifier locations.
  - L. When the System is approved to connect to a separate communications system (i.e. LAN, WAN, Telephone, Nurse Call, radio paging, wireless systems, etc) the connection point shall be at one location and shall meet the following minimum requirements for each hard wired connection (note each wireless system connection MUST BE APPROVED PRIOR TO CONTRACT BID BY VA HEADQUARTERS 005OP3B AND 005OP2B):
    1. UL 60950-1/2.
    2. FIPS 142.
    3. FCC Part 15 Listed Radio Equipment is not allowed.
  - M. All passive distribution equipment shall meet or exceed -80 dB radiation shielding (aka RFI) shielding specifications and be provided with screw type audio connectors.
  - N. All equipment face plates utilized in the system shall be stainless steel, anodized aluminum or UL approved cyclocac plastic for the areas where provided.
  - O. All trunk, branch, and interconnecting cables and unused equipment ports or taps shall be terminated with proper terminating resistors designed for RF, audio and digital cable systems without adapters.



- P. Noise filters and surge protectors shall be provided for each equipment interface cabinet, headend cabinet, control console and local and remote amplifier locations to insure protection from input primary AC power surges and to insure noise glitches are not induced into low voltage data circuits.
- Q. Plug-in connectors shall be provided to connect all equipment, except coaxial cables and RF transmission line interface points. Coaxial cable distribution points and RF transmission lines shall use coaxial cable connections recommended by the cable OEM and approved by the system OEM. Base band cable systems shall utilize barrier terminal screw type connectors, at a minimum. As an alternate, crimp type connectors installed with a ratchet type installation tool are acceptable provided the cable dress, pairs, shielding, grounding, connections and labeling are the same as the barrier terminal strip connectors. Tape of any type, wire nuts or solder type connections are unacceptable and will not be approved.
- R. Audio Level Processing: The control equipment shall consist of audio mixer(s), volume limiter(s) and/or compressor(s), and power amplifier(s) to process, adjust, equalize, isolate, filter, and amplify each audio channel for each sub-zone in the system and distribute them into the System's RF interfacing distribution trunks and amplification circuits. It is acceptable to use identified Telephone System cable pairs designated for Two-Way Radio interface and control use or identified as spare telephone cable pairs by the Facility's Telephone System Contractor. The use of telephone cable to distribute RF signals, carrying system or sub-system AC or DC voltage is not acceptable and will not be approved. Additionally, each control location shall be provided with the equipment required to insure the system can produce its designed audio channel capacity at each speaker identified on the contract drawings. The Contractor shall provide: a spare set of telephone paging modules as recommended by the OEM (as a minimum provide one spare module for each installed module); one spare audio power amplifier, one spare audio mixer, one spare audio volume limiter and/or compressor, and one spare audio automatic gain adjusting device, and minimum RF equipment recommended by the OEM.
- S. Contractor is responsible for pricing all accessories and miscellaneous equipment required to form a complete and operating system. Unless otherwise noted in this Part, equipment quantities shall be as indicated on the drawings.

## **2.2 SYSTEM PERFORMANCE:**

- A. At a minimum, each distribution, interconnection, interface, terminating point and TCO shall be capable of supporting the Facility's PA system voice and data service as follows:
  - 1. Shall be compliant with and not degrade the operating parameters of the Public Switched Telephone Network (PSTN) and the Federal Telecommunications System (FTS) at each PSTN and FTS interface, interconnection and terminating locations in the TERS.

2. Audio Input: The signal level of each audio input channel at each input point shall be a MINIMUM of zero decibels measured (dBm), +0.10 dBm across 150 Ohms, balanced.
3. Audio Output: The audio signal level at each speaker shall be a MINIMUM of +0.25 Watt (W) and a maximum of +20 W, 600 Ohms balanced impedance, on a 70.7 V audio distribution line Contractor to determine and set each speaker's proper audio signal level (top) based on speaker location and the ambient noise level in speaker coverage area.
4. The system shall meet the following MINIMUM parameters at each speaker:
  - a. Cross Modulation: -46 dB
  - b. Hum Modulation: -55 dB
  - c. Isolation (outlet-outlet): 24 dB
  - d. Impedance:
    - 1) Distribution: 600 Ohm balanced @ 70.7 V audio line level.
    - 2) Speaker: Selectable, as required.
  - e. Audio Gain: 10 dB minimum @ mid-range measured with a sound pressure level meter (SPL)
  - f. Signal to noise (S/N) ratio: 35 dB, minimum
- B. Audio Level Processing: The head-end equipment shall consist of audio mixer(s), volume limiter(s) and/or compressor(s), and power amplifier(s) to process, adjust, equalize, isolate, filter, and amplify each audio channel for each zone or sub-zone in the system and distribute them into the system's distribution trunks. It is acceptable to use identified telephone system cable pairs designated for PA use or identified as spare telephone cable pairs by the Facility's Telephone System Contractor.
  1. THE USE OF TELEPHONE CABLE TO DISTRIBUTE PA SIGNALS CARRYING AC OR DC VOLTAGE IS NOT ACCEPTABLE AND WILL NOT BE APPROVED.
  2. Additionally, each remote location shall be provided with the equipment required to ensure the system supervision and designed audio channel capacity at each speaker identified on the contract drawings.

### **2.3 MANUFACTURERS**

- A. The products specified shall be new, FCC and UL Listed, labeled and produced by OEM of record. An OEM of record shall be defined as a company whose main occupation is the manufacture for sale of the items of equipment supplied and which:
  1. Maintains a stock of replacement parts for the item submitted,
  2. Maintains engineering drawings, specifications, and operating manuals for the items submitted, and

3. Has published and distributed descriptive literature and equipment specifications on the items of equipment submitted at least 30 days prior to the Invitation for Bid (IFB).
- B. Specifications contained herein as set forth in this document detail the salient operating and performance characteristics of equipment in order for VA to distinguish acceptable items of equipment from unacceptable items of equipment. When an item of equipment is offered or furnished for which there is a specification contained herein, the item of equipment offered or furnished shall meet or exceed the specification for that item of equipment.
- C. Equipment Standards and Testing:
1. The System has been defined herein as connected to systems identified as an Emergency performing Public Safety Support Functions. Therefore, at a minimum, the system shall conform to all aforementioned National and/or Local Public and Life Safety Codes (which ever are the more stringent), NFPA, NEC, this specification, JCAHCO Life Safety Accreditation requirements, and the OEM recommendations, instructions, and guidelines.
  2. All supplies and materials shall be listed, labeled or certified by UL or a nationally recognized testing laboratory (NRTL) where such standards have been established for the supplies, materials or equipment.
  3. The provided equipment required by the System design and approved technical submittal must conform with each UL standard in effect for the equipment, as of the date of the technical submittal (or the date when the RE approved system equipment necessary to be replaced) was technically reviewed and approved by VA. Where a UL standard is in existence for equipment to be used in completion of this contract, the equipment must bear the approved UL seal.
  4. Each item of electronic equipment to be provided under this contract must bear the approved UL seal or the seal of the testing laboratory that warrants the equipment has been tested in accordance with, and conforms to the specified standards. The placement of the UL Seal shall be a permanent part of the electronic equipment that is not capable of being transportable from one equipment item to another.

## **2.4 PRODUCTS**

- A. General.
1. Contractor is responsible for pricing all accessories and miscellaneous equipment required to form a complete and operating system. The equipment quantities provided herein shall be as indicated on the drawings with the exception of the indicated spare equipment.
  2. Maintain a neat and orderly system of equipment, wire, cable and conduit connections and routing.
  3. Contractor Furnished Equipment List (CFEs):

- a. The Contractor is required to provide a list of the CFE equipment to be furnished. The quantity, make and model number of each item is required. Select the required equipment items quantities that will satisfy the needs of the system as described herein and with the OEM's concurrence applied to the list(s), in writing.
- b. The following equipment items are the minimum requirements of VA to provide an acceptable system described herein:

<u>Item</u>	<u>items.</u>	<u>Quantity</u>	<u>Unit</u>
1.	//As required//		Interface Panel(s)
1.a	//As required//		Electrical Supervision
			Trouble Enunciator
1.a.1.	//As required//		Equipment Back Box(s)
1.a.2.	//As required//		Telephone Access Equipment
1.a.3.	//As required//		Radio Paging Access Equipment
1.a.3.a.	//As required//		Radio Pager Equipment
1.a.4.	//As required//		Wireless Access Equipment
1.a.5.	//As required//		Personal Communicator
			Equipment
2.	//As required//		Lightning Arrestor
3.	//As required//		Head End Equipment Locations
3.a	//As required//		Cabinet(s)
3.a.1.	//As required//		AC Power Conditioner & Filter
3.a.2.	//As required//		AC Power Strip
3.a.3.	//As required//		UPS
3.a.3.a	//As required//		Main Power Amplifiers
3.a.3.b	//As required//		Remote Power Amplifiers
3.a.3.c	//As required//		Distributed Amplifiers (When Approved)
3.a.4.	//As required//		Interconnecting wire Cable(s)
3.a.4.a	//As required//		Wire Cable Connector(s)
3.a.4.b	//As required//		Wire Cable Terminator(s)
3.a.4.c	//As required//		Wire Management System
3.b.	//As required//		Head End Function(s)
4.	//As required//		Distribution System(s)
4.a	//As required//		Equipment Back Box(s)
4.a.1.	//As required//		Speakers
4.a.1.a	//As required//		Overhead
4.a.1.b	//As required//		Horn
4.a.1.c	//As required//		Outside
4.a.1.d	//As required//		Speaker w/ Microphone
5.	2 (MIN)		Remote Station(s)
5.a.	//As required//		Spare Items
6.	//As required//		Mental Health Unit
6.a.	//As required//		Interface Panel(s)
6.b.	//As required//		Electrical Supervision
			Trouble Enunciator
6.c.	//As required//		Equipment Back Box(s)
6.d.	//As required//		Telephone Access Equipment
6.e.	//As required//		Radio Paging Access Equipment

6.e.1.	//As required//	Radio Pager Equipment
6.f.	//As required//	Wireless Access Equipment
6.g.	//As required//	Personal Communicator Equipment
6.h.	//As required//	Lightning Arrestor
6.i.	//As required//	Head End Equipment Location(s) Cabinets
6.i.1.	//As required//	AC Power Conditioner & Filter
6.i.2.	//As required//	AC Power Strip
6.i.3.	//As required//	UPS
6.i.4.	//As required//	Main Power Amplifiers
6.i.5.	//As required//	Remote Power Amplifiers
6.j.	//As required//	Distributed Amplifiers (When Approved)
6.k.	//As required//	Interconnecting Wire Cable(s) Wire Cable Connector(s) Wire Cable Terminator(s) Wire Management System
6.l.	//As required//	Head End Function(s) Distribution System(s) Equipment Back Box(S) Speakers Overhead Horn Outside Speaker w/ Microphone Remote Station(s) Spare Items
6.l.1.	//As required//	
6.l.2.	//As required//	
6.l.3.	//As required//	
6.m.	//As required//	
6.n.	//As required//	
6.n.1	//As required//	
6.n.2	//As required//	
6.n.2(a)	//As required//	
6.n.2(b)	//As required//	
6.n.2(c)	//As required//	
6.n.2(d)	//As required//	
6.o	2 (MIN)	
6.p.	//As required//	
<b>7.</b>	<b>//As required//</b>	<b>Blind Rehabilitation Unit//</b>
<b>7.a</b>	<b>//As required//</b>	<b>Interface Panel(s)</b>
<b>7.b</b>	<b>//As required//</b>	<b>Electrical Supervision Trouble Enunciator Equipment Back Box(s)</b>
<b>7.c</b>	<b>//As required//</b>	<b>Telephone Access Equipment</b>
<b>7.d.</b>	<b>//As required//</b>	<b>Radio Paging Access Equipment</b>
<b>7.e.</b>	<b>//As required//</b>	<b>Radio Pager Equipment</b>
<b>7.e.1.</b>	<b>//As required//</b>	<b>Wireless Access Equipment</b>
<b>7.f.</b>	<b>//As required//</b>	<b>Personal Communicator Equipment</b>
<b>7.g.</b>	<b>//As required//</b>	<b>Lightning Arrestor Head End Equipment Location(s) Cabinets</b>
<b>7.h.</b>	<b>//As required//</b>	<b>AC Power Conditioner &amp; Filter</b>
<b>7.i.</b>	<b>//As required//</b>	<b>AC Power Strip</b>
<b>7.i.1.</b>	<b>//As required//</b>	<b>UPS</b>
<b>7.i.2.</b>	<b>//As required//</b>	<b>Main Power Amplifiers</b>
<b>7.i.3.</b>	<b>//As required//</b>	<b>Remote Power Amplifiers</b>
<b>7.i.4.</b>	<b>//As required//</b>	
<b>7.i.5.</b>	<b>//As required//</b>	
<b>7.j.</b>	<b>//As required//</b>	
<b>7.k.</b>	<b>//As required//</b>	<b>Distributed Amplifiers (When Approved)</b>
<b>7.l.</b>	<b>//As required//</b>	<b>Interconnecting Wire Cable(s)</b>

7.l.1.	//As required//	Wire Cable Connector(s)
7.l.2.	//As required//	Wire Cable Terminator(s)
7.l.3.	//As required//	Wire Management System
7.k.	//As required//	Head End Function(s)
7.m.	//As required//	Distribution System(s)
7.m.1.	//As required//	Equipment Back Box(s)
7.m.2.	//As required//	Speakers
7.m.2(a)	//As required//	Overhead
7.m.2(b)	//As required//	Horn
7.m.2(c)	//As required//	Outside
7.m.2(d)	//As required//	Speaker w/ Microphone
7.n.	2 (MIN)	Remote Station(s)
7.o.	//As required//	Spare Items
//8.	//As required//	Oncology, Radiology, Dialysis, Units (These units are treated the same as Blind Rehabilitation Unit EXCEPT it does contains a CODE BLUE Function. If these units are provided as a part of the project, AT A MINIMUM – DUPLI-CATE THE BLINE REHABILITATION UNIT'S EQUIPMETN LISTE AND EDIT AND RENUMBER ACCORD-INGLY)//

**B. TIP DISTRIBUTION SYSTEM:**

**1. System Speakers:**

**a. Ceiling Cone-Type:**

- 1) Minimum Axial Sensitivity: 91 dB at one meter, with 1-W input.
- 2) Frequency Response: Within plus or minus 3 dB from 70 to 15,000 Hz.
- 3) Minimum Dispersion Angle: 100 degrees.
- 4) Line Transformer: Maximum insertion loss of 0.5 dB, power rating equal to speaker's, and at least four level taps.
- 5) Enclosures: Steel housings or back boxes, acoustically dampened, with front face of at least 0.0478-inch steel and whole assembly rust proofed and factory primed; complete with mounting assembly and suitable for surface ceiling, flush ceiling, pendant or wall mounting; with relief of back pressure.
- 6) Baffle: For flush speakers, minimum thickness of 0.032-inch aluminum with textured white finish. Completely fill the baffle with fiberglass.
- 7) Vandal-Proof, High-Strength Baffle: For flush-mounted speakers, self-aging cast aluminum with tensile strength of 44,000 psi, 0.025-inch minimum thickness; countersunk heat-treated alloy mounting screws; and textured white epoxy finish.
- 8) Size: 8 inches with 1-inch voice coil and minimum 5-oz. ceramic magnet.

- 9) Have a minimum of two (2) safety wires installed to a solid surface or use a flexible conduit from ceiling / wall back box to the speaker back box.
  - 10) The speakers and mounting shall be self contained and wall mounted with flush back box at a minimum of 10 meter intervals and shall match (or contrast with, at the direction of the RE) the color of the adjacent surfaces.
  - 11) Provide one spare speaker, mount, and back box for each 50 speakers or portion thereof.
- b. System Cables: In addition to the TIP provided under Specification Section 27 15 00 – TIP Horizontal and Vertical Communications Cabling, provide the following additional TIP installation and testing requirements, provide the following minimum System TIP cables & interconnections:
- 1) Line Level Audio and Microphone Cable:
    - a) Line level audio and microphone cable for inside racks and conduit.
    - b) Shielded, twisted pair Minimum 22 American Wire Gauge (AWG), stranded conductors and 24 AWG drain wire with overall jacket.
  - 2) Speaker Level (Audio 70.7Volt [V]) Cable, Riser Rated:
    - a) For use with 70.7 V audio speaker circuits.
    - b) 18 AWG stranded pair, minimum.
    - c) UL-1333 listed.
  - 3) Speaker Level Audio Cable, Plenum Rated (70.7V):
    - a) For use with 70.7 V audio speaker circuits.
    - b) 18 AWG stranded pair, minimum.
  - 4) All cabling shall be riser **//plenum//** rated.
  - 5) Provide one (1) spare 1,000 foot roll of approved System (not microphone) cable only.
2. Raceways, Back Boxes and conduit:
- a. Raceways:
    - 1) In addition to the Raceways, Equipment Room Fittings provided under Specification Sections 27 15 00 TIP Communication Room Fittings and 27 15 00 – TIP Communications Horizontal and Vertical Cabling, provide the following additional TIP raceway and fittings:
      - 2) Each raceway that is open top, shall be: UL certified for telecommunications systems, partitioned with metal partitions in order to comply with NEC Parts 517 & 800 to “mechanically separate telecommunications systems of different service, protect the

installed cables from falling out when vertically mounted and allow junction boxes to be attached to the side to interface "drop" type conduit cable feeds.

- 3) Intercommunication System cable infrastructure: EMT or in J-hooks above accessible ceilings, 24 inches on center.
  - 4) Junction boxes shall be not less than 2-1/2 inches deep and 6 inches wide by 6 inches long.
  - 5) Flexible metal conduit is prohibited unless specifically approved by 005OP3B.
- b. System Conduit:
- 1) The PA system is NFPA listed as Emergency / Public Safety Communication System which requires the entire system to be installed in a separate conduit system.
  - 2) The use of centralized mechanically partitioned wireways may be used to augment main distribution conduit on a case by case basis when specifically approved by VA Headquarters (005OP3B).
  - 3) Conduit Sleeves:
    - a) The AE has made a good effort to identify where conduit sleeves through full-height and fire rated walls on the drawings, and has instructed the electrician to provide the sleeves as shown on the drawings.
    - b) While the sleeves shown on the drawings will be provided by others, the contractor is responsible for installing conduit sleeves and fire-proofing where necessary. It is often the case, that due to field conditions, the nurse-call cable may have to be installed through an alternate route. Any conduit sleeves required due to field conditions or those omitted by the engineer shall be provided by the cabling contractor.
3. Device Back Boxes:
- a. Furnish to the electrical contractor all back boxes required for the PA system devices.
  - b. The electrical contractor shall install the back boxes as well as the system conduit.  
Coordinate the delivery of the back boxes with the construction schedule.
4. Telecommunication Outlets (TCO): Populate each TCO that is required to perform system operations in the locations that were provided and cabled as a part of Specifications Sections 27 11 00 and 27 15 00. Provide additional TCO equipment, interfaces and connections as required by System design. Provide secured pathway(s) and TCOs as required.
- E. Installation Kit:
1. General: The kit shall be provided that, at a minimum, includes all connectors and terminals, labeling systems, audio spade lugs, barrier strips, punch blocks or wire wrap terminals, heat shrink tubing, cable ties, solder, hangers, clamps, bolts, conduit, etc., required to accomplish



- a neat and secure installation. All wires shall terminate in a spade lug and barrier strip, wire wrap terminal or punch block. Unfinished or unlabeled wire connections shall not be allowed.
2. System Grounding:
    - a. The grounding kit shall include all cable and installation hardware required. All radio equipment shall be connected to earth ground via internal building wiring, according to the NEC.
    - b. This includes, but is not limited to:
      - 1) Coaxial Cable Shields.
      - 2) Control Cable Shields.
      - 3) Data Cable Shields.
      - 4) Equipment Racks.
      - 5) Equipment Cabinets.
      - 6) Conduits.
      - 7) Duct.
      - 8) Cable Trays.
      - 9) Power Panels.
      - 10) Connector Panels.
      - 11) Grounding Blocks.
  3. Wire and Cable: The wire and cable kit shall include all connectors and terminals, audio spade lugs, barrier straps, punch blocks, wire wrap strips, heat shrink tubing, tie wraps, solder, hangers, clamps, labels etc., required to accomplish a neat and orderly installation.
  4. Conduit, Cable Duct, and Cable Tray: The kit shall include all conduit, duct, trays, junction boxes, back boxes, cover plates, feed through nipples, hangers, clamps, other hardware required to accomplish a neat and secure conduit, cable duct, and/or cable tray installation in accordance with the NEC and this document.
  5. Labels: The labeling kit shall include any item or quantity of labels, tools, stencils, and materials needed to completely and correctly label each subsystem according to the OEM requirements, as-installed drawings, and this document.

## **PART 3 - EXECUTION**

### **3.1 PROJECT MANAGEMENT**

- A. Assign a single project manager to this project who will serve as the point of contact for the Owner, the General Contractor, and the Engineer.

- B. The Contractor shall be proactive in scheduling work at the hospital, specifically the Contractor will initiate and maintain discussion with the general contractor regarding the schedule for ceiling cover up and install cables to meet that schedule.
- C. Contact the Office of Telecommunications, Special Communications Team (005OP3B) at (301) 734-0350 to have a VA Certified Telecommunications COR assigned to the project for telecommunications review, equipment and system approval and co-ordination with VA's Spectrum Management and OCIS Teams.

### 3.2 COORDINATION WITH OTHER TRADES

- A. Coordinate with the cabling contractor the location of the PA system faceplate and the faceplate opening for the PA system back boxes.
- B. Coordinate with the cabling contractor the location of TIP equipment in the **TER, TCR, PA, PCR, SCC, ECR, STRs, NSs, HER and TCOs in order to connect to the TIP cable network that was installed as a part of Section Specification 27 11 00. Contact the RE immediately, in writing, if additional location(s) are discovered to be activated that was not previously provided.**
- C. Before beginning work, verify the location, quantity, size and access for the following:
  - 1. Isolated ground AC power circuits provided for systems.
  - 2. Junction boxes, wall boxes, wire troughs, conduit stubs and other related infrastructure for the systems.
  - 3. System components installed by others.
  - 4. Overhead supports and rigging hardware installed by others.
- D. Immediately notify the Owner, GC and Consultant(s) in writing of any discrepancies

### 3.3 NEEDS ASSESSMENT

Provide a one-on-one meeting with the particular manager of each unit affected by the installation of the new PA system. Review the floor plan drawing, educate the nursing manager with the functions of the equipment that is being provided and gather details specific to the individual units; coverage and priorities of calls; staffing patterns; and other pertinent details that will affect system programming and training.

### 3.4 INSTALLATION

- A. General
  - 1. Execute work in accordance with National, State and local codes, regulations and ordinances.
  - 2. 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.
3. 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.
  4. Secure equipment firmly in place, including receptacles, speakers, system cables, etc.
    - a. All supports, mounts, fasteners, attachments and attachment points shall support their loads with a safety factor of at least 5:1.
    - b. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems.
    - c. Any suspended equipment or associated hardware must be certified by the OEM for overhead suspension.
    - d. The Contractor is responsible for means and methods in the design, fabrication, installation and certification of any supports, mounts, fasteners and attachments.
  5. Locate overhead ceiling-mounted loudspeakers as shown on drawings, with minor changes not to exceed 12" in any direction.
    - a. Mount transformers securely to speaker brackets or enclosures using screws. Adjust torsion springs as needed to securely support speaker assembly.
    - b. Speaker back boxes shall be completely filled with fiberglass insulation.
    - c. Seal cone speakers to their enclosures to prevent air passing from one side of the speaker to the other.
  6. Finishes for any exposed work such as plates, racks, panels, speakers, etc. shall be approved by the Architect, Owner and 005OP3B.
  7. Coordinate cover plates 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.
  8. 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.
  9. Color code all distribution wiring to conform to the PA 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.

10. Connect the System's primary input AC power to the Facility' Critical Branch of the Emergency AC power distribution system as shown on the plans or if not shown on the plans consult with RE regarding a suitable circuit location prior to bidding.

11. Product Delivery, Storage and Handling:

- a. 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.
- b. Storage and Handling: Store and protect equipment in a manner, which will preclude damage as directed by the RE.

B. Wiring Practice - in addition to the MANDATORY infrastructure requirements outlined in VA Construction Specifications 27 10 00 – TIP Structured Communications Cabling, 27 11 00 – TIP Communications Rooms Fittings and 27 15 00 – TIP Horizontal and Vertical Communicators Cabling, the following additional practices shall be adhered to:

1. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
2. Execute all wiring in strict adherence to the National Electrical Code, applicable local building codes and standard industry practices.
3. Wiring shall be classified according to the following low voltage signal types:
  - a. Balanced microphone level audio (below -20dBm) or Balanced line level audio (-20dBm to +30dBm)
  - b. 70V audio speaker level audio.
  - c. Low voltage DC control or power (less than 48VDC)
4. Where raceway is to be EMT (conduit), wiring of differing classifications shall be run in separate conduit. Where raceway is to be an enclosure (rack, tray, wire trough, utility box) wiring of differing classifications which share the same enclosure shall be mechanically partitioned and separated by at least four (4) inches. Where Wiring of differing classifications must cross, they shall cross perpendicular to one another.
5. 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.
6. 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.
7. 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.
8. Use wire pulling lubricants and pulling tensions as recommended by the OEM.

9. Use grommets around cut-outs and knock-outs where conduit or chase nipples are not installed.
10. Do not use tape-based or glue-based cable anchors.
11. Ground shields and drain wires to the Facility's signal ground system as indicated by the drawings.
12. Field wiring entering equipment racks shall be terminated as follows:
  - a. Provide ample 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.
  - b. 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.
  - c. If specified terminal blocks are not designed for rack mounting, utilize  $\frac{3}{4}$ " plywood or  $\frac{1}{8}$ " thick aluminum plates/blank panels as a mounting surface. Do not mount on the bottom of the rack.
  - d. Employ permanent strain relief for any cable with an outside diameter of 1" or greater.
13. Use only balanced audio circuits unless noted otherwise
14. Make all connections as follows:
  - a. Make all connections using rosin-core solder or mechanical connectors appropriate to the application.
  - b. For crimp-type connections, use only tools that are specified by the manufacturer for the application.
  - c. 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.
  - d. Wire nuts, electrical tape or "Scotch Lock" connections are not acceptable for any application.
15. Make all connections as follows:
  - a. Make all connections using rosin-core solder or mechanical connectors appropriate to the application.
  - b. For crimp-type connections, use only tools that are specified by the manufacturer for the application.
  - c. 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.
  - d. Wire nuts, electrical tape or "Scotch Lock" connections are not acceptable for any application.

16. Wires or cables **previously approved** to be installed outside of conduit, cable trays, wireways, cable duct, etc:

- a. Only when specifically authorized as described herein, will wires or cables be identified and approved to be installed outside of conduit. The wire or cable runs shall be UL rated plenum and OEM certified for use in air plenums.
  - b. Wires and cables shall be hidden, protected, fastened and tied at 600 mm (24 in.) intervals, maximum, as described herein to building structure.
  - c. Closer wire or cable fastening intervals may be required to prevent sagging, maintain clearance above suspended ceilings, remove unsightly wiring and cabling from view and discourage tampering and vandalism. Wire or cable runs, not provided in conduit, that penetrate two hour fire barriers shall be sleeved and sealed with an approved fire retardant sealant.
  - d. Wire or cable runs to system components installed in walls (i.e.: volume attenuators, circuit controllers, signal, or data outlets, etc.) may, when specifically authorized by the RE, be fished through hollow spaces in walls and shall be certified for use in air plenum areas.
  - e. Completely test all of the cables after installation and replace any defective cables.
- C. Cable Installation - In addition to the **MANDATORY** infrastructure requirements outlined in VA Construction Specifications 27 10 00 – Structured TIP Communications Cabling, 27 11 00 – TIP Communications Rooms and Fittings and 27 15 00 – TIP Communications Horizontal and Vertical Cabling and the following additional practices shall be adhered to:
1. Support cable on maximum 2'-0" centers. Acceptable means of cable support are cable tray, j-hooks, and bridal rings. Velcro wrap cable bundles loosely to the means of support with plenum rated Velcro straps. Plastic tie wraps are not acceptable as a means to bundle cables.
  2. Run cables parallel to walls.
  3. Install maximum of 10 cables in a single row of J-hooks. Provide necessary rows of J-hooks as required by the number of cables.
  4. 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.
  5. 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.

6. Ends of cables shall be properly terminated on both ends per industry and OEM's recommendations.
7. Provide proper temporary protection of cable after pulling is complete before final dressing and terminations are complete. Do not leave cable lying on floor. Bundle and tie wrap up off of the floor until you are ready to terminate.
8. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
9. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
10. Bundle, lace, and train conductors to terminal points without exceeding OEM's limitations on bending radii. Install lacing bars and distribution spools.
11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.
12. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.
13. Separation of Wires: (REFER TO RACEWAY INSTALLATION) Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.
14. Serve all cables as follows:
  - a. Cover the end of the overall jacket with a 1" (minimum) length of transparent heat-shrink tubing. Cut unused insulated conductors 2" (minimum) past the heat-shrink, fold back over jacket and secure with cable-tie. Cut unused shield/drain wires 2" (minimum) past the Heatshrink and serve as indicated below.
  - b. Cover shield/drain wires with heat-shrink tubing extending back to the overall jacket. Extend tubing ¼" past the end of unused wires, fold back over jacket and secure with cable tie.
  - c. For each solder-type connection, cover the bare wire and solder connection with heat-shrink tubing.
- D. Labeling: Provide labeling in accordance with ANSI/EIA/TIA-606-A. All lettering for PA circuits shall be stenciled using laser printer thermal ink transfer process.
  1. Cable and Wires (Hereinafter referred to as "Cable"): Cables shall be labeled at both ends in accordance with ANSI/EIA/TIA-606-A. Labels shall be permanent in contrasting colors. Cables shall be identified according to the System "Record Wiring Diagrams."

2. Equipment: System equipment shall be permanently labeled with contrasting plastic laminate or Bakelite material. System equipment shall be labeled on the face of the unit corresponding to its source.
    - a. Clearly, consistently, logically and permanently mark switches, connectors, jacks, relays, receptacles and electronic and other equipment.
  3. Conduit, Cable Duct, and/or Cable Tray: The Contractor shall label all conduit, duct and tray, including utilized GFE, with permanent marking devices or spray painted stenciling a minimum of 3 meters (10 ft.) identifying it as the System. In addition, each enclosure shall be labeled according to this standard.
  4. Termination Hardware: The Contractor shall label TCOs and patch panel connections using color coded labels with identifiers in accordance with ANSI/EIA/TIA-606-A and the "Record Wiring Diagrams."
  5. Where multiple pieces of equipment reside in the same rack group, clearly and logically label each indicating to which room, channel, receptacle location, etc. they correspond.
  6. Permanently label cables at each end, including intra-rack connections. Labels shall be covered by the same, transparent heat-shrink tubing covering the end of the overall jacket. Alternatively, computer generated labels of the type which include a clear protective wrap may be used.
  7. Contractor's name shall appear no more than once on each continuous set of racks. The Contractor's name shall not appear on wall plates or portable equipment.
  8. Ensure each OEM supplied item of equipment has appropriate UL Labels / Marks for the service the equipment is performed permanently attached / marked. **SYSTEM EQUIPMENT INSTALLED NOT BEARING THESE UL MARKS WILL NOT BE ALLOWED TO BE A PART OF THE SYSTEM. THE CONTRACTOR SHALL BEAR ALL COSTS REQUIRED TO PROVIDE REPLACEMENT EQUIPMENT WITH APPROVED UL MARKS.**
- E. Conduit and Signal Ducts: When the Contractor and/or OEM determines additional system conduits and/or signal ducts are required in order to meet the system minimum performance standards outlined herein, the contractor shall provide these items as follows:
1. Conduit:
    - a. The Contractor shall employ the latest installation practices and materials. The Contractor shall provide conduit, junction boxes, connectors, sleeves, and associated sealing materials not specifically identified in this document as GFE. Conduit penetrations of walls, ceilings, floors, interstitial space, fire barriers, etc., shall be sleeved and sealed.
    - b. All cables shall be installed in separate conduit and/or signal ducts (exception from the separate conduit requirement to allow PA cables to be installed in partitioned cable tray



with voice cables may be granted in writing by the RE if requested). Conduits shall be provided in accordance with Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS, and NEC Articles 517 for Critical Care and 800 for Communications systems, at a minimum.

### **3.5 PROTECTION OF NETWORK DEVICES**

Contractor shall protect network devices during unpacking and installation by wearing manufacturer approved electrostatic discharge (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.

### **3.6 CUTTING, 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 be responsible for providing any additional cutting, drilling, fitting or patching required that is not indicated as provided by others to complete the Work or to make its parts fit together properly.
- D. The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate Contractor the Contractor's consent to cutting or otherwise altering the Work.
- E. Where coring of existing (previously installed) concrete is specified or required, including coring indicated under unit prices, the location of such coring shall be clearly identified in the field and the location shall be approved by the Project Manager prior to commencement of coring work.

### **3.7 FIREPROOFING**

- A. Where PA wires, cables and conduit penetrate fire rated walls, floors and ceilings, fireproof the opening.
- B. Provide conduit sleeves (if not already provided by electrical contractor) for cables that penetrate fire rated walls and Telecommunications Rooms floors and ceilings. After the cabling installation is complete, install fire proofing material in and around all conduit sleeves and openings. Install fire proofing material thoroughly and neatly. Seal all floor and ceiling penetrations.

- C. Use only materials and methods that preserve the integrity of the fire stopping system and its rating.
- D. Install fireproofing where low voltage cables are installed in the same manholes with high voltage cables; also cover the low voltage cables with arc proof and fireproof tape.
- E. Use approved fireproofing tape of the same type as used for the high voltage cables, and apply the tape in a single layer, one-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 (one inch) into each duct.
- F. Secure the tape in place by a random wrap of glass cloth tape.

### **3.8 GROUNDING**

- A. Ground PA cable shields and equipment to eliminate shock hazard and to minimize ground loops, commonmode returns, noise pickup, cross talk, and other impairments as specified in CFM Division 27, Section 27 05 26 – Grounding and Bonding for Communications Systems.
- B. Facility Signal Ground Terminal: Locate at main room or area signal ground within the room (i.e. head end and telecommunications rooms) or area(s) and indicate each signal ground location on the drawings.
- C. Extend the signal ground to inside each equipment cabinet and/or rack. Ensure each cabinet and/or rack installed item of equipment is connected to the extended signal ground. Isolate the signal ground from power and major equipment grounding systems.
- D. When required, install grounding electrodes as specified in CFM Division 26, Section 26 05 26 – Grounding and Bonding for Electrical Systems.
- E. Do not use “3<sup>rd</sup> or 4<sup>th</sup>” wire internal electrical system conductors for communications signal ground.
- F. Do not connect the signal ground to the building’s external lightning protection system.
- G. Do Not “mix grounds” of different systems.
- H. Insure grounds of different systems are installed as to not violate OSHA Safety and NEC installation requirements for protection of personnel.

## **PART 4 – TESTING / GUARANTY / TRAINING**

### **4.0 SYSTEM LISTING**

The PA System is NFPA listed as an “Emergency / Public Safety” Communications system. Where Code Blue signals are transmitted, that listing is elevated to “Life Support/Safety.” Therefore, the following testing and guaranty provisions are the minimum to be performed and provided by the contractor and OEM.

### **4.1 PROOF OF PERFORMANCE TESTING**

- A. Intermediate Testing:

1. After completion of 25 – 30% the installation of a head end cabinet(s) and equipment, one microphone console, local and remote enunciation stations, two (2) zones, two (2) sub zones prior to any further work, this portion of the system must be pretested, inspected, and certified. Each item of installed equipment shall be checked to ensure appropriate UL Listing and Certification Labels are affixed as required by NFPA -Life Safety Code 101-3.2 (a) & (b) and JCHCO evaluation guidelines, and proper installation practices are followed. The intermediate test shall include a full operational test.
2. All inspections and tests shall be conducted by an OEM-certified contractor representative and witnessed by TVE-005OP3B if there is no local Government Representative that processes OEM and VA approved Credentials to inspect and certify the system. The results of the inspection will be officially recorded by the Government Representative and maintained on file by the RE, until completion of the entire project. The results will be compared to the Acceptance Test results. An identical inspection may be conducted between the 65 - 75% of the system construction phase, at the direction of the RE.

B. Pretesting:

1. Upon completing installation of the PA System, the Contractor shall align, balance, and completely pretest the entire system under full operating conditions.
2. Pretesting Procedure:
  - a. During the System Pretest the Contractor shall verify (utilizing approved test equipment) that the System is fully operational and meets all the System performance requirements of this standard.
  - b. The Contractor shall pretest and verify that all PA System functions and specification requirements are met and operational, no unwanted aural effects, such as signal distortion, noise pulses, glitches, audio hum, poling noise, etc. are present. At a minimum, each of the following locations shall be fully pretested:
    - 1) Central Control Cabinets.
    - 2) Local Control Stations.
    - 3) Zone Equipment/Systems.
    - 4) Sub-Zone Equipment/Systems.
    - 5) Remote Control Panels.
      - a.)TCR.
      - b.)PCR/SCC.
      - c.)ECR.
    - 6) All Networked locations.
    - 7) System interface locations (i.e. TELCO, two way radio, etc.).

- 8) System trouble reporting.
- 9) System Electrical Supervision.
- 10) UPS operation.
- 11) STRs.
- 12) NSs
- 13) TCOs.

3. The Contractor shall provide four (4) copies of the recorded system pretest measurements and the written certification that the System is ready for the formal acceptance test shall be submitted to the RE.

C. Acceptance Test:

1. After the PA System has been pretested and the Contractor has submitted the pretest results and certification to the RE, then the Contractor shall schedule an acceptance test date and give the RE 30 day's written notice prior to the date the acceptance test is expected to begin. The System shall be tested in the presence of TVE 005OP3B and an OEM certified representatives. The System shall be tested utilizing the approved test equipment to certify proof of performance and Emergency / Public Safety compliance. The tests shall verify that the total System meets all the requirements of this specification. The notification of the acceptance test shall include the expected length (in time) of the test.
2. The acceptance test shall be performed on a "go-no-go" basis. Only those operator adjustments required to show proof of performance shall be allowed. The test shall demonstrate and verify that the installed System does comply with all requirements of this specification under operating conditions. The System shall be rated as either acceptable or unacceptable at the conclusion of the test. Failure of any part of the System that precludes completion of system testing, and which cannot be repaired in four (4) hours, shall be cause for terminating the acceptance test of the System. Repeated failures that result in a cumulative time of eight (8) hours to affect repairs shall cause the entire System to be declared unacceptable. Retesting of the entire System shall be rescheduled at the convenience of the Government.
3. Retesting of the entire System shall be rescheduled at the convenience of the Government and costs borne by the Contractor at the direction of the SRE.

D. Acceptance Test Procedure:

1. Physical and Mechanical Inspection:
  - a. The TVE 005OP3B Representative will tour all areas where the PA system and all sub-systems are completely and properly installed to insure they are operationally ready for proof of performance testing. A system inventory including available spare parts will be

taken at this time. Each item of installed equipment shall be checked to ensure appropriate UL certification labels are affixed.

- b. The System diagrams, record drawings, equipment manuals, TIP Auto CAD Disks, intermediate, and pretest results shall be formally inventoried and reviewed.
  - c. Failure of the System to meet the installation requirements of this specification shall be grounds for terminating all testing.
2. Operational Test:
- a. After the Physical and Mechanical Inspection, the system head end equipment shall be checked to verify that it meets all performance requirements outlined herein. A spectrum analyzer and sound level meter may be utilized to accomplish this requirement.
  - b. Following the head end equipment test, each speaker (or on board speaker) shall be inspected to ensure there are no signal distortions such as intermodulation, data noise, popping sounds, erratic system functions, on any function.
  - c. The distribution system shall be checked at each interface, junction, and distribution point, first, middle, and last speaker in each leg to verify the PA distribution system meets all system performance standards.
  - d. If the RED system is a part of the system, each volume stepper switches shall be checked to insure proper operation of the pillow speaker, the volume stepper and the RED system (if installed).
  - e. Additionally, each installed head end equipment, microphone console; amplifier, mixer, distributed speaker/amplifier, monitor speaker, telephone interface, power supply and remote amplifiers shall be checked insuring they meet the requirements of this specification.
  - f. Once these tests have been completed, each installed sub-system function shall be tested as a unified, functioning and fully operating system. The typical functions are: "all call," three sub-zoned, minimum of 15 minutes of UPS operation, electrical supervision, trouble panel, corridor speakers and audio paging.
  - h. Individual Item Test: The TVE 005OP3B Representative will select individual items of equipment for detailed proof of performance testing until 100% of the System has been tested and found to meet the contents of this specification. Each item shall meet or exceed the minimum requirements of this document.
3. Test Conclusion:
- a. At the conclusion of the Acceptance Test, using the generated punch list (or discrepancy list) the VA and the Contractor shall jointly agree to the results of the test, and reschedule

testing on deficiencies and shortages with the RE. Any retesting to comply with these specifications will be done at the Contractor's expense.

- b. If the System is declared unacceptable without conditions, all rescheduled testing expenses will be borne by the Contractor.
- E. Acceptable Test Equipment: The test equipment shall furnished by the Contractor shall have a calibration tag of an acceptable calibration service dated not more than 12 months prior to the test. As part of the submittal, a test equipment list shall be furnished that includes the make and model number of the following type of equipment as a minimum:
  - 1. Spectrum Analyzer.
  - 2. Signal Level Meter.
  - 3. Volt-Ohm Meter.
  - 4. Sound Pressure Level (SPL) Meter.
  - 5. Oscilloscope.
  - 6. Random Noise Generator.
  - 7. Audio Amplifier with External Speaker.

#### 4.2 WARRANTY

- A. Comply with FAR 52.246-21, except that warranty shall be as follows:
- B. Contractor's Responsibility:
  - 1. The Contractor shall warranty that all provided material and equipment will be free from defects, workmanship and will remain so for a period of two (2) years from date of final acceptance of the System by the VA. The Contractor shall provide OEM's equipment warranty documents, to the RE (or Facility Contracting Officer if the Facility has taken possession of the building), that certifies each item of equipment installed conforms to OEM published specifications.
  - 2. The Contractor's maintenance personnel shall have the ability to contact the Contractor and OEM for emergency maintenance and logistic assistance, remote diagnostic testing, and assistance in resolving technical problems at any time. This contact capability shall be provided by the Contractor and OEM at no additional cost to the VA.
  - 3. All Contractor maintenance and supervisor personnel shall be fully qualified by the OEM and must provide two (2) copies of current and qualified OEM training certificates and OEM certification upon request.
  - 4. Additionally, the Contractor shall accomplish the following minimum requirements during the two year guaranty period:
    - a. Response Time During the **Two Year** Guaranty Period:

- 1) The RE (or Facility Contracting Officer if the system has been turned over to the Facility) is the Contractor's ONLY OFFICIAL reporting and contact official for nurse call system trouble calls, during the guaranty period.
  - 2) A standard work week is considered 8:00 A.M. to 5:00 P.M. or as designated by the RE (or Facility Contracting Officer), Monday through Friday exclusive of Federal Holidays.
  - 3) The Contractor shall respond and correct on-site trouble calls, during the standard work week to:
    - a) A routine trouble call within one (1) working day of its report. A routine trouble is considered a trouble which causes a power supply; one (1) master System control station, microphone console or amplifier to be inoperable.
    - b) 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.
    - c) An emergency trouble call within four (4) hours of its report. An emergency trouble is considered a trouble which causes a sub-zone, zone, distribution point, terminal cabinet, or all call system to be inoperable at anytime.
  - 4) If a PA System component failure cannot be corrected within four (4) hours (exclusive of the standard work time limits), the Contractor shall be responsible for providing alternate System equipment. The alternate equipment/system shall be operational within a maximum of 12 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.
- b. Required On-Site Visits During the **Two Year** Guaranty Period
- 1) The Contractor shall visit, on-site, for a minimum of eight (8) hours, once every 12 weeks, during the guaranty period, to perform system preventive maintenance, equipment cleaning, and operational adjustments to maintain the System according the descriptions identified in this document.
  - 2) The Contractor shall arrange all Facility visits with the RE (or Facility Contracting Officer) prior to performing the required maintenance visits.

- 3) Preventive maintenance procedure(s) shall be performed by the Contractor in accordance with the OEM's recommended practice and service intervals during non-busy time agreed to by the RE (or Facility Contracting Officer) and Contractor.
  - 4) The preventive maintenance schedule, functions and reports shall be provided to and approved by the RE (or Facility Contracting Officer).
  - 5) The Contractor shall provide the RE (or Facility Contracting Officer) a type written report itemizing each deficiency found and the corrective action performed during each required visit or official reported trouble call. The Contractor shall provide the RE with sample copies of these reports for review and approval at the beginning of the Acceptance Test. The following reports are the minimum required:
    - a) The Contractor shall provide a monthly summary all equipment and sub-systems serviced during this warranty period to RE (or Facility Contracting Officer) by the fifth (5<sup>th</sup>) working day after the end of each month. The report shall clearly and concisely describe the services rendered, parts replaced and repairs performed. The report shall prescribe anticipated future needs of the equipment and systems for preventive and predictive maintenance.
    - b) The Contractor shall maintain a separate log entry for each item of equipment and each sub-system of the System. The log shall list dates and times of all scheduled, routine, and emergency calls. Each emergency call shall be described with details of the nature and causes of emergency steps taken to rectify the situation and specific recommendations to avoid such conditions in the future.
  - 6) The RE (or Facility Contracting Officer) shall convey to the Facility Engineering Officer, two (2) copies of actual reports for evaluation.
    - a) The RE (or Facility Contracting Officer) shall ensure a copy of these reports is entered into the System's official acquisition documents.
    - b) The Facility Chief Engineer shall ensure a copy of these reports is entered into the System's official technical record documents.
- C. Work Not Included: Maintenance and repair service shall not include the performance of any work due to improper use; accidents; other vendor, contractor, or owner tampering or negligence, for which the Contractor is not directly responsible and does not control. The Contractor shall immediately notify the RE or Facility Contracting Officer in writing upon the discovery of these incidents. The RE or Facility Contracting Officer will investigate all reported incidents and render an official opinion in writing concerning the supplied information.



#### **4.3 TRAINING**

- A. Provide thorough training of all biomed engineering and electronic technical 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. A separate training room will be set up that allows this type of individualized training utilizing in-service training unit, prior to cut over of the new system.

--- E N D ---

**SECTION 27 52 23  
NURSE CALL AND CODE BLUE SYSTEMS**

**PART 1 - GENERAL**

**1.1 SECTION 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.
- B. Scope of Work
  - 1. New nurse call system equipment is to be installed throughout all portions of the remodel and new construction areas, as defined herein and elsewhere noted on project plans and documents.
  - 2. Equipment being added shall be interfaced to the Hospital's existing Nurse Call System, allowing all portions of the system to function as a **single large area network**; continuing to accept, announce and record call activity from all areas of the facility.
  - 3. System shall also support staff to staff communications, as well as staff to patient communications, using both fixed and portable communications devices, such as desk consoles, bedstations, staff stations, staff terminals AND staff assigned **wireless phones**.
- C. Maintain operation & integrity of existing Nurse Call System
  - 1. It shall be the responsibility of this Contractor to ensure that the existing **Rauland Responder 5 Nurse Call System**, including all field devices, servers and applications is in no manner compromised by any construction activity and that the system, as a whole, remains in full and proper operation through the course of the entire construction project.
  - 2. As equipment is removed and added to the existing system, it shall be this contractor's responsibility to verify that wiring and components continue to operate properly and that the system, as a whole, remains up and running in an intact and reliable manner.
  - 3. Coordinate all work that may affect operation of the existing system with the Project Manager, COR and local engineering office, as well as Electronic Shop personnel assigned to routinely maintain the system.
- D. Items specified herein shall be tested and certified capable of receiving, distributing, interconnecting and supporting Nurse Call and Code Blue communications signals generated both locally and remotely, as detailed herein.

- E. Work shall be complete, Occupational Safety and Health Administration (OSHA), National Recognized Testing Laboratory (NRTL – i.e. Underwriters Laboratory [UL]) Listed and Labeled; and VA Central Office (VACO), Telecommunications Voice Engineering (TVE 005OP3B) tested, certified and ready for operation.
- F. The System shall be delivered free of engineering, manufacturing, installation, and functional defects. System shall be designed, engineered and installed for ease of operation, maintenance, and testing.
- G. The term “provide”, as used herein, shall be defined as: designed, engineered, furnished, installed, certified, tested, and guaranteed by the Contractor.
- H. 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-005OP3B. *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 writing with technical concurrences by VA’s PM, RE, TVE-005OP3B and identified Facility Project Personnel.

## 1.2 RELATED SECTIONS

- A. 01 33 23 – Shop Drawings, Product Data and Samples.
- B. 07 84 00 – Firestopping.
- C. 26 05 21 – Low – Voltage Electrical Power Conductors and Cables (600 Volts and Below).
- D. 26 41 00 – Facility Lightning Protection.
- E. 27 05 11 – Requirements for Communications Installations.
- F. 27 05 26 – Grounding and Bonding for Communications Systems.
- G. 27 05 33 – Raceways and Boxes for Communications Systems.
- H. 27 10 00 – TIP Structured Communications Systems Cabling.
- I. 27 11 00 – TIP Communications Interface and Equipment Rooms Fittings.
- J. 27 15 00 – TIP Communications Horizontal and Vertical Cabling.

## 1.3 DEFINITION

- A. Provide: Design, engineer, furnish, install, connect complete, test, certify and guarantee.
- B. Work: Materials furnished and completely installed.

- C. Review of contract drawings: A service by the engineer to reduce the possibility of materials being ordered which do not comply with contract documents. The engineer's review shall not relieve the Contractor of responsibility for dimensions or compliance with the contract documents. The reviewer's failure to detect an error does not constitute permission for the Contractor to proceed in error.
- D. Headquarters (aka VACO) Technical Review, for National and VA Communications and Security, Codes, Frequency Licensing Standards, Guidelines and Compliance:
  - Office of Telecommunications
  - Special Communications Team (005OP3B)
  - 1335 East West Highway – 3rd Floor
  - Silver Spring, Maryland 20910,
  - (O) 301-734-0350, (F) 301-734-0360
- E. Engineer: West Plains Engineering
  - 4609 South Techlink Circle
  - Sioux Falls, SD
- F. Owner: // VA Med. Center / Sioux Falls, SD //
- H. Contractor: System's Contractor; you; successful bidder.
  - 1. Note that the System's Contractor may also refer to a second or third tier subcontractor, retained by a higher tier subcontractor (i.e. electrical) to assist them in fulfilling the technical design & installation requirements for the system defined in this specification.

#### 1.4 REFERENCES

- A. The installation shall comply fully with all governing authorities, laws and ordinances, regulations, codes and standards, including, but not limited to:
  - 1. United States Federal Law:
    - a. Departments of:
      - 1) Commerce, Consolidated Federal Regulations (CFR), Title 15 – Under the Information Technology Management Reform Act (Public Law 104-106), the Secretary of Commerce approves standards and guidelines that are developed by the:
        - a) Chapter II, National Institute of Standards Technology (NIST – formerly the National Bureau of Standards). Under Section 5131 of the Information Technology Management Reform Act of 1996 and the Federal Information Security Management Act of 2002 (Public Law 107-347), NIST develops –

Federal Information Processing Standards Publication (FIPS) 140-2—Security Requirements for Cryptographic Modules.

- b) Chapter XXIII, National Telecommunications and Information Administration (NTIA – aka ‘Red Book’) Chapter 7.8 / 9; CFR, Title 47 Federal communications Commission (FCC) Part 15, Radio Frequency Restriction of Use and Compliance in “Safety of Life” Functions & Locations.
- 2) FCC - Communications Act of 1934, as amended, CFR, Title 47 – Telecommunications, in addition to Part 15 – Restrictions of use for Part 15 listed Radio Equipment in Safety of Life / Emergency Functions / Equipment/ Locations (also see CFR, Title 15 – Department of Commerce, Chapter XXIII – NTIA):
  - a) Part 15 – Restrictions of use for Part 15 listed Radio Equipment in Safety of Life / Emergency Functions / Equipment/Locations.
  - b) Part 58 – Television Broadcast Service.
  - c) Part 90 – Rules and Regulations, Appendix C.
- 3) Health, (Public Law 96-88), CFR, Title 42, Chapter IV Health & Human Services, CFR, Title 46, Subpart 1395(a)(b) JCAHO “a hospital that meets JCAHO accreditation is deemed to meet the Medicare conditions of Participation by meeting Federal Directives:”
  - a) All guidelines for Life, Personal and Public Safety; and, Essential and Emergency Communications.
- 4) Labor, CFR, Title 29, Part 1910, Chapter XVII - Occupational Safety and Health Administration (OSHA), Occupational Safety and Health Standard:
  - a) Subpart 7 - Definition and requirements (for complete list, contact- [http://www.osha.gov/dts/otpca/nrtl/faq\\_nrtl.html](http://www.osha.gov/dts/otpca/nrtl/faq_nrtl.html)):
    - 1) UL:
      - a) 44-02– Standard for Thermoset-Insulated Wires and cables
      - b) 65– Standard for Wired Cabinets.
      - c) 83-03– Standard for Thermoplastic-Insulated Wires and Cables.
      - d) 467-01– Standard for Electrical Grounding and Bonding Equipment
      - e) 468– Standard for Grounding and Bonding Equipment
      - f) 486A-01– Standard for Wire Connectors and Soldering Lugs for Use with Copper Conductors
      - g) 486C-02– Standard for Splicing Wire Connectors.
      - h) 486D-02– Standard for Insulated Wire Connector Systems for Underground Use or in Damp or wet Locations.

- i) 486E-00– Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors.
- j) 493-01– Standard for Thermoplastic-Insulated Underground Feeder and Branch Circuit Cable.
- k) 514B-02– Standard for Fittings for Cable and Conduit.
- l) 1069– Hospital Signaling and Nurse Call Equipment.
- m) 1449– Standard for Transient Voltage Surge Suppressors.
- n) 1479-03– Standard for Fire Tests of Through-Penetration Fire Stops.
- o) 1666– Standard for Wire/Cable Vertical Riser Tray Flame Tests.
- p) 1863– Standard for Safety, Communications Circuits Accessories.
- q) 2024– Standard for Optical Fiber Raceways.
- r) 60950-1/2– Information Technology Equipment – Safety.
- 2) Canadian Standards Association (CSA): same tests as for UL.
- 3) Communications Certifications Laboratory (CCL): same tests as for UL.
- 4) Intertek Testing Services NA, Inc. (ITSNA formerly Edison Testing Laboratory [ETL]): same tests as for UL.
- b) Subpart 35 – Compliance with NFPA 101 – Life Safety Code.
- c) Subpart 36 - Design and construction requirements for exit routes.
- d) Subpart 268 - Telecommunications.
- e) Subpart 305 - Wiring methods, components, and equipment for general use.
- 5) Department of Transportation, CFR, Title 49 (Public Law 89-670), Part 1, Subpart C – Federal Aviation Administration (FAA):
  - a) Standards AC 110/460-ID & AC 707 / 460-2E – Advisory Circulars for Construction of Antenna Towers.
  - b) Forms 7450 and 7460-2 – Antenna Construction Registration.
- 6) Veterans Affairs (Public Law No. 100-527), CFR, Title 38, Volumes I & II:
  - a) Office of Telecommunications:
    - 1) Handbook 6100 – Telecommunications.
      - a) Spectrum Management FCC & NTIA Radio Frequency Compliance and Licensing Program.
      - b) Special Communications Proof of Performance Testing, VACO Compliance and Life Safety Certification(s).
  - b) Office of Cyber and Information Security (OCIS):
    - 1) Handbook 6500 - Information Security Program.

- 2) Wireless and Handheld Device Security Guideline Version 3.2, August 15, 2005.
- c) VA's National Center for Patient Safety – Veterans Health Administration Warning System, Failure of Medical Alarm Systems using Paging Technology to Notify Clinical Staff, July 2004.
- d) VA's Center for Engineering Occupational Safety and Health, concurrence with warning identified in VA Directive 7700.
- e) Office of Construction and Facilities Management (CFM):
  - 1) Master Construction Specifications (PG-18-1).
  - 2) Standard Detail and CAD Standards (PG-18-4).
  - 3) Equipment Guide List (PG-18-5).
  - 4) Electrical Design Manual for VA Facilities (PG 18-10), Articles 7 & 8.
  - 5) Minimum Requirements of A/E Submissions (PG 18-15):
    - a) Volume B, Major New Facilities, Major Additions; and Major Renovations, Article VI, Paragraph B.
    - b) Volume C - Minor and NRM Projects, Article III, Paragraph S.
    - c) Volume E - Request for Proposals Design/Build Projects, Article II, Paragraph F.
  - 6) Mission Critical Facilities Design Manual (Final Draft – 2007).
  - 7) Life Safety Protected Design Manual (Final Draft – 2007).
  - 8) Solicitation for Offerors (SFO) for Lease Based Clinics – (05-2009).
- b. Federal Specifications (Fed. Specs.):
  - 1) A-A-59544-00 - Cable and Wire, Electrical (Power, Fixed Installation).
2. National Codes:
  - a. American Institute of Architects (AIA): Guidelines for Healthcare Facilities.
  - b. American National Standards Institute/Electronic Industries Association/Telecommunications Industry Association (ANSI/EIA/TIA):
    - 1) 568-B - Commercial Building Telecommunications Wiring Standards:
      - a) B-1 – General Requirements.
      - b) B-2 – Balanced twisted-pair cable systems.

- c) B-3 - Fiber optic cable systems.
  - 2) 569 - Commercial Building Standard for Telecommunications Pathways and Spaces.
  - 3) 606 – Administration Standard for the Telecommunications Infrastructure of Communications Buildings.
  - 4) 607 – Commercial Building Grounding and Bonding Requirements for Telecommunications.
  - 5) REC 127-49 – Power Supplies.
  - 6) RS 270 – Tools, Crimping, Solderless Wiring Devices, Recommended Procedures for User Certification.
  - c. American Society of Mechanical Engineers (ASME):
    - 1) Standard 17.4 – Guide for Emergency Personnel.
    - 2) Standard 17.5 – Elevator & Escalator Equipment (prohibition of installing non-elevator equipment in Elevator Equipment Room / Mechanical Penthouse).
  - d. American Society of Testing Material (ASTM):
    - 1) D2301-04 - Standard Specification for Vinyl Chloride Plastic Pressure Sensitive Electrical Insulating Tape.
  - e. Building Industries Communications Services Installation (BICSI):
    - 1) All standards for smart building wiring, connections and devices for commercial and medical facilities.
    - 2) **Structured Building Cable Topologies.**
    - 3) In consort with ANSI/EIA/TIA.
  - f. Institute of Electrical and Electronics Engineers (IEEE):
    - 1) SO/TR 21730:2007 - Use of mobile wireless communication and computing technology in healthcare facilities - Recommendations for electromagnetic compatibility (management of unintentional electromagnetic interference) with medical devices.
    - 2) 0739-5175/08/©2008 IEEE – Medical Grade – Mission Critical – Wireless Networks.
    - 3) C62.41 – Surge Voltages in Low-Voltage AC Power Circuits.
  - g. NFPA:
    - 1) 70 - National Electrical Code (current date of issue) – Articles 517, 645 & 800.
    - 2) 75 - Standard for Protection of Electronic Computer Data-Processing Equipment.
    - 3) 77 – Recommended Practice on Static Electricity.
    - 4) 99 - Healthcare Facilities.
    - 5) 101 - Life Safety Code.
3. State Hospital Code(s).



4. Local Town, City and/or County Codes.
5. Accreditation Organization(s):
  - a. Joint Commission on Accreditation of Hospitals Organization (JCAHO) – Section VI, Part 3a – Operating Features.

### **1.5 QUALIFICATIONS**

- A. 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.
  1. Each of these installations shall have performed satisfactorily for at least one (1) year after final acceptance by the user.
  2. Include the names, locations and point of contact for these installations as a part of the submittal.
- B. 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.
  1. The Contractor shall also be authorized by the OEM to pass thru the OEM's warranty of the installed equipment to the VA.
  2. The OEM and Contractor shall accept complete responsibility for the design, installation, certification, operation, and physical support for the System.
- C. The Contractor's Communications Technicians, assigned to install and maintain the System shall be fully trained, qualified, and certified by the OEM on the engineering, installation, operation, and testing of the System.
  1. The Contractor shall provide written evidence of this certification.
- D. The Contractor shall maintain all applicable national, state and local licenses.

### **1.6 CODES AND PERMITS**

- A. Provide all necessary permits and schedule all inspections as identified in the contract's milestone chart, so that the system is proof of performance tested, certified and approved by VA and ready for operation on a date directed by the Owner.
- B. The contractor is responsible to adhere to all codes described herein and associated contractual, state and local codes.

### **1.7 SCHEDULING**

- A. This Contractor shall adhere to the construction time lines and schedules as advanced by the General Contractor and as approved by the Project Manager. Any changes to this schedule, deemed necessary, shall be submitted through appropriate construction channels for review and action. No changes to schedules are allowed, except as approved by the Project Manager.

- B. It is the responsibility of this 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.

**1.8 CONTRACT DRAWINGS AND EQUIPMENT DATA SUBMITTALS (AKA TECHNICAL SUBMITTAL[S])**

- A. Contractor shall submit- drawings and product data on all proposed equipment and system(s). Verify compliance with contract documents and certify compliance by affixing Contractor's "APPROVED" stamp and signature.
- B. Submittals shall include- descriptive materials, including- catalog sheets, product data sheets, diagrams, and charts, indicating conformance to specification and drawing requirements.
  - 1. Where multiple products are listed on a single cut-sheet, circle or highlight items being proposed for use.
- C. As part of the submittal, provide a complete material list, describing equipment to be furnished and installed, including spare parts.
- D. Submittals shall also include complete floor plans and riser diagrams, detailing the methods to be used to interconnect major components of the system together.
  - 1. Show all major devices by location (area & room) and detail how such equipment is to be connected together, including suggested conduit (raceway) and cabling methods and routes to be used.
  - 2. Identify all equipment, telecom & data closets, etc. where control & amplification equipment is to reside and detail methods used to interconnect such equipment.

**1.9 PROJECT RECORD DOCUMENTS (AS BUILTS)**

- A. Throughout construction, record drawings shall be maintained and updated so that, upon completion of the project, accurate "as built" documentation can be compiled, for inclusion in final O&M manuals.
- B. Final, "as-built" floor plans, created and presented in electronic format, shall include, as a minimum, the following:
  - 1. All devices shown at appropriate locations where installed
  - 2. Conduit routing
  - 3. Each point of interface, by location
  - 4. Head-end equipment, by specific location.
  - 5. Device specific wire termination diagrams
  - 6. Labeling and administration documentation.
  - 7. Warranty certificate.
  - 8. System test results.

**1.10 WARRANTIES / GUARANTY**

- A. This Contractor shall warrant the installation to be free from defects in material and workmanship for a period of one (1) year from the date of final acceptance of the project by the owner. The Contractor shall agree to remedy covered defects within four (4) hours of notification of major failures or within twenty-four (24) hours of notification for individual station (minor) related problems.
- B. Refer to Part 4 of this specification for further information regarding Testing, Guaranty and Training requirements.

**1.11 USE OF THE SITE**

- A. Use of the site shall be at the General Contractor's (GC's) direction.
- B. Coordinate with the GC for lay-down areas for product storage and administration areas.
- C. Coordinate work with the GC and their sub-contractors.
- D. Access to buildings and areas where work is to be performed shall be as directed by the GC.

**1.12 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft.
- B. Store products in original containers.
- C. Coordinate with the GC for product storage. There may be little or no storage space available on site. Plan to potentially store materials off site.
- D. Do not install damaged products. Remove damaged products from the site and replaced with new product at no cost to the Owner.

**1.13 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 / FUNCTIONAL REQUIREMENTS**

### **2.0 GENERAL REQUIREMENTS FOR EQUIPMENT AND MATERIALS**

- A. Furnish and install a complete, fully functional and operable Nurse Call System for each location shown on the contract drawings.
  1. Note that the Nurse Call empty conduit system is defined and provided as part of Specification 27.11.00
- B. Integration to Existing Nurse Call System equipment
  1. System to be furnished shall be a **Rauland Borg Responder 5 Nurse Call System**, designed and configured **to work AS AN EXTENSION TO and** in conjunction with the **Hospital's EXISTING Responder 5 Nurse Call System**, including Code Blue Central Annunciation at both the Main Switchboard and Main Emergency Department (ED) locations.
  2. Equipment being installed as part of this project shall also **integrate completely** with the Hospital's current nurse call system, allowing both routine (bed, bath, staff, etc.)calls, as well as priority (code blue, staff assist, rapid response, etc.) calls to pass seamlessly between desk consoles and workstations in various areas of the facility.
- C. Support and Integration into Hospital's LAN/WAN Network
  1. Utilizing the features of various Responder software applications, it shall be possible for this nurse call system's terminals (desk consoles, workstations and staff terminals) & servers to display, manage and archive information about daily activity and operation of the Nurse Call System.
  2. At the **SFVAHCS**, the Hospital's Nurse Call Application Servers are located in **IT Server Room 178** on the first floor of Building 5.
  3. Extend data cabling, as necessary, to interconnect new equipment being added as part of this project to existing servers.
  4. Note that all Application Servers are existing and are currently being maintained by the VA under separate (direct) contract with the OEM.
    - a. No new servers are not provided or installed as part of this project's scope of work.
- D. Support and Integration with **Hospital provided Personal Wireless Communications Devices (i.e. pocket pagers & portable phones)**
  1. Utilizing features of the Responder software applications already in use at the **SFVAHCS** facility, it shall be possible for calls originating on the nurse call system to be broadcast directly to wireless devices (pocket pagers and LP wireless phones) being carried by

- assigned staff. Staff will also have the ability to establish two-way voice communications directly between their portable (wireless) phones and assigned patient room stations.
- E. 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.
  - F. Expansion Capability: In the area(s) under construction, the nurse call equipment area processors, interfaces and enunciators shall be sized to support future expansion of up to a minimum of 50% without the need to add any internal or external components or main data cable conductors.
  - G. Equipment: Active electronics 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.
  - H. 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 structure.
  - I. Weather/Water Proof Equipment: Listed and labeled by an OSHA certified NRTL (i.e. UL) for duty outdoors or in damp locations.

## 2.1 SYSTEM DESCRIPTION

- A. Furnish and install a complete, fully functional and operable extension to the existing Nurse Call and Code Blue System throughout the areas being constructed and remodeled.
- B. This Contractor shall be responsible for interfacing the Nurse Call System to other communications systems in each patient care area, including-
  - TV remote control,
  - Patient bed service walls,
  - LV lighting controls (For patient control of room/read lights)
- C. This Contractor shall continually employ interfacing methods that are approved by the OEM and VA. At a minimum, an acceptable interfacing method requires not only a physical and mechanical connection, but also a matching of signal, voltage, and processing levels with regard to signal quality and impedance. The interface point must adhere to all standards described herein for the full separation of Critical Care and Life Safety systems.
- D. The System Contractor shall connect the System ensuring that all NFPA and UL Critical Care and Life Safety Circuit and System separation guidelines are satisfied.

1. The System Contractor shall not make any connections directly to the facility telephone system. Contact the Project Manager (PM) to coordinate this type of work.
  2. VA Project Manager shall also arrange for the interconnection between the [MATV & Patient Bed Service Wall](#) Systems, with the appropriate responsible parties.
- E. System hardware shall consist of an expansion to the Hospital's existing Nurse Call and Code Blue System.
1. Devices to be added shall include, but not be limited to, the following- nurse consoles, bed stations, control stations, staff and duty stations, room and corridor dome lights, pillow speakers/call cords, pull cord and/or emergency push button stations, wiring. And, other options such as, pocket page interfaces, computer interfaces, printer interfaces, wireless / telephone network interfaces, as shown on drawings. 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 call/ code blue patient communications network.
- F. OEM shall provide, free of charge, product firmware/software upgrades **for a period of two (2) years** from date of acceptance by VA for any product feature enhancements.
1. System configuration programming changes shall not require any exchange of parts and shall be capable of being executed remotely via a modem or other network connection, as specifically approved by the TVE 0050P3B.
- G. The Nurse Call (Area) Head End Equipment, being **added** as part of this expansion project, shall be located in a Telecommunications Room, as elsewhere noted on plans.
- H. The System shall utilize microprocessor components for all signaling and programming circuits and functions. Self contained or on board system program memory shall be non-volatile and protected from erasure during power outages for a minimum of **12** hours.
- I. Provide a backup battery or a UPS for the System (including each distribution cabinet/point, CRT and Monitor) to allow normal operation and function (as if there was no AC power failure) in the event of an AC power failure or during input power fluctuations for a minimum of **10** minutes.
- J. The System is defined as Critical Service and the Code Blue functions are defined as Life Safety/Support by NFPA (re Part 1.1.A) and so evaluated by JCAHCO.
1. With this requirement in mind, the system **installed at the SF VAHCS facility** shall have three (3) locations for remote enunciation of Code Blue and other emergency response type calls-
    - a. Main Telephone Switchboard on Ground Floor
    - b. Emergency Department Nurse's Station on Ground Floor
    - c. ICU area Nurse Station ([located on 3 South at the SFVAHCS](#))

2. Code Blue Calls shall also annunciate at the following associated locations:
    - a. "On Call" Rooms.
    - b. Area Nurse Master Station(s).
    - c. Area Staff Station(s).
    - d. Area Duty Station(s).
    - e. Assigned Pocket Pagers
    - f. Assigned Portable (Wireless) Staff Phones
  3. The MAXIMUM enunciation time period from placement of a Code Blue Call to enunciation at each remote location shall be no greater than 10 seconds; and, 15 seconds to the secondary enunciating media equipment (i.e. PA, Radio Paging, Emergency Telephone or Radio Backup, etc.), if elsewhere defined and required.
- K. When the System is approved to connect to a separate communications system (i.e. LAN, WAN, Telephone, Public Address, radio raging, wireless systems, etc) the connection point(s) shall meet the following minimum requirements for each hard wired / wireless connection
1. UL 60950-1/2.
  2. FIPS 142.
  3. FCC Part 15 Listed Radio Equipment restriction compliance approved by SM – 005OP2B.
- L. All passive distribution equipment shall meet or exceed -80 dB radiation shielding (aka RFI) shielding specifications and be provided with connectors specified by the OEM.
- M. All equipment face plates utilized in the system shall be stainless steel, anodized aluminum or UL approved cyclocac plastic for the areas where provided.
- N. Noise filters and surge protectors shall be provided for each equipment interface cabinet, headend cabinet, control console and local and remote amplifier locations to insure protection from input primary AC power surges and to insure noise glitches are not induced into low voltage data circuits.
- O. Audio Level Processing: The control equipment shall consist of audio mixer(s), volume limiter(s) and/or compressor(s), and power amplifier(s) to process, adjust, equalize, isolate, filter, and amplify each audio channel for each sub-zone in the system and distribute them into the System's RF interfacing distribution trunks and amplification circuits.
- P. Contractor shall provide all accessories and miscellaneous equipment required to form a complete and operating system.
1. Unless otherwise noted in this Part, equipment quantities shall be as indicated on the drawings.
- Q. System Performance:

1. Each distribution, interconnection, interface, terminating point and TCO shall be capable of supporting the Facility's Nurse Call and/or Code Blue System voice and data service as follows:
  - a. Shall be compliant with and not degrade the operating parameters of the Public Switched Telephone Network (PSTN) and the Federal Telecommunications System (FTS) at each PSTN and FTS interface.
  - b. The System shall provide the following minimum operational functions:
    - 1) Code Blue calls shall be cancelable at the calling station only. The nurse call master station(s) that manage Code Blue functions shall not have the ability to cancel Code Blue calls.
    - 2) Each desk console utilized to annunciate code blue calls shall be able to receive audio calls from all bedside stations simultaneously.
    - 3) Calls placed from any Code Blue station shall generate Code Blue emergency type audible and visual signals at each associated nurse control and duty station, respective dome lights and all local and remote annunciator panels. Calls placed from a bedside station shall generate emergency type visual signals at the bedside station and associated dome light(s) in addition to the previous stated stations and panels.
    - 4) Activating the silencing device at any location, while a Code Blue call or system fault is occurring shall mute the audible signals at that annunciating location.
      - a) The audible alarm shall regenerate at the end of the selected time-out period until the call or fault is corrected.
      - b) The visual signals shall continue until the call is canceled and/or a fault is corrected. When the fault is corrected, all signals generated by the fault shall automatically cease, returning the System to a standby status.
      - c) Audible signals shall be regenerated in any local or remote annunciator panel that is in the silence mode, in the event an additional Code Blue call is placed in any Code Blue system.
      - d) The additional Code Blue call shall also generate visual signals at all enunciators to identify the location of the call.
2. Each System Nurse Call location shall, at a minimum, support the following distinct calls:
  - a. Routine: single flashing dome lights & master station color and audio tone,
  - b. Staff Assist: rapid flashing dome lights & master station color and audio tone,
  - c. Emergency: Red flashing done lights & master station color and audio tone,
  - d. Code Blue: Blue flashing dome lights and master station color and audio tone,



1. Each generated call shall be cancelable at ONLY the originating location,
- e. Staff Locator: Green Flashing dome lights & master station color and audio tone, and
- f. Additional Staff Locator Priorities: Orange and Yellow flashing dome lights & master station color and audio tone.

## 2.3 MANUFACTURERS

- A. Qualified OEM manufacturer(s) **for this project-**
  1. **Rauland Borg Corporation, no substitutions**
  2. As previously described, equipment that is being added, as part of this project, is considered to be an extension to the existing Nurse Call System and, as such, must be of the same manufacture and type as the existing system.
- B. The products specified shall be new, FCC and UL Listed, labeled and produced by OEM manufacturer of record. An OEM of record shall be defined as a company whose main occupation is the manufacture for sale of the items of equipment supplied and which:
  1. Maintains a stock of replacement parts for the item submitted,
  2. Maintains engineering drawings, specifications, and operating manuals for the items submitted, and
  3. Has published and distributed descriptive literature and equipment specifications on the items of equipment submitted at least 30 days prior to the Invitation for Bid.
- C. Specifications contained herein as set forth in this document detail the salient operating and performance characteristics of equipment in order for VA to distinguish acceptable items of equipment from unacceptable items of equipment. When an item of equipment is offered or furnished for which there is a specification contained herein, the item of equipment offered or furnished shall meet or exceed the specification for that item of equipment.
- D. Equipment Standards and Testing:
  1. The System has been defined herein as connected to systems identified as Critical Service performing various Emergency and Life Support Functions. Therefore, at a minimum, the system shall conform to all aforementioned National and/or Local Life Safety Codes (which ever are the more stringent), NFPA, NEC, this specification, JCAHCO Life Safety Accreditation requirements, and the OEM recommendations, instructions, and guidelines.
  2. All supplies and materials shall be listed, labeled or certified by UL or a NRTL where such standards have been established for the supplies, materials or equipment.
  3. The provided equipment required by the System design and approved technical submittal must conform with each UL standard in effect for the equipment, as of the date of the technical submittal (or the date when the RE approved system equipment necessary to be

replaced) was technically reviewed and approved by VA. Where a UL standard is in existence for equipment to be used in completion of this contract, the equipment must bear the approved UL seal.

4. Each item of electronic equipment to be provided under this contract must bear the approved UL seal or the seal of the testing laboratory that warrants the equipment has been tested in accordance with, and conforms to the specified standards. The placement of the UL Seal shall be a permanent part of the electronic equipment that is not capable of being transportable from one equipment item to another.

## **2.4 PRODUCTS**

### **A. General.**

1. Contractor shall provide all accessories and miscellaneous equipment required to form a complete, fully functional and operating system. The equipment quantities to be provided shall be as indicated on the drawings and shall also include spare equipment, as elsewhere quantified in this specification.
2. Contractor Furnished Equipment List (CFEs):
  - a. All Nurse Call System equipment identified on project floor plans and described herein is to be furnished and installed as part of this project. (Contractor furnished and contractor installed.)
  - b. As previously noted, this Contractor shall, as part of the submittal process, provide complete material lists, describing all CFE equipment being provided. Lists shall include the quantity, make and model number for of each item to be provided.

### **B. Telecommunications Room(s) (TR):**

1. Locate the Nurse Call (area) distribution equipment as required by system design and OEM direction. Provide secured and lockable cabinet/rack(s) as required.
2. Head-End Equipment:
  - a. Provide all required power supplies, communications hubs, network switches, intelligent controllers and other devices necessary to form a complete system. Head-end components may be rack mounted or wall mounted in an enclosed metal enclosure.
  - b. Provide area control equipment in a Telecommunications Room (TR) located as close as practical to where the new system equipment is being installed.
  - c. Provide the System UPS (or battery backup) inside or adjacent to the area cabinet.
  - d. Equipment Cabinet: Comply with TIA/EIA-310-D. Lockable, ventilated metal cabinet containing- terminal strips, power supplies, amplifiers, system volume control, and other switching and control devices as needed to perform necessary audio & control functions.
3. HL7 Interface:

- a. While HL7 interface is a feature that is to be supported by the Nurse Call System, at the **SFVAHCS** this type of integration is **NOT** considered part of this construction project scope of work.
  - b. HL7 interface may be addressed under a separate project in the future at this site.
4. Wireless:
- a. Radio Paging Equipment / Systems (including pocket paging)
    - 1) While paging system interface is a feature that is supported by the Nurse Call System, software, hardware, installation and technical labor services to implement, maintain & support this feature are **NOT** considered part of **this** construction project scope of work.
    - 2) Paging interface will be addressed directly by the Owner, **outside** the scope of this construction project.
5. Personal Wireless Communicator (Portable Phone)
- 1) While personal wireless (LP cell Phone) communications is supported by the Nurse Call System- software, hardware, installation and technical labor services to implement, maintain & support this feature is **NOT** part of **this** construction project scope of work.
  - 2) Changes to wireless communications, if desired, will be addressed directly by the Owner, **outside** the scope of this construction project.
- F. TIP Cable Systems:
- Connect the Nurse Call system to the TIP system provided as a part of Specification Section 27 15 00.** Provide additional TIP equipment, interfaces and connections as required by System design. Provide secured pathway(s) and lockable cabinet/rack(s) as required.
- G. Interface Equipment:
1. TCR and all other remote locations:
    - a. Code Blue Annunciation Master Station:
      - 1) Code Blue calls are to annunciate at existing desk consoles, furnished as part of a separate nurse call project.
  2. Hospital Bed Interface (Sidecom Receptacle):
    - a. Where shown on plans, provide multi-pin (37 pin)receptacles for interface of the Hospital's patient beds to various room communications devices, including- the nurse call system, TV audio and control, as well as (low voltage) patient headwall lighting control.
    - b. To complete this interface, extend cabling from each receptacle out to the associated nurse call, lighting and TV system devices in each room and make all final terminations as necessary.

- c. Multi-pin receptacle(s) shall be terminated in accordance with standard practice, allowing Hospital grade (feature) beds to be connected to the Nurse Call, TV and lighting systems.
  - d. Receptacles shall support interface to feature beds manufactured by:
    - 1) Hill Rom
    - 2) Stryker Medical
    - 3) Sizewise
  - e. Provide one (1) spare receptacle assembly for every ten (10) receptacles that are installed.
3. Nurse (aka Staff) or Real Time Locating (RTLS) Interface:
- a. While there is an existing RTLS System installed throughout the existing facility.
  - b. There is to be NO interface of the RTLS System to the Nurse Call System, as part of this project.
4. Lighting Interface Module:
- a. Where so noted on plans and otherwise required, provide an interface module for the pillow speakers to control up to 2 lights. Coordinate with the electrical contractor the exact voltage requirements.
  - b. Provide at each location noted on plans and also provide one (1) spare module for every ten (10) modules installed.
5. Pillow Speakers- Proprietary, for:  
Patient Interactive TV System (**GETWELL**)-

Explanation-

- a. At the **Sioux Falls VAHCS facility**, there is a Patient Interactive TV Distribution System that was furnished and installed in Fiscal Year 2013 under contract with (vendor) GETWELL.
- b. This system requires the use of **proprietary** pillow speakers that are to be connected through the Nurse Call System's patient room bedstations to the GETWELL Interactive TV Sets.
- c. In all acute care Patient Rooms where the GETWELL TV System is to be actively used by the patient in an interactive manner, the associated pillow speakers are to be purchased by the government (local SFVAHCS) OUTSIDE the scope of the construction contract. Facility Engineering is responsible for this purchase and those pillow speakers are NOT to be furnished (or installed) by this Contractor, as part of this project.
- d. In all other areas of the facility, where patient interactive TV use is not being provided or desired, as part of THIS contract project, THIS contractor shall provide traditional (standard) pillow speakers as further described in the spec section that follows.

6. Pillow Speakers- Traditional:

(To be furnished only in Acute Care Patient Rooms that do **NOT** have interactive (Getwell) TV.)

- a. Pillow Speakers shall be utilized to call the nurse, turn patient lights on and off, as well as to control and listen to the TV.
- b. In patient rooms where entertainment capable NC bedstations are installed, and where specifically noted on plans, provide **one (1)** pillow speaker for each patient station.
- c. Provide one (1) spare pillow speaker for every twenty (20) pillow speakers installed.

7. TV Control Jack and Wiring:

- a. Provide connection from the pillow speaker outlet (at each NC bedstation) to the TV location. Terminate wire on a jack in the TV low voltage faceplate. Coordinate faceplate opening with the cabling contractor. Coordinate jack type with the TV (typically it is a 3-conductor, ¼" jack, but verify prior to installation).
- b. Provide patch cord from the TV control jack to the TV.
- c. Provide one (1) spare complete assembly for each twenty (20) assemblies installed. Provide 10 spare remote control (RC) cables.

H. Call Initiation, Annunciation and Response:

1. Light and Tones:

- a. Calls may be initiated through:
  - 1) Patient station.
  - 2) Staff station.
  - 3) Code Blue station.
  - 4) Toilet Emergency Station pull cord / push button.
  - 5) Shower Emergency Station pull cord.
  - 6) Bed Pillow speaker.
  - 7) Bed Push-button cordset.
  - 8) 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.
- c. All calls must be displayed until they are cleared by the nursing staff **ONLY** from the initiating device location.

2. Voice:
  - a Calls may be initiated through:
    - 1) Patient station.
    - 2) Staff station.
    - 3) Code Blue station.
    - 4) Toilet Emergency pull cord / push button station.
    - 5) Shower Emergency pull cord station.
    - 6) Pillow speaker.
    - 7) Push-button cordset.
    - 8) Integrated bed controls.
    - 9) Master Station.
  3. Provide two-way voice communication between a master station and patient, staff, duty and each of the two (2) remote stations.
  4. Failure of the voice intercom portion of the system shall not interfere with visual and audible signal systems.
  5. All calls must be displayed on the master station until they are cleared by the nursing staff at ONLY the originating station. If multiple calls are received at the master station within a short period of time, they shall be stacked based on priority and wait time. If there are more calls than the master station screen can display at one time (four [4] minimum), the system must provide a simple scrolling feature. The nurse must be able to answer any call in any order at the master station. The nurse must also be able to forward calls to staff members. If a call is not answered within a programmable time period, then the system must forward the call to appropriate back-up staff identified by each shift supervisor in a manner technically approved by VA Headquarters 005OP3B.
- I. Auxiliary Alarm Monitoring:
  1. Each patient station must have the ability to connect a separate and isolated auxiliary alarm to it such as an infusion pump or data tracking / recording device
  2. Provide one(1) **dual** alarm jack station adjacent to each patient station, where shown on plans.
- J. Patient and Staff Assignment:
  1. System may 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.
- K. Reports:

1. While Reporting software is a feature that is supported by the existing Nurse Call System- the actual software, hardware, installation/ technical labor services to implement this feature are **NOT** considered part of this construction project scope of work.
2. For all projects at the [SFVAHCS](#), Reporting Software, if & when desired, will be acquired and managed directly by the Owner “outside the scope” of any construction project.
3. No reporting software is to be furnished or installed as part of this project.

L. System/Management Software:

1. System Diagnostic Maintenance software and hardware is a feature of the existing Nurse Call System and is currently installed and maintained on existing “owner provided” computers and/or servers.
2. This contractor shall make all changes to the existing diagnostic support software, as deemed necessary for continued proper operation of the system, as a whole.
  - a. Coordinate all such work with the [SF VAHCS Electronic Shop](#).
  - b. O&M documents shall include updated records, to include all existing as well as all new points and equipment added under the scope of this project.
3. Rights in Data: VA shall have the right to all script and programming language of system management software.

M. System Functional Station:

1. Master Control:
  - a. Audio-Visual Operation:
    - 1) Consoles shall be provided at nurse stations in quantities indicated on drawings.
    - 2) Consoles shall be audio/visual type and incorporate alpha/ numeric digital display readout, a standard dial pad and a telephone style handset, as well as an open console microphone and speaker with push to talk button.
    - 3) Consoles shall be made of cyclac plastic, for durability. The display shall be electroluminescent.
    - 4) Console shall be equipped with four feet of interconnecting cable to allow for convenient placement of the nurse control station on the counter top.
    - 5) Provide one (1) spare console for repair parts use.
  - b. Simple Tone and Light (Visual only) Operation:
    - 1) At locations noted on plans, Tone/ Light Annunciator panels shall be furnished and installed.
    - 2) Panels shall provide both a visual and audible indication of each call.

- 3) Visual indication shall be made using individual LED lamps or by alpha numeric LCD readout, as appropriate for the application.
  - 4) Panels shall be made of cyclolac plastic, for durability.
2. Staff:
    - a. Light and Tone Only.
    - b. Voice Communications Enabled.
    - c. Provide one (1) station at each location noted on plans and one (1) spare station for each twenty (20) stations installed.
  3. Duty:
    - a. Light and Tone Only.
    - b. Voice Communications Enabled.
    - c. Provide one (1) station at each location noted on plans and one (1) spare station for each twenty (20) stations installed.
  4. Patient:
    - a. Single & Dual:
      - 1) Provide each patient station with the following minimum Feature.
        - a) Call button.
        - b) Call answered button.
        - c) Pillow speaker jack.
        - d) Auxiliary alarm monitoring jack.
        - e) Hospital bed interface jack (when specially approved by TVE - 005OP3B).
      - 2) Provide one (1) station at each location noted on plans and one (1) spare station for each twenty (20) stations installed.
- N. Distribution System: Refer to Specification Sections 27 11 00, Structured TIP Communications Cables; 27 11 00, TIP Communications Interface and Equipment Rooms Fittings and 27 15 00, HORIZONTAL and Vertical TIP Communications Cabling for additional specific TIP wire and cable standards and installation requirements used to install the Facility's TIP network. Also comply with the following:
1. Cables & Interconnections:
    - a. All wire and cabling used in the System shall be deemed acceptable for the specific use by the OEM.
    - b. All cabling shall be riser and/or plenum rated, as appropriate for the application.
  2. Raceways, Back Boxes and conduit:



- a. Raceway shall be UL certified for the application and include metal partitions, in accordance with NEC Parts 517 & 800, where cables from multiple systems utilize the same raceway.
- b. System Conduit:
  - 1) Because the NC system is NFPA listed as a Emergency / Public Safety Communication System, **the entire system shall be installed in a separate conduit system.**
- c. Device Back Boxes:
  - 1) Furnish to the electrical contractor all non-standard (custom) back boxes required for the NC system devices.
  - 2) The electrical contractor is responsible for installation of all backboxes (standard & custom), along with all conduit.
- O. Patient Bedside Prefabricated Units (PBPU):
  - 1. Coordinate installation of Nurse Call System components into patient room headwall units with the PBPU fabricator, all other affected trades, as well as the Architect and Resident Engineer (RE).
- P. Installation Kit:
  - 1. Where practical to use, installation kits may be preassembled and shipped to the construction site for use by various trades during installation of the system.

### **PART 3 - EXECUTION**

#### **3.1 PROJECT MANAGEMENT**

- A. Contractor shall assign a single project manager to this project who will serve as the point of contact for the Owner, the General Contractor, and the Engineer.
- B. The Contractor shall be proactive in scheduling work at the hospital. Specifically, the Contractor shall initiate and maintain discussion with the General Contractor regarding the schedule for ceiling cover up and install cables to meet that schedule.
- C. Contact the Office of Telecommunications, Special Communications Team (005OP2B) at (301) 734-0350 to have a VA Certified Telecommunications COR assigned to the project for telecommunications review, equipment and system approval and co-ordination with VA's Spectrum Management and OCIS Teams.

#### **3.2 COORDINATION WITH OTHER TRADES**

- A. Coordinate with the cabling contractor the location of the TV faceplate and the faceplate opening for the nurse call TV remote control (RC) jacks in each patient room.

- B. Coordinate with the cabling contractor the location of TIP equipment in the TER, TCR, PCR, SCC, ECR, STRs, NSs, and TCOs in order to connect to the TIP cable network that was installed as a part of Section Specification 27 11 00. Contact the RE immediately, in writing, if additional location(s) are discovered to be activated that were not previously provided.
- C. Before beginning work, verify the location, quantity, size and access for the following:
  - 1. Isolated ground AC power circuits provided for systems.
  - 2. Primary, emergency and extra auxiliary AC power generator requirements.
  - 3. Junction boxes, wall boxes, wire troughs, conduit stubs and other related infrastructure for the systems.
  - 4. System components installed by others.
  - 5. Overhead supports and rigging hardware installed by others.
- D. Immediately notify the Owner, GC and Consultant(s) in writing of any discrepancies.

### **3.3 NEEDS ASSESSMENT**

- A. Provide a one-on-one meeting with the particular manager(s) of each unit affected by the installation of the new nurse call/code blue system.
- B. Review the floor plan drawing, educate the nursing manager with the functions of the equipment being provided and gather details specific to the individual units; coverage and priorities of calls; staffing patterns; and other pertinent details that will affect system programming and training.

### **3.4 INSTALLATION**

- A. General:
  - 1. Execute work in accordance with National, State and local codes, regulations and ordinances.
  - 2. 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.
  - 3. 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.
  - 4. Secure equipment firmly in place, including receptacles, speakers, equipment racks, system cables, etc.
    - a. All supports, mounts, fasteners, attachments and attachment points shall support their loads with a safety factor of at least 5:1.
    - b. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems.

- c. Any suspended equipment or associated hardware must be certified by the OEM for overhead suspension.
    - d. The Contractor is responsible for means and methods in the design, fabrication, installation and certification of any supports, mounts, fasteners and attachments.
  5. Finishes for any exposed work such as plates, racks, panels, speakers, etc. shall be approved by the Architect, Owner and TVE 005OP3B.
  6. Coordinate cover plates 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 grommeted holes in size and quantity required. Do not allow cable to leave or enter boxes without cover plates installed.
  7. 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.
  8. 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.
  9. Connect the System's primary input AC power to the Facility' Critical Branch of the Emergency AC power distribution system as shown on the plans or if not shown on the plans consult with RE regarding a suitable circuit location prior to installation.
  10. Product Delivery, Storage and Handling:
    - a. 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.
    - b. Storage and Handling: Store and protect equipment in a manner, which will preclude damage as directed by the RE.
  11. Where TCOs are installed adjacent to each other, install one outlet for each instrument.
  12. Equipment installed outdoors shall be weatherproof or installed in weatherproof enclosures with hinged doors and locks with two keys.
- B. 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. Provide continuous raceway/conduit with no more than 40% fill between wire troughs and equipment racks/cabinets for all non-plenum-rated cable. Ensure each system is mechanically separated from each other in the wireway.
  6. 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
- C. Distribution Frames.
1. Any new cabinets, frames or racks provided shall be connected to the TER/MCR system ground.
- D. Wiring Practice - in addition to the MANDATORY infrastructure requirements outlined in VA Construction Specifications 27 10 00 – TIP Structured Communications Cabling, 27 11 00 – TIP Communications Rooms Fittings and 27 15 00 – TIP Horizontal and Vertical Communicators Cabling, the following additional practices shall be adhered to:
1. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
  2. Execute all wiring in strict adherence to the National Electrical Code, applicable local building codes and standard industry practices.
  3. Wiring shall be classified according to the following low voltage signal types:
    - a. Balanced microphone level audio (below -20dBm) or Balanced line level audio (-20dBm to +30dBm)
    - b. 70V audio speaker level audio.
    - c. Low voltage DC control or power (less than 48VDC)
  4. Where raceway is to be EMT (conduit), wiring of differing classifications shall be run in separate conduit. Where raceway is to be an enclosure (rack, tray, wire trough, utility box) wiring of differing classifications which share the same enclosure shall be mechanically partitioned and separated by at least four (4) inches. Where Wiring of differing classifications must cross, they shall cross perpendicular to one another.
  5. 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.

6. 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.
7. 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.
8. Use wire pulling lubricants and pulling tensions as recommended by the OEM.
9. Use grommets around cut-outs and knock-outs where conduit or chase nipples are not installed.
10. Do not use tape-based or glue-based cable anchors.
11. Ground shields and drain wires to the Facility's signal ground system as indicated by the drawings.
12. Field wiring entering equipment racks shall be terminated as follows:
  - a. 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.
  - b. 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.
  - c. If specified terminal blocks are not designed for rack mounting, utilize  $\frac{3}{4}$ " plywood or  $\frac{1}{8}$ " thick aluminum plates/blank panels as a mounting surface. Do not mount on the bottom of the rack.
  - d. Employ permanent strain relief for any cable with an outside diameter of 1" or greater.
13. Use only balanced audio circuits unless noted otherwise directed and indicated on the drawings.
14. Make all connections as follows:
  - a. Make all connections using rosin-core solder or mechanical connectors appropriate to the application.
  - b. For crimp-type connections, use only tools that are specified by the manufacturer for the application.
  - c. 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.
  - d. Wire nuts, electrical tape or "Scotch Lock" connections are not acceptable for any application.
15. Noise filters and surge protectors shall be provided, as needed, to ensure protection from input primary AC power surges and noise glitches are not induced into low Voltage data circuits.

- E. Cable Installation- Comply with the **MANDATORY** infrastructure requirements outlined in VA Construction Specifications 27 10 00 – Structured TIP Communications Cabling, 27 11 00 – TIP Communications Rooms and Fittings and 27 15 00 – TIP Communications Horizontal and Vertical Cabling, as well as the following additional practices:
1. Support cable on maximum 2'-0" centers. Acceptable means of cable support are cable tray, j-hooks, and bridal rings. Velcro wrap cable bundles loosely to the means of support with plenum rated Velcro straps. Plastic tie wraps are not acceptable as a means to bundle cables.
  2. Run cables parallel to walls.
  3. Install maximum of 10 cables in a single row of J-hooks. Provide necessary rows of J-hooks as required by the number of cables.
  4. 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.
  5. Ends of cables shall be properly terminated on both ends per industry and OEM's recommendations.
  6. Provide proper temporary protection of cable after pulling and before final dressing and terminations are complete. Do not leave cable lying on floor. Bundle and tie wrap up off of the floor until you are ready to terminate.
  8. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
  9. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
  10. Bundle, lace, and train conductors to terminal points without exceeding OEM's limitations on bending radii. Install lacing bars and distribution spools.
  11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.
  12. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.
  13. Separation of Wires: (REFER TO RACEWAY INSTALLATION) Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.
  14. Service all cables as follows:

- a. Cover the end of the overall jacket with a 1" (minimum) length of transparent heat-shrink tubing. Cut unused insulated conductors 2" (minimum) past the heat-shrink, fold back over jacket and secure with cable-tie. Cut unused shield/drain wires 2" (minimum) past the heatshrink and serve as indicated below.
  - b. Cover shield/drain wires with heat-shrink tubing extending back to the overall jacket. Extend tubing ¼" past the end of unused wires, fold back over jacket and secure with cable tie.
  - c. For each solder-type connection, cover the bare wire and solder connection with heat-shrink tubing.
- F. Labeling: Provide labeling in accordance with ANSI/EIA/TIA-606-A. All lettering for Nurse Call and/or Code Blue circuits shall be stenciled using either laser printers or thermal ink transfer process.
1. Cable and Wires (Hereinafter referred to as "Cable"): Cables shall be labeled at both ends in accordance with ANSI/EIA/TIA-606-A. Labels shall be permanent in contrasting colors. Cables shall be identified according to the System "Record Wiring Diagrams."
  2. Equipment: System equipment shall be permanently labeled with contrasting plastic laminate or Bakelite material. System equipment shall be labeled on the face of the unit corresponding to its source.
    - a. Clearly, consistently, logically and permanently mark switches, connectors, jacks, relays, receptacles and electronic and other equipment.
    - b. Engrave and paint fill all receptacle panels using 1/8" (minimum) high lettering and contrasting paint.
    - c. For rack-mounted equipment, use engraved Lamacoid labels with white 1/8" (minimum) high lettering on black background. Label the front and back of all rack-mounted equipment.
  3. Conduit, Cable Duct, and/or Cable Tray: The Contractor shall label all conduit, duct and tray, including utilized GFE, with permanent marking devices or spray painted stenciling a minimum of 3 meters (10 ft.) identifying it as the System. In addition, each enclosure shall be labeled according to this standard.
  4. Termination Hardware: The Contractor shall label TCOs and patch panel connections using color coded labels with identifiers in accordance with ANSI/EIA/TIA-606-A and the "Record Wiring Diagrams."
  5. Where multiple pieces of equipment reside in the same rack group, clearly and logically label each indicating to which room, channel, receptacle location, etc. they correspond.

6. Permanently label cables at each end, including intra-rack connections. Labels shall be covered by the same, transparent heat-shrink tubing covering the end of the overall jacket. Alternatively, computer generated labels of the type which include a clear protective wrap may be used.
7. Contractor's name shall appear no more than once on each continuous set of racks. The Contractor's name shall not appear on wall plates or portable equipment.
8. Ensure each OEM supplied item of equipment has appropriate UL Labels / Marks for the service the equipment is performed permanently attached / marked to a ***non-removal*** board in the unit. **EQUIPMENT INSTALLED NOT BEARING THESE UL MARKS WILL NOT BE ALLOWED TO BE A PART OF THE SYSTEM. THE CONTRACTOR SHALL BEAR ALL COSTS REQUIRED TO PROVIDE REPLACEMENT EQUIPMENT WITH APPROVED UL MARKS.**

G. Conduit and Signal Ducts:

1. Ensure that any incidental conduit, raceway or ductwork that needs to be separately furnished and/or installed by this Contractor conforms to and is installed in the same manner as that furnished and installed by the Electrical Contractor, as part of system rough-in.

**3.5 PROTECTION OF NETWORK DEVICES**

- A. Contractor shall protect network devices during unpacking and installation by wearing manufacturer approved electrostatic discharge (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.

**3.6 CUTTING, 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 be responsible for providing any additional cutting, drilling, fitting or patching required that is not indicated as provided by others to complete the Work or to make its parts fit together properly.
- D. The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not



unreasonably withhold from the Owner or a separate Contractor the Contractor's consent to cutting or otherwise altering the Work.

- E. Where coring of existing (previously installed) concrete is specified or required, including coring indicated under unit prices, the location of such coring shall be clearly identified in the field and the location shall be approved by the Project Manager prior to commencement of coring work.

### **3.7 FIREPROOFING**

- A. Where Nurse Call and/or Code Blue wires, cables and conduit penetrate fire rated walls, floors and ceilings, fireproof the opening.
- B. Provide conduit sleeves (if not already provided by electrical contractor) for cables that penetrate fire rated walls and Telecommunications Rooms floors and ceilings. After the cabling installation is complete, install fire proofing material in and around all conduit sleeves and openings. Install fire proofing material thoroughly and neatly. Seal all floor and ceiling penetrations.
- C. Use only materials and methods that preserve the integrity of the fire stopping system and its rating.
- D. Install fireproofing where low voltage cables are installed in the same manholes with high voltage cables; also cover the low voltage cables with arc proof and fireproof tape.
- E. Use approved fireproofing tape of the same type as used for the high voltage cables, and apply the tape in a single layer, one-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 (one inch) into each duct.
- F. Secure the tape in place by a random wrap of glass cloth tape.

### **3.8 GROUNDING**

- A. Ground Nurse Call and/or Code Blue cable shields and equipment to eliminate shock hazard and to minimize ground loops, common mode returns, noise pickup, cross talk, and other impairments as specified in CFM Division 27, Section 27 05 26 – Grounding and Bonding for Communications Systems.
- B. Facility Signal Ground Terminal: Locate at main room or area signal ground within the room (i.e. head end and telecommunications rooms) or area(s) and indicate each signal ground location on the drawings.
- C. Extend the signal ground to inside each equipment cabinet and/or rack. Ensure each cabinet and/or rack installed item of equipment is connected to the extended signal ground. Isolate the signal ground from power and major equipment grounding systems.
- D. When required, install grounding electrodes as specified in CFM Division 26, Section 26 05 26 – Grounding and Bonding for Electrical Systems.

- E. Do not use “3<sup>rd</sup> or 4<sup>th</sup>” wire internal electrical system conductors for communications signal ground.
- F. Do not connect the signal ground to the building’s external lightning protection system.
- G. Do Not “mix grounds” of different systems.
- H. Insure grounds of different systems are installed as to not violate OSHA Safety and NEC installation requirements for protection of personnel.

#### **PART 4 – TESTING / GUARANTY / TRAINING**

##### **4.0 SYSTEM LISTINGS**

The Nurse Call System is NFPA listed as an “Emergency” Communication system. At locations in the facility where Code Blue signals are transmitted, that listing is elevated to “Life Support/Safety.” Therefore, the following testing and guaranty provisions are the minimum to be performed and provided by the contractor and warranted by the OEM.

##### **4.1 PROOF OF PERFORMANCE TESTING**

- A. Intermediate Testing:
  - 1. After completion of 30 – 40% of the installation of a head end cabinet(s) **and interconnection to the corresponding System Patient Head Wall Units** and equipment, one master station, local and remote stations, treatment rooms, and prior to any further work, this portion of the system must be pretested, inspected, and certified. Each item of installed equipment shall be checked to ensure appropriate UL Listing and Certification Labels are affixed as required by NFPA -Life Safety Code 101-3.2 (a) & (b), UL Nurse Call Standard 1069 and JCHCO evaluation guidelines, and proper installation practices are followed. The intermediate test shall include a full operational test.
  - 2. All inspections and tests shall be conducted by an OEM-certified contractor representative and witnessed by TVE-005OP3B, if there is no local Government Representative that processes OEM and VA approved Credentials to inspect and certify the system. The results of the inspection will be officially recorded by the Government Representative and maintained on file by the RE, until completion of the entire project. The results will be compared to the Acceptance Test results. An identical inspection may be conducted between the 65 - 75% of the system construction phase, at the direction of the RE.
- B. Pretesting:
  - 1. Upon completing installation of the Nurse Call and/or Code Blue System, the Contractor shall align, balance, and completely pretest the entire system under full operating conditions.
  - 2. Pretesting Procedure:
    - a. During the System Pretest the Contractor shall verify (utilizing approved test equipment) that the System is fully operational and meets all the System performance requirements of this standard.

- b. The Contractor shall pretest and verify that all PSM System functions and specification requirements are met and operational, no unwanted aural effects, such as signal distortion, noise pulses, glitches, audio hum, poling noise, etc. are present.
    - 1) All components of the system shall be pretested "by area", as dictated by job progress and completion.
  3. The Contractor shall provide four (4) copies of the recorded system pretest measurements and the written certification that the System is ready for the formal acceptance test shall be submitted to the RE.
- C. Acceptance Test:
1. After complying with all pretest requirements (by area if necessary), the Contractor shall schedule an acceptance test date, giving the RE 15 working days written notice prior to the date the tests are expected to begin. If elsewhere required as part of this project, the System shall be tested in the presence of a TVE 005OP3B and OEM certified representatives. The System shall be tested utilizing approved test equipment to certify proof of performance and Life Safety / Critical Service compliance. Tests shall verify that the total System meets all the requirements of this specification. The notification of the acceptance test shall include the expected length (in time) of the test.
  2. The acceptance test shall be performed on a "go-no-go" basis. Only those operator adjustments required to show proof of performance shall be allowed. The test shall demonstrate and verify that the installed System does comply with all requirements of this specification under operating conditions. The System shall be rated as either acceptable or unacceptable at the conclusion of the test. Failure of any part of the System that precludes completion of system testing, and which cannot be repaired in four (4) hours, shall be cause for terminating the acceptance test of the System. Repeated failures that result in a cumulative time of eight (8) hours to affect repairs shall cause the entire System to be declared unacceptable.
  3. Retesting of the entire System shall be rescheduled at the convenience of the Government and costs borne by the Contractor at the direction of the SRE.
- D. Acceptance Test Procedure:
1. Physical and Mechanical Inspection:
    - a. The VA and/or TVE 005OP3B Representative will tour all major areas where the System and all sub-systems are completely and properly installed to insure they are operationally ready for proof of performance testing. A system inventory including available spare parts will be taken at this time. Each item of installed equipment shall be checked to ensure appropriate UL certification labels are affixed.

- b. The System diagrams, record drawings, equipment manuals, TIP Auto CAD Disks, intermediate, and pretest results shall be formally inventoried and reviewed.
  - c. Failure of the System to meet the installation requirements of this specification shall be grounds for terminating all testing.
2. Operational Test:
- a. After the Physical and Mechanical Inspection, the central terminating and nurse call master control equipment shall be checked to verify that it meets all performance requirements outlined herein.
  - b. Following the central equipment test, a pillow speaker (or on board speaker) shall be connected to the central terminating and nurse call master control equipment's output tap to ensure there are no signal distortions such as intermodulation, data noise, popping sounds, erratic system functions, on any function.
  - c. The distribution system shall be checked at each interface, junction, and distribution point, first, middle, and last intersectional, room, and bed dome light in each leg to verify that the nurse call distribution system meets all system performance standards.
  - d. Each MATV outlet that is controlled by a nurse call pillow speaker shall be functionally tested at the same time utilizing the Contractor's approved hospital grade HDTV receiver and TV remote control cable.
  - e. Additionally, each installed emergency, patient, staff, duty, panic station, intersectional, room, and bed dome light, power supply, code one, and remote annunciator panels shall be checked insuring they meet the requirements of this specification.
  - f. Once these tests have been completed, each installed sub-system function shall be tested as a unified, functioning and fully operating system. The typical functions are: nurse follower, three levels of emergency signaling (i.e. flashing red emergency, flashing white patient emergency, flashing white or combination lights for staff emergency, separate flashing code blue), minimum of 10 minutes of UPS operation, memory saving, minimum of ten station audio paging, canceling emergency calls at each originating station only, and storage and prioritizing of calls.
  - g. Individual Item Test: The TVE 005OP3B Representative will select individual items of equipment for detailed proof of performance testing until 100% of the System has been tested and found to meet the contents of this specification. Each item shall meet or exceed the minimum requirements of this document.
3. Test Conclusion:
- a. At the conclusion of the Acceptance Test, using the generated punch list (or discrepancy list) the VA and the Contractor shall jointly agree to the results of the test, and reschedule

testing on deficiencies and shortages with the RE. Any retesting to comply with these specifications will be done at the Contractor's expense.

- b. If the System is declared unacceptable without conditions, all rescheduled testing expenses will be borne by the Contractor.

E. Acceptable Test Equipment:

The test equipment to be furnished by the Contractor shall have a calibration tag of an acceptable calibration service dated not more than 12 months prior to the date of test. As part of the submittal, a test equipment list shall be furnished that includes the make and model number of the following type of equipment as a minimum:

1. Spectrum Analyzer.
2. Signal Level Meter.
3. Volt-Ohm Meter.
4. Sound Pressure Level (SPL) Meter.
5. Oscilloscope.
6. Pillow Speaker Test Set (Pillow Speaker with appropriate load and cross connections in lieu of the set is acceptable).
7. Patient Push Button Cord Test Set.
8. Patient Bed with connecting multiple conductor cord.

#### 4.2 SYSTEM GUARANTEE PERIOD OF SERVICE

A. Contractor's Responsibility:

1. The Contractor shall guarantee that all provided material and equipment will be free from defects, workmanship and will remain so for a period of **one year** from date of final acceptance of the System by the VA. The Contractor shall provide OEM's equipment warranty documents, to the RE (or Facility Contracting Officer if the Facility has taken possession of the building), that certifies each item of equipment installed conforms to OEM published specifications.
2. The Contractor's maintenance personnel shall have the ability to contact the Contractor and OEM for emergency maintenance and logistic assistance, remote diagnostic testing, and assistance in resolving technical problems at any time. This contact capability shall be provided by the Contractor and OEM at no additional cost to the VA.
3. All Contractor maintenance and supervisor personnel shall be fully qualified by the OEM and must provide two (2) copies of current and qualified OEM training certificates and OEM certification upon request.
4. Additionally, the Contractor shall accomplish the following minimum requirements during the guaranty period:

- a. Response Time during the Guaranty Period:
  - 1) The RE (or Facility Contracting Officer if the system has been turned over to the Facility) is the Contractor's ONLY OFFICIAL reporting and contact official for nurse call system trouble calls, during the guaranty period.
  - 2) A standard work week is considered 8:00 A.M. to 5:00 P.M. or as designated by the RE (or Facility Contracting Officer), Monday through Friday exclusive of Federal Holidays.
  - 3) The Contractor shall respond and correct on-site trouble calls, during the standard work week to:
    - a) 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 cordset, one (1) master nurse control station, patient station, emergency station, or dome light to be inoperable.
    - b) 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.
    - c) 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 anytime.
  - 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.
- b. Required On-Site Visits during the **One Year** Guaranty Period
  - 1) The Contractor shall visit, on-site, for a minimum of eight (8) hours, once every 12 weeks, during the guaranty period, to perform system preventive maintenance, equipment cleaning, and operational adjustments to maintain the System according the descriptions identified in this document.

- 2) The Contractor shall arrange all Facility visits with the RE (or Facility Contracting Officer) prior to performing the required maintenance visits.
  - 3) Preventive maintenance shall be performed by the Contractor in accordance with the OEM's recommended practice and service intervals during non-busy time agreed to by the COR and Contractor.
  - 4) The preventive maintenance schedule, functions and reports shall be provided to and approved by the COR.
  - 5) The Contractor shall provide the COR a type written report itemizing each deficiency found and the corrective action performed during each required visit or official reported trouble call. The Contractor shall provide the COR with sample copies of these reports for review and approval at the beginning of the Acceptance Test. The following reports are the minimum required:
    - a) The Contractor shall provide a monthly summary of all equipment and sub-systems serviced during this guarantee period to COR by the fifth (5<sup>th</sup>) working day after the end of each month. The report shall clearly and concisely describe the services rendered, parts replaced and repairs performed. The report shall prescribe anticipated future needs of the equipment and systems for preventive and predictive maintenance.
    - b) The Contractor shall maintain a separate log entry for each item of equipment and each sub-system of the System. The log shall list dates and times of all scheduled, routine, and emergency calls. Each emergency call shall be described with details of the nature and causes of emergency steps taken to rectify the situation and specific recommendations to avoid such conditions in the future.
  - 6) The COR shall convey to the Facility Engineering Officer, two (2) copies of actual reports for evaluation.
    - a) The COR shall ensure a copy of these reports is entered into the System's official acquisition documents.
    - b) The COR shall ensure a copy of these reports is entered into the System's official technical record documents.
- B. Work Not Included: Maintenance and repair service shall not include the performance of any work due to improper use; accidents; other vendor, contractor, or owner tampering or negligence, for which the Contractor is not directly responsible and does not control. The Contractor shall immediately notify the COR in writing upon the discovery of these incidents. The RE or Facility Contracting Officer will investigate all reported incidents and render final decisions.

#### 4.3 TRAINING

- A. Provide thorough training for all staff assigned to those nursing units receiving new (or upgraded) nurse/patient communications equipment as part of this project.
  - 1. This training shall be developed and implemented to address three (3) different types of staff-
    - a. Floor nurses/staff shall receive training from their perspective, and likewise,
    - b. Unit secretaries (or any person whose specific responsibilities include answering patient calls and dispatching staff) shall receive operational training from their perspective.
    - c. BioMed/ Electronic Shop Staff shall receive both system overview and specific maintenance training.
  - 2. Training shall be conducted in one (or more) of the new patient care rooms, prior to occupancy, at a location designated by the project manager.
- B. Prior to the date when occupancy in each of the project areas is expected, set a date, time and place to conduct training. Meet with the PM to schedule this training directly with the Nursing Staff, who will be assigned to use this system.
- C. Training sessions to be scheduled as follows:
  - 1. Prior to occupancy, provide a total of **16** hours training (by floor/unit being modified), to be offered in 2-4 hour increments and spread out over a 1-2 week period, so that personnel on all shifts are allowed the opportunity to participate.
  - 2. After occupancy and during the opening week, provide a total of **12** hours additional training (per floor/ unit), to be either scheduled or offered on an “as needed” basis.
  - 3. **16** hours for supervisors and system administrators.
  - 4. **8** hours for BioMed and Electronic Shop personnel, broken into time blocks as requested by those personnel.

--- E N D ---



**SECTION 27 52 41  
MISCELLANEOUS MEDICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies miscellaneous medical equipment and systems including Elapsed Time Indicators.

**1.2 RELATED WORK**

- A. Low-voltage electric locks and monitoring system: Section 28 13 00, ACCESS CONTROL.
- B. General electrical requirements and items common to more than one section of Division 28: Section 28 05 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY.
- C. Cables and wiring: Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW).
- D. Requirements for personal safety and to provide a low impedance path for possible ground fault currents: Section 28 05 26, GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.

**PART 2 - PRODUCTS**

**2.1 MEDICAL ELAPSED TIME INDICATORS**

- A. Provide 0-60 minute range, plus or minus 3 percent of full scale instrument accuracy, medical elapsed time indicator clock.
  - 1. Provide 300 mm (12 inch) dial, flush or semi-flush mounted.
  - 2. Provide minute hand and sweep-second hand.
  - 3. Provide black on white, large digits at 5-minute intervals and individual second markings.
  - 4. Provide completely enclosed synchronous motor.
  - 5. Provide shock-resistant and dust-proof metal enclosure.
- B. Provide automatic and manual operation, with controls on front of panel and terminals inside panel for connecting remote equipment, which actuates automatic operation.
  - 1. Provide reset switch mounted on front panel; switch resets indicator to zero within five seconds after its momentary activation.
- C. Power Supply: 120 volts, 60 Hz.

- D. Provide solid-state clock with equivalent operational readability, electronic, digital type, and medical elapsed time indicators. Provide with LED display; minimum 65 mm (2-1/2 inch) high numerals.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install wiring in conduit.
- B. Install in accordance with manufacturer's instructions and as indicated.

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

- A. Demonstrate that miscellaneous medical systems operate properly in presence of COR.
- B. Test and adjust controls and safeties.
- C. Replace or repair malfunctioning controls, safeties, and equipment not accepted by Government.

--- E N D ---

**SECTION 28 13 00  
PHYSICAL ACCESS CONTROL SYSTEM**

**PART 1 – GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the finishing, installation, connection, testing and certification of a complete and fully operating Physical Access Control System, hereinafter referred to as the PACS.
- B. This Section includes a Physical Access Control System consisting of a system server, [one or more networked workstation computers,] operating system and application software, and field-installed Controllers connected by a high-speed electronic data transmission network. The PACS shall have the following:
  - 1. Physical Access Control:
    - a. Regulating access through doors
    - b. Credential cards and readers
    - c. Push-button switches
    - d. RS-232 ASCII interface
    - e. Monitoring of field-installed devices
  - 2. Security:
    - a. <PACs Johnson Control system.>
- C. System Architecture:
  - 1. Criticality, operational requirements, and/or limiting points of failure may dictate the development of an enterprise and regional server architecture as opposed to system capacity. Provide server and workstation configurations with all necessary connectors, interfaces and accessories as shown.
- D. PACS shall provide secure and reliable identification of Federal employees and contractors by utilizing credential authentication per FIPS-201.
- E. Physical Access Control System (PACS) shall consist of:
  - 1. Field installed controllers,
  - 2. Card readers,
  - 3. Supportive information system,
  - 4. Door locks and sensors,
  - 5. Power supplies,
  - 6. Interfaces with:
    - a. Automatic door operators,
    - b. Intrusion Detection System,
    - c. Intercommunication System
    - d. Fire Protection System,

## 1.2 RELATED WORK

- A. Section 01 00 00 - GENERAL REQUIREMENTS. For General Requirements.
- B. Section 07 84 00 - FIRESTOPPING. Requirements for firestopping application and use.
- C. Section 08 71 00 - DOOR HARDWARE. Requirements for door installation.
- D. Section 10 14 00 - SIGNAGE. Requirements for labeling and signs.
- E. Section 26 05 21 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW). Requirements for power cables.
- F. Section 26 05 33 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS. Requirements for infrastructure.
- G. Section 28 26 00 - ELECTRONIC PERSONAL PROTECTION SYSTEM (EPPS). Requirements for emergency and interior communications.
- H. Section 28 31 00 - FIRE DETECTION AND ALARM. Requirements for integration with fire detection and alarm system.

## 1.3 QUALITY ASSURANCE

- A. The Contractor shall be responsible for providing, installing, and the operation of the PACS as shown. The Contractor shall also provide certification as required.
- B. The security system will be installed and tested to ensure all components are fully compatible as a system and can be integrated with all associated security subsystems, whether the security system is stand-alone or a part of a complete Information Technology (IT) computer network.
- C. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.
- D. Product Qualifications:
  - 1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
  - 2. The Government reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.
- E. Contractor Qualifications:
  - 1. The Contractor or security sub-contractor shall be a licensed security Contractor with a minimum of five (5) years experience installing and servicing systems of similar scope and complexity. The Contractor shall be an authorized regional representative of the Security Management System's (PACS) manufacturer. The Contractor shall provide four (4) current references from clients with systems of similar scope and complexity which became operational in the past three (3) years. At least three (3) of the references shall be utilizing the same system components, in a similar configuration as the proposed system. The

references must include a current point of contact, company or agency name, address, telephone number, complete system description, date of completion, and approximate cost of the project. The owner reserves the option to visit the reference sites, with the site owner's permission and representative, to verify the quality of installation and the references' level of satisfaction with the system. The Contractor shall provide copies of system manufacturer certification for all technicians. The Contractor shall only utilize factory-trained technicians to install, program, and service the PACS. The Contractor shall only utilize factory-trained technicians to install, terminate and service controller/field panels and reader modules. The technicians shall have a minimum of five (5) continuous years of technical experience in electronic security systems. The Contractor shall have a local service facility. The facility shall be located within 60 miles of the project site. The local facility shall include sufficient spare parts inventory to support the service requirements associated with this contract. The facility shall also include appropriate diagnostic equipment to perform diagnostic procedures. The Resident Engineer reserves the option of surveying the company's facility to verify the service inventory and presence of a local service organization.

- a. The Contractor shall provide proof project superintendent with BICSI Certified Commercial Installer Level 1, Level 2, or Technician to provide oversight of the project.
  - b. Cable installer must have on staff a Registered Communication Distribution Designer (RCDD) certified by Building Industry Consulting Service International. The staff member shall provide consistent oversight of the project cabling throughout design, layout, installation, termination and testing.
- F. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

#### **1.4 SUBMITTALS**

- A. Submit below items in conjunction with Master Specification Sections 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, Section 02 41 00, DEMOLITION, and Section 28 05 00 COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY.
- B. Provide certificates of compliance with Section 1.3, Quality Assurance.
- C. Provide a complete and thorough pre-installation and as-built design package in both electronic format and on paper, minimum size 48 x 48 inches (1220 x 1220 millimeters); drawing submittals shall be per the established project schedule.
- D. Shop drawing and as-built packages shall include, but not be limited to:
  1. Index Sheet that shall:
    - a. Define each page of the design package to include facility name, building name, floor, and sheet number.

- b. Provide a complete list of all security abbreviations and symbols.
- c. Reference all general notes that are utilized within the design package.
- d. Specification and scope of work pages for all individual security systems that are applicable to the design package that will:
  - 1) Outline all general and job specific work required within the design package.
  - 2) Provide a detailed device identification table outlining device Identification (ID) and use for all security systems equipment utilized in the design package.
- E. Pre-installation design packages shall go through a full review process conducted by the Contractor along with a VA representative to ensure all work has been clearly defined and completed. All reviews shall be conducted in accordance with the project schedule. There shall be four (4) stages to the review process:
  1. 35 percent
  2. 65 percent
  3. 90 percent
  4. 100 percent
- F. Provide manufacturer security system product cut-sheets. Submit for approval at least 30 days prior to commencement of formal testing, a Security System Operational Test Plan. Include procedures for operational testing of each component and security subsystem, to include performance of an integrated system test.
- G. Submit manufacture's certification of Underwriters Laboratories, Inc. (UL) listing as specified. Provide all maintenance and operating manuals per Section 01 00 00, GENERAL REQUIREMENTS, and Section 28 05 00 COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY.
- H. General: Submittals shall be in full compliance of the Contract Documents. All submittals shall be provided in accordance with this section. Submittals lacking the breath or depth these requirements will be considered incomplete and rejected. Submissions are considered multidisciplinary and shall require coordination with applicable divisions to provide a complete and comprehensive submission package. Additional general provisions are as follows:
  1. The Contractor shall schedule submittals in order to maintain the project schedule. For coordination drawings refer to Specification Section 01 33 10 - DESIGN SUBMITTAL PROCEDURES, which outline basic submittal requirements and coordination. Section 01 33 10 shall be used in conjunction with this section.
  2. The Contractor shall identify variations from requirements of Contract Documents and state product and system limitations, which may be detrimental to successful performance of the completed work or system.

3. Each package shall be submitted at one (1) time for each review and include components from applicable disciplines (e.g., electrical work, architectural finishes, door hardware, etc.) which are required to produce an accurate and detailed depiction of the project.
4. Manufacturer's information used for submittal shall have pages with items for approval tagged, items on pages shall be identified, and capacities and performance parameters for review shall be clearly marked through use of an arrow or highlighting. Provide space for Resident Engineer and Contractor review stamps.
5. Technical Data Drawings shall be in the latest version of AutoCAD®, drawn accurately, and in accordance with VA CAD Standards. FREEHAND SKETCHES OR COPIED VERSIONS OF THE CONSTRUCTION DOCUMENTS WILL NOT BE ACCEPTED. The Contractor shall not reproduce Contract Documents or copy standard information as the basis of the Technical Data Drawings. If departures from the technical data drawings are subsequently deemed necessary by the Contractor, details of such departures and the reasons thereof shall be submitted in writing to the Resident Engineer for approval before the initiation of work.
6. Packaging: The Contractor shall organize the submissions according to the following packaging requirements.
  - a. Binders: For each manual, provide heavy duty, commercial quality, durable three (3) ring vinyl covered loose leaf binders, sized to receive 8.5 x 11 in paper, and appropriate capacity to accommodate the contents. Provide a clear plastic sleeve on the spine to hold labels describing the contents. Provide pockets in the covers to receive folded sheets.
    - 1) Where two (2) or more binders are necessary to accommodate data, correlate data in each binder into related groupings according to the Project Manual table of contents. Cross-referencing other binders where necessary to provide essential information for communication of proper operation and or maintenance of the component or system.
    - 2) Identify each binder on the front and spine with printed binder title, Project title or name, and subject matter covered. Indicate the volume number if applicable.
  - b. Dividers: Provide heavy paper dividers with celluloid tabs for each Section. Mark each tab to indicate contents.
  - c. Protective Plastic Jackets: Provide protective transparent plastic jackets designed to enclose diagnostic software for computerized electronic equipment.
  - d. Text Material: Where written material is required as part of the manual use the manufacturer's standard printed material, or if not available, specially prepared data, neatly typewritten on 8.5 inches by 11 inches 20 pound white bond paper.

- e. Drawings: Where drawings and/or diagrams are required as part of the manual, provide reinforced punched binder tabs on the drawings and bind them with the text.
  - 1) Where oversized drawings are necessary, fold the drawings to the same size as the text pages and use as a foldout.
  - 2) If drawings are too large to be used practically as a foldout, place the drawing, neatly folded, in the front or rear pocket of the binder. Insert a type written page indicating the drawing title, description of contents and drawing location at the appropriate location of the manual.
  - 3) Drawings shall be sized to ensure details and text is of legible size. Text shall be no less than 1/16" tall.
- f. Manual Content: In each manual include information specified in the individual Specification section, and the following information for each major component of building equipment and controls:
  - 1) General system or equipment description.
  - 2) Design factors and assumptions.
  - 3) Copies of applicable Shop Drawings and Product Data.
  - 4) System or equipment identification including: manufacturer, model and serial numbers of each component, operating instructions, emergency instructions, wiring diagrams, inspection and test procedures, maintenance procedures and schedules, precautions against improper use and maintenance, repair instructions, sources of required maintenance materials and related services, and a manual index.
- g. Binder Organization: Organize each manual into separate sections for each piece of related equipment. At a minimum, each manual shall contain a title page, table of contents, copies of Product Data supplemented by drawings and written text, and copies of each warranty, bond, certifications, and service Contract issued. Refer to Group I through V Technical Data Package Submittal requirements for required section content.
- h. Title Page: Provide a title page as the first sheet of each manual to include the following information; project name and address, subject matter covered by the manual, name and address of the Project, date of the submittal, name, address, and telephone number of the Contractor, and cross references to related systems in other operating and/or maintenance manuals.
- i. Table of Contents: After the title page, include a type written table of contents for each volume, arranged systematically according to the Project Manual format. Provide a list of each product included, identified by product name or other appropriate identifying symbols and indexed to the content of the volume. Where more than one (1) volume is



- required to hold data for a particular system, provide a comprehensive table of contents for all volumes in each volume of the set.
- j. General Information Section: Provide a general information section immediately following the table of contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the installer and maintenance Contractor. In addition, list a local source for replacement parts and equipment.
  - k. Drawings: Provide specially prepared drawings where necessary to supplement the manufacturers printed data to illustrate the relationship between components of equipment or systems, or provide control or flow diagrams. Coordinate these drawings with information contained in Project Record Drawings to assure correct illustration of the completed installation.
  - l. Manufacturer's Data: Where manufacturer's standard printed data is included in the manuals, include only those sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where more than one (1) item in tabular format is included, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation and delete references to information which is not applicable.
  - m. Where manufacturer's standard printed data is not available and the information is necessary for proper operation and maintenance of equipment or systems, or it is necessary to provide additional information to supplement the data included in the manual, prepare written text to provide the necessary information. Organize the text in a consistent format under a separate heading for different procedures. Where necessary, provide a logical sequence of instruction for each operating or maintenance procedure. Where similar or more than one product is listed on the submittal the Contractor shall differentiate by highlighting the specific product to be utilized.
  - n. Calculations: Provide a section for circuit and panel calculations.
  - o. Loading Sheets: Provide a section for DGP Loading Sheets.
  - p. Certifications: Provide section for Contractor's manufacturer certifications.
7. Contractor Review: Review submittals prior to transmittal. Determine and verify field measurements and field construction criteria. Verify manufacturer's catalog numbers and conformance of submittal with requirements of contract documents. Return non-conforming or incomplete submittals with requirements of the work and contract documents. Apply Contractor's stamp with signature certifying the review and verification of products occurred, and the field dimensions, adjacent construction, and coordination of information is in accordance with the requirements of the contract documents.

8. Resubmission: Revise and resubmit submittals as required within 15 calendar days of return of submittal. Make resubmissions under procedures specified for initial submittals. Identify all changes made since previous submittal.
9. Product Data: Within 15 calendar days after execution of the contract, the Contractor shall submit for approval a complete list of all of major products proposed for use. The data shall include name of manufacturer, trade name, model number, the associated contract document section number, paragraph number, and the referenced standards for each listed product.
- I. Group 1 Technical Data Package: Group I Technical Data Package shall be one submittal consisting of the following content and organization. Refer to VA Special Conditions Document for drawing format and content requirements. The data package shall include the following:
  1. Section I - Drawings:
    - a. General – Drawings shall conform to VA Special Conditions and CAD Standards Documents. All text associated with security details shall be 1/8" tall and meet VA text standard for AutoCAD™ drawings.
    - b. Cover Sheet – Cover sheet shall consist of Project Title and Address, Project Number, Area and Vicinity Maps.
- J. Group II Technical Data Package
  1. The Contractor shall prepare a report of "Current Site Conditions" and submit a report to the Resident Engineer documenting changes to the site, particularly those conditions that affect performance of the system to be installed. The Contractor shall provide specification sheets, or written functional requirements to support the findings, and a cost estimate to correct those site changes or conditions which affect the installation of the system or its performance. The Contractor shall not correct any deficiency without written permission from the COR.
  2. System Configuration and Functionality: The contractor shall provide the results of the meeting with VA to develop system requirements and functionality including but not limited to:
    - a. Baseline configuration
    - b. Access levels
    - c. Schedules (intrusion detection, physical access control, holidays, etc.)
    - d. Badge database
    - e. System monitoring and reporting (unit level and central control)
    - f. Naming conventions and descriptors
- K. Group III Technical Data Package
  1. Development of Test Procedures: The Contractor will prepare performance test procedures for the system testing. The test procedures shall follow the format of the VA Testing procedures and be customized to the contract requirements. The Contractor will deliver the

test procedures to the Resident Engineer for approval at least 60 calendar days prior to the requested test date.

L. Group IV Technical Data Package

1. Performance Verification Test

a. Based on the successful completion of the pre-delivery test, the Contractor shall finalize the test procedures and report forms for the performance verification test (PVT) and the endurance test. The PVT shall follow the format, layout and content of the pre-delivery test. The Contractor shall deliver the PVT and endurance test procedures to the Resident Engineer for approval. The Contractor may schedule the PVT after receiving written approval of the test procedures. The Contractor shall deliver the final PVT and endurance test reports within 14 calendar days from completion of the tests. Refer to Part 3 of this section for System Testing and Acceptance requirements.

2. Training Documentation

a. New Facilities and Major Renovations: Familiarization training shall be provided for new equipment or systems. Training can include site familiarization training for VA technicians and administrative personnel. Training shall include general information on new system layout including closet locations, turnover of the completed system including all documentation, including manuals, software, key systems, and full system administration rights. Lesson plans and training manuals training shall be oriented to type of training to be provided.

b. New Unit Control Room:

- 1) Provide the security personnel with training in the use, operation, and maintenance of the entire control room system (Unit Control and Equipment Rooms). The training documentation must include the operation and maintenance. The first of the training sessions shall take place prior to system turnover and the second immediately after turnover. Coordinate the training sessions with the Owner. Completed classroom sessions will be witnessed and documented by the Architect/Engineer, and approved by the COR. Instruction is not to begin until the system is operational as designed.
- 2) The training documents will cover the operation and the maintenance manuals and the control console operators' manuals and service manuals in detail, stressing all important operational and service diagnostic information necessary for the maintenance and operations personnel to efficiently use and maintain all systems.
- 3) Provide an illustrated control console operator's manual and service manual. The operator's manual shall be written in laymen's language and printed so as to become a permanent reference document for the operators, describing all control panel

- switch operations, graphic symbol definitions and all indicating functions and a complete explanation of all software.
- 4) The service manual shall be written in laymen's language and printed so as to become a permanent reference document for maintenance personnel, describing how to run internal self diagnostic software programs, troubleshoot head end hardware and field devices with a complete scenario simulation of all possible system malfunctions and the appropriate corrective measures.
  - 5) Provide a professional color DVD instructional recording of all the operational procedures described in the operator's manual. All charts used in the training session shall be clearly presented on the video. Any DVD found to be inferior in recording or material content shall be reproduced at no cost until an acceptable DVD is submitted. Provide four copies of the training DVD, one to the architect/engineer and three to the owner.
3. System Configuration and Data Entry:
- a. The contractor is responsible for providing all system configuration and data entry for the SMS and subsystems (e.g., video matrix switch, intercom, digital video recorders, network video recorders). All data entry shall be performed per VA standards & guidelines. The Contractor is responsible for participating in all meetings with the client to compile the information needed for data entry. These meetings shall be established at the beginning of the project and incorporated in to the project schedule as a milestone task. The contractor shall be responsible for all data collection, data entry, and system configuration. The contractor shall collect, enter, & program and/or configure the following components:
    - 1) Physical Access control system components,
    - 2) All intrusion detection system components,
    - 3) Video surveillance, control and recording systems,
    - 4) Intercom systems components,
    - 5) All other security subsystems shown in the contract documents.
  - b. The Contractor is responsible for compiling the card access database for the VA employees, including programming reader configurations, access shifts, schedules, exceptions, card classes and card enrollment databases.
  - c. Refer to Part 3 for system programming requirements and planning guidelines.
4. Graphics: Based on CAD as-built drawings developed for the construction project, create all map sets showing locations of all alarms and field devices. Graphical maps of all alarm points installed under this contract including perimeter and exterior alarm points shall be delivered with the system. The Contractor shall create and install all graphics needed to

- make the system operational. The Contractor shall utilize data from the contract documents, Contractor's field surveys, and all other pertinent information in the Contractor's possession to complete the graphics. The Contractor shall identify and request from the COTR, any additional data needed to provide a complete graphics package. Graphics shall have sufficient level of detail for the system operator to assess the alarm. The Contractor shall supply hard copy, color examples at least 203.2 x 254 mm (8 x 10 in) of each type of graphic to be used for the completed Security system. The graphics examples shall be delivered to the COR for review and approval at least 90 calendar days prior to the scheduled date the Contractor requires them.
- M. Group V Technical Data Package: Final copies of the manuals shall be delivered to the COR as part of the acceptance test. The draft copy used during site testing shall be updated with any changes required prior to final delivery of the manuals. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of each sub-contractor installing equipment or systems, as well as the nearest service representatives for each item of equipment for each system. The manuals shall include a table of contents and tab sheets. Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix. The final copies delivered after completion of the endurance test shall include all modifications made during installation, checkout, and acceptance. Six (6) hard-copies and one (1) soft copy on CD of each item listed below shall be delivered as a part of final systems acceptance.
1. Functional Design Manual: The functional design manual shall identify the operational requirements for the entire system and explain the theory of operation, design philosophy, and specific functions. A description of hardware and software functions, interfaces, and requirements shall be included for all system operating modes. Manufacturer developed literature may be used; however, shall be produced to match the project requirements.
  2. Equipment Manual: A manual describing all equipment furnished including:
    - a. General description and specifications; installation and checkout procedures; equipment electrical schematics and layout drawings; system schematics and layout drawings; alignment and calibration procedures; manufacturer's repair list indicating sources of supply; and interface definition.
  3. Software Manual: The software manual shall describe the functions of all software and include all other information necessary to enable proper loading, testing, and operation. The manual shall include:
    - a. Definition of terms and functions; use of system and applications software; procedures for system initialization, start-up, and shutdown; alarm reports; reports generation, database format and data entry requirements; directory of all disk files; and description of all

communications protocols including data formats, command characters, and a sample of each type of data transfer.

4. Operator's Manual: The operator's manual shall fully explain all procedures and instructions for the operation of the system, including:
  - a. Computers and peripherals; system start-up and shutdown procedures; use of system, command, and applications software; recovery and restart procedures; graphic alarm presentation; use of report generator and generation of reports; data entry; operator commands' alarm messages, and printing formats; and system access requirements.
5. Maintenance Manual: The maintenance manual shall include descriptions of maintenance for all equipment including inspection, recommend schedules, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
6. Spare Parts & Components Data: At the conclusion of the Contractor's work, the Contractor shall submit to the Resident Engineer a complete list of the manufacturer's recommended spare parts and components required to satisfactorily maintain and service the systems, as well as unit pricing for those parts and components.
7. Operation, Maintenance & Service Manuals: The Contractor shall provide two (2) complete sets of operating and maintenance manuals in the form of an instructional manual for use by the VA Security Guard Force personnel. The manuals shall be organized into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder. If multiple volumes are required, each volume shall be fully indexed and coordinated.
8. Equipment and Systems Maintenance Manual: The Contractor shall provide the following descriptive information for each piece of equipment, operating system, and electronic system:
  - a. Equipment and/or system function.
  - b. Operating characteristics.
  - c. Limiting conditions.
  - d. Performance curves.
  - e. Engineering data and test.
  - f. Complete nomenclature and number of replacement parts.
  - g. Provide operating and maintenance instructions including assembly drawings and diagrams required for maintenance and a list of items recommended to stock as spare parts.
  - h. Provide information detailing essential maintenance procedures including the following: routine operations, trouble shooting guide, disassembly, repair and re-assembly, alignment, adjusting, and checking.
  - i. Provide information on equipment and system operating procedures, including the following; start-up procedures, routine and normal operating instructions, regulation and

- control procedures, instructions on stopping, shut-down and emergency instructions, required sequences for electric and electronic systems, and special operating instructions.
- j. Manufacturer equipment and systems maintenance manuals are permissible.
9. **Project Redlines:** During construction, the Contractor shall maintain an up-to-date set of construction redlines detailing current location and configuration of the project components. The redline documents shall be marked with the words 'Master Redlines' on the cover sheet and be maintained by the Contractor in the project office. The Contractor will provide access to redline documents anytime during the project for review and inspection by the Resident Engineer or authorized Office of Protection Services representative. Master redlines shall be neatly maintained throughout the project and secured under lock and key in the contractor's onsite project office. Any project component or assembly that is not installed in strict accordance with the drawings shall be so noted on the drawings. Prior to producing Record Construction Documents, the contractor will submit the Master Redline document to the Resident Engineer for review and approval of all changes or modifications to the documents. Each sheet shall have Resident Engineer initials indicating authorization to produce "As Built" documents. Field drawings shall be used for data gathering & field changes. These changes shall be made to the master redline documents daily. Field drawings shall not be considered "master redlines".
10. **Record Specifications:** The Contractor shall maintain one (1) copy of the Project Specifications, including addenda and modifications issued, for Project Record Documents. The Contractor shall mark the Specifications to indicate the actual installation where the installation varies substantially from that indicated in the Contract Specifications and modifications issued. (Note related Project Record Drawing information where applicable). The Contractor shall pay particular attention to substitutions, selection of product options, and information on concealed installations that would be difficult to identify or measure and record later. Upon completion of the mark ups, the Contractor shall submit record Specifications to the COR. As with master relines, Contractor shall maintain record specifications for Resident Engineer review and inspection at anytime.
11. **Record Product Data:** The Contractor shall maintain one (1) copy of each Product Data submittal for Project Record Document purposes. The Data shall be marked to indicate the actual product installed where the installation varies substantially from that indicated in the Product Data submitted. Significant changes in the product delivered to the site and changes in manufacturer's instructions and recommendations for installation shall be included. Particular attention will be given to information on concealed products and installations that cannot be readily identified or recorded later. Note related Change Orders and mark up of

- Record Construction Documents, where applicable. Upon completion of mark up, submit a complete set of Record Product Data to the COTR.
12. Miscellaneous Records: The Contractor shall maintain one (1) copy of miscellaneous records for Project Record Document purposes. Refer to other Specifications for miscellaneous record-keeping requirements and submittals concerning various construction activities. Before substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Categories of requirements resulting in miscellaneous records include, a minimum of the following:
    - a. Certificates received instead of labels on bulk products.
    - b. Testing and qualification of tradesmen. ("Contractor's Qualifications")
    - c. Documented qualification of installation firms.
    - d. Load and performance testing.
    - e. Inspections and certifications.
    - f. Final inspection and correction procedures.
    - g. Project schedule
  13. Record Construction Documents (Record As-Built)
    - a. Upon project completion, the contractor shall submit the project master redlines to the Resident Engineer prior to development of Record construction documents. The Resident Engineer shall be given a minimum of a thirty (30) day review period to determine the adequacy of the master redlines. If the master redlines are found suitable by the Resident Engineer, the Resident Engineer will initial and date each sheet and turn redlines over to the contractor for as built development.
    - b. The Contractor shall provide the COR a complete set of "as-built" drawings and original master redlined marked "as-built" blue-line in the latest version of AutoCAD drawings unlocked on CD or DVD. The as-built drawing shall include security device number, security closet connection location, data gathering panel number, and input or output number as applicable. All corrective notations made by the Contractor shall be legible when submitted to the COTR. If, in the opinion of the COTR, any redlined notation is not legible, it shall be returned to the Contractor for re-submission at no extra cost to the Owner. The Contractor shall organize the Record Drawing sheets into manageable sets bound with durable paper cover sheets with suitable titles, dates, and other identifications printed on the cover. The submitted as built shall be in editable formats and the ownership of the drawings shall be fully relinquished to the owner.
    - c. Where feasible, the individual or entity that obtained record data, whether the individual or entity is the installer, sub-contractor, or similar entity, is required to prepare the mark up on Record Drawings. Accurately record the information in a comprehensive drawing



technique. Record the data when possible after it has been obtained. For concealed installations, record and check the mark up before concealment. At the time of substantial completion, submit the Record Construction Documents to the COR. The Contractor shall organize into bound and labeled sets for the COR's continued usage. Provide device, conduit, and cable lengths on the conduit drawings. Exact in-field conduit placement/routings shall be shown. All conduits shall be illustrated in their entire length from termination in security closets; no arrowed conduit runs shall be shown. Pull box and junction box sizes are to be shown if larger than 100mm (4 inch).

N. FIPS 201 Compliance Certificates

1. Provide Certificates for all software components and device types utilizing credential verification. Provide certificates for:
  - b. Card Readers

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

**1.5 APPLICABLE PUBLICATIONS**

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

B. American National Standards Institute (ANSI)/ Security Industry Association (SIA):

AC-03 .....Access Control: Access Control Guideline Dye Sublimation  
Printing Practices for PVC Access Control Cards

TVAC-01 .....CCTV to Access Control Standard - Message Set for System  
Integration

C. American National Standards Institute (ANSI)/ International Code Council (ICC):

A117.1 .....Standard on Accessible and Usable Buildings and Facilities

D. Department of Justice American Disability Act (ADA)

28 CFR Part 36 .....ADA Standards for Accessible Design 2010

E. Department of Veterans Affairs (VA):

PACS-R: Physical Access Control System (PACS) Requirements

VA Handbook 0730 Security and Law Enforcement

F. Government Accountability Office (GAO):

GAO-03-8-02 Security Responsibilities for Federally Owned and Leased Facilities

G. National Electrical Contractors Association

303-2005 .....Installing Closed Circuit Television (CCTV) Systems

H. National Electrical Manufacturers Association (NEMA):

250-08 .....Enclosures for Electrical Equipment (1000 Volts Maximum)

I. National Fire Protection Association (NFPA):

- 70-11 ..... National Electrical Code
- J. Underwriters Laboratories, Inc. (UL):
  - 294-99 ..... The Standard of Safety for Access Control System Units
  - 305-08 ..... Standard for Panic Hardware
  - 639-97 ..... Standard for Intrusion-Detection Units
  - 752-05 ..... Standard for Bullet-Resisting Equipment
  - 827-08 ..... Central Station Alarm Services
  - 1076-95 ..... Standards for Proprietary Burglar Alarm Units and Systems
  - 1981-03 ..... Central Station Automation System
  - 2058-05 ..... High Security Electronic Locks
- K. Homeland Security Presidential Directive (HSPD):
  - HSPD-12 ..... Policy for a Common Identification Standard for Federal  
Employees and Contractors
- L. Federal Communications Commission (FCC):
  - (47 CFR 15) Part 15        Limitations on the Use of Wireless Equipment/Systems
- M. Federal Information Processing Standards (FIPS):
  - FIPS-201-1 ..... Personal Identity Verification (PIV) of Federal Employees and  
Contractors
- N. National Institute of Standards and Technology (NIST):
  - IR 6887 V2.1 ..... Government Smart Card Interoperability Specification (GSC-IS)
  - Special Pub 800-63 ..... Electronic Authentication Guideline
  - Special Pub 800-96 ..... PIV Card Reader Interoperability Guidelines
  - Special Pub 800-73-3 ..... Interfaces for Personal Identity Verification (4 Parts)
    - ..... Pt. 1- End Point PIV Card Application Namespace, Data Model &  
Representation
    - ..... Pt. 2- PIV Card Application Card Command Interface
    - ..... Pt. 3- PIV Client Application Programming Interface
    - ..... Pt. 4- The PIV Transitional Interfaces & Data Model Specification
  - Special Pub 800-76-1 ..... Biometric Data Specification for Personal Identity Verification
  - Special Pub 800-78-2 ..... Cryptographic Algorithms and Key Sizes for Personal Identity  
Verification
  - Special Pub 800-79-1 ..... Guidelines for the Accreditation of Personal Identity Verification  
Card Issuers
  - Special Pub 800-85B-1 ..... DRAFTPIV Data Model Test Guidelines
  - Special Pub 800-85A-2 ..... PIV Card Application and Middleware Interface Test Guidelines  
(SP 800-73-3 compliance)

- Special Pub 800-96.....PIV Card Reader Interoperability Guidelines
- Special Pub 800-37.....Guide for Applying the Risk Management Framework to Federal Information Systems
- Special Pub 800-96.....PIV Card Reader Interoperability Guidelines
- Special Pub 800-96.....PIV Card Reader Interoperability Guidelines
- Special Pub 800-104A .....Scheme for PIV Visual Card Topography
- Special Pub 800-116.....Recommendation for the Use of PIV Credentials in Physical Access Control Systems (PACS)
- O. Institute of Electrical and Electronics Engineers (IEEE):
  - C62.41.....IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
- P. International Organization for Standardization (ISO):
  - 7810 ..... Identification cards – Physical characteristics
  - 7811 ..... Physical Characteristics for Magnetic Stripe Cards
  - 7816-1 ..... Identification cards - Integrated circuit(s) cards with contacts - Part 1: Physical characteristics
  - 7816-2 ..... Identification cards - Integrated circuit cards - Part 2: Cards with contacts -Dimensions and location of the contacts
  - 7816-3 ..... Identification cards - Integrated circuit cards - Part 3: Cards with contacts - Electrical interface and transmission protocols
  - 7816-4 ..... Identification cards - Integrated circuit cards - Part 11: Personal verification through biometric methods
  - 7816-10 ..... Identification cards - Integrated circuit cards - Part 4: Organization, security and commands for interchange
  - 14443 ..... Identification cards - Contactless integrated circuit cards; Contactless Proximity Cards Operating at 13.56 MHz in up to 5 inches distance
  - 15693 ..... Identification cards -- Contactless integrated circuit cards - Vicinity cards; Contactless Vicinity Cards Operating at 13.56 MHz in up to 50 inches distance
  - 19794 ..... Information technology - Biometric data interchange formats
- Q. Uniform Federal Accessibility Standards (UFAS) 1984
- R. ADA Standards for Accessible Design 2010
- S. Section 508 of the Rehabilitation Act of 1973

## 1.6 DEFINITIONS

- A. ABA Track: Magnetic stripe that is encoded on track 2, at 75-bpi density in binary-coded decimal format; for example, 5-bit, 16-character set.
- B. Access Control List: A list of (identifier, permissions) pairs associated with a resource or an asset. As an expression of security policy, a person may perform an operation on a resource or asset if and only if the person's identifier is present in the access control list (explicitly or implicitly), and the permissions in the (identifier, permissions) pair include the permission to perform the requested operation.
- C. Access Control: A function or a system that restricts access to authorized persons only.
- D. API Application Programming Interface
- E. Assurance Level (or E-Authentication Assurance Level): A measure of trust or confidence in an authentication mechanism defined in OMB Memorandum M-04-04 and NIST Special Publication (SP) 800-63, in terms of four levels: [M-04-04]
  - 1. Level 1: LITTLE OR NO confidence
  - 2. Level 2: SOME confidence
  - 3. Level 3: HIGH confidence
  - 4. Level 4: VERY HIGH confidence
- F. Authentication: A process that establishes the origin of information, or determines an entity's identity. In this publication, authentication often means the performance of a PIV authentication mechanism.
- G. Authenticator: A memory, possession, or quality of a person that can serve as proof of identity, when presented to a verifier of the appropriate kind. For example, passwords, cryptographic keys, and fingerprints are authenticators.
- H. Authorization: A process that associates permission to access a resource or asset with a person and the person's identifier(s).
- I. BIO or BIO-A: A FIPS 201 authentication mechanism that is implemented by using a Fingerprint data object sent from the PIV Card to the PACS. Note that the short-hand "BIO (-A)" is used throughout the document to represent both BIO and BIO-A authentication mechanisms.
- J. Biometric: An authenticator produced from measurable qualities of a living person.
- K. CAC EP – CAC End Point with end point PIV applet
- L. CAC NG – CAC Next Generation with transitional PIV applet
- M. Card Authentication Key (CAK): A PIV authentication mechanism (or the PIV Card key of the same name) that is implemented by an asymmetric or symmetric key challenge/response protocol. The CAK is an optional mechanism defined in NIST SP 800-73. [SP800-73] NIST strongly recommends that every PIV Card contain an asymmetric CAK and corresponding

- certificate, and that agencies use the asymmetric CAK protocol, rather than a symmetric CAK protocol, whenever the CAK authentication mechanism is used with PACS.
- N. CCTV: Closed-circuit television.
  - O. Central Station: A PC with software designated as the main controlling PC of the PACS. Where this term is presented with initial capital letters, this definition applies.
  - P. Controller: An intelligent peripheral control unit that uses a computer for controlling its operation. Where this term is presented with an initial capital letter, this definition applies.
  - Q. CPU: Central processing unit.
  - R. Credential: Data assigned to an entity and used to identify that entity.
  - S. File Server: A PC in a network that stores the programs and data files shared by users.
  - T. FIPS Federal Information Processing Standards
  - U. FRAC – First Responder Authentication Credential
  - V. HSPD Homeland Security Presidential Directive
  - W. I/O: Input/Output.
  - X. Identifier: A credential card, keypad personal identification number or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.
  - Y. IEC International Electrotechnical Commission
  - Z. ISO International Organization for Standardization
  - AA. KB Kilobyte
  - BB. kbit/s Kilobits / second
  - CC. LAN: Local area network.
  - DD. LED: Light-emitting diode.
  - EE. Legacy CAC – Contact only Common Access Card with v1 and v2 applets
  - FF. Location: A Location on the network having a PC-to-Controller communications link, with additional Controllers at the Location connected to the PC-to-Controller link with RS-485 communications loop. Where this term is presented with an initial capital letter, this definition applies.
  - GG. NIST: National Institute of Standards and Technology
  - HH. PACS: Physical Access Control System
  - II. PC/SC: Personal Computer / Smart Card
  - JJ. PC: Personal computer. This acronym applies to the Central Station, workstations, and file servers.
  - KK. PCI Bus: Peripheral component interconnect; a peripheral bus providing a high-speed data path between the CPU and peripheral devices (such as monitor, disk drive, or network).

- LL. PDF: (Portable Document Format.) The file format used by the Acrobat document exchange system software from Adobe.
- MM. PIV: Personal Identification Verification
- NN. PIV-I – PIV Interoperable credential
- OO. PPS: Protocol and Parameters Selection
- PP. RF: Radio frequency.
- QQ. ROM: Read-only memory. ROM data are maintained through losses of power.
- RR. RS-232: A TIA/EIA standard for asynchronous serial data communications between terminal devices. This standard defines a 25-pin connector and certain signal characteristics for interfacing computer equipment.
- SS. RS-485: A TIA/EIA standard for multipoint communications.
- TT. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.
- UU. TPDU: Transport Protocol Data Unit
- VV. TWIC – Transportation Worker Identification Credential
- WW. UPS: Uninterruptible power supply.
- XX. Vcc: Voltage at the Common Collector
- YY. WAN: Wide area network.
- ZZ. WAV: The digital audio format used in Microsoft Windows.
- AAA. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.
- BBB. Windows: Operating system by Microsoft Corporation.
- CCC. Workstation: A PC with software that is configured for specific limited security system functions.

## 1.7 COORDINATION

- A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed.

### **1.8 PERFORMANCE REQUIREMENTS**

- A. PACS shall provide support for multiple authentication modes and bidirectional communication with the reader. PACS shall provide implementation capability for enterprise security policy and incident response.
- B. All processing of authentication information must occur on the “safe side” of a door
- C. Physical Access Control System shall provide access to following Security Areas:
  - 1. Controlled
- D. PACS shall provide:
  - 1. One authentication factor for access to Controlled security areas
- E. Door Hardware Interface: Coordinate with Division 08 Sections that specify door hardware required to be monitored or controlled by the PACS. The Controllers in this Section shall have electrical characteristics that match the signal and power requirements of door hardware. Integrate door hardware specified in Division 08 Sections to function with the controls and PC-based software and hardware in this Section.
- F. References to industry and trade association standards and codes are minimum installation requirement standards.
- G. Drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the above standards.

### **1.9 EQUIPMENT AND MATERIALS**

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

2. Four copies of certified test reports containing all test data shall be furnished to the Resident Engineer prior to final inspection and not more than 90 days after completion of the tests.
3. When equipment fails to meet factory test and re-inspection is required, the contractor shall be liable for all additional expenses, including expenses of the Government.

#### **1.10 WARRANTY OF CONSTRUCTION.**

- A. Warrant PACS work subject to the Article "Warranty of Construction" of FAR clause 52.246-21.
- B. Demonstration and training shall be performed prior to system acceptance.

#### **1.11 GENERAL REQUIREMENTS**

- A. For general requirements that are common to more than one section in Division 28 refer to Section 28 05 00, REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS.
- B. General requirements applicable to this section include:
  1. General Arrangement Of Contract Documents,
  2. Delivery, Handling and Storage,
  3. Project Conditions,
  4. Electrical Power,
  5. Lightning, Power Surge Suppression, and Grounding,
  6. Electronic Components,
  7. Substitute Materials and Equipment, and
  8. Like Items.

### **PART 2 – PRODUCTS**

#### **2.1 GENERAL**

- A. All equipment and materials for the system will be compatible to ensure correct operation as outlined in FIPS 201, March 2006 and HSPD-12.
- B. The security system characteristics listed in this section will serve as a guide in selection of equipment and materials for the PACS. If updated or more suitable versions are available then the Contracting Officer will approve the acceptance of prior to an installation.
- C. PACS equipment shall meet or exceed all requirements listed below.
- D. A PACS shall be comprised of, but not limited to, the following components:
  1. Physical Access Control System
  2. Card Readers
  3. Credential Cards
  4. System Sensors and Related Equipment
  5. Push Button Switches



6. Interfaces
7. Door 18. RS-232 ASCII Interface
8. Real Time Guard Tour
9. Cables
10. Transformers

## **2.2 CONTROLLERS**

- A. Controllers: Are existing.

## **2.3 CARD READERS**

- A. Power: Card reader shall be powered from its associated Controller, including its standby power source.
- B. Response Time: Card reader shall respond to passage requests by generating a signal that is sent to the Controller. Response time shall be [800]ms or less, from the time the card reader finishes reading the credential card until a response signal is generated.
- C. Enclosure: Suitable for surface, semiflush, or pedestal mounting. Mounting types shall additionally be suitable for installation in the following locations:
  1. Indoors, controlled environment.
  2. Indoors, uncontrolled environment.
- D. Display: LED or other type of visual indicator display shall provide visual[ and audible] status indications and user prompts. Indicate power on/off, whether user passage requests have been accepted or rejected, and whether the door is locked or unlocked.
- E. Shall be utilized for controlling the locking hardware on a door and allows for reporting back to the main control panel with the time/date the door was accessed, the name of the person accessing the point of entry, and its location.
- F. Will be fully programmable and addressable, locally and remotely, and hardwired to the system.
- G. Shall be individually home run to the main panel.
- H. Shall be installed in a manner that they comply with:
  1. The Uniform Federal Accessibility Standards (UFAS)
  2. The Americans with Disabilities Act (ADA)
  3. The ADA Standards for Accessible Design
- I. Shall support a variety of card readers that must encompass a wide functional range. The PACS may combine any of the card readers described below for installations requiring multiple types of card reader capability (i.e., card only, card and/or PIN, card and/or biometrics, card and/or pin and/or biometrics, supervised inputs, etc.). These card readers shall be available in the approved technology to meet FIPS 201, and is ISO 14443 A or B, ISO/IEC 7816 compliant. The reader output can be Wiegand, RS-22, 485 or TCP/IP.

- J. Shall be housed in an aluminum bezel with a wide lead-in for easy card entry.
- K. Shall contain read head electronics, and a sender to encode digital door control signals.
- L. LED's shall be utilized to indicate card reader status and access status.
- M. Shall be able to support a user defined downloadable off-line mode of operation (e.g. locked, unlocked), which will go in effect during loss of communication with the main control panel.
- N. Shall provide audible feedback to indicate access granted/denied decisions. Upon a card swipe, two audible tones or beeps shall indicate access granted and three tones or beeps shall indicate access denied. All keypad buttons shall provide tactile audible feedback.
- O. Shall have a minimum of two programmable inputs and two programmable outputs.
- P. All card readers that utilize keypad controls along with a reader and shall meet the following specifications:
  - 1. Communications protocol shall be compatible with the local processor.
- Q. Shall include a Light Emitting Diode (LED) or other type of visual indicator display and provide visual or visual and audible status indications and user prompts. The display shall indicate power on/off, and whether user passage requests have been accepted or rejected. The design of the keypad display or keypad enclosure shall limit the maximum horizontal and vertical viewing angles of the keypad. The maximum horizontal viewing angle shall be plus and minus five (5) degrees or less off a vertical plane perpendicular to the plane of the face of the keypad display. The maximum vertical viewing angle shall be plus and minus 15 degrees or less off a horizontal plane perpendicular to the plane of the face of the keypad display.
  - 1. Shall respond to passage requests by generating a signal to the local processor. The response time shall be 800 milliseconds or less from the time the last alphanumeric symbol is entered until a response signal is generated.
  - 2. Shall be powered from the source as designed and shall not dissipate more than 150 Watts.
  - 3. Shall be suitable for surface, semi-flush, pedestal, or weatherproof mounting as required.
  - 4. Shall provide a means for users to indicate a duress situation by entering a special code.
- R. PIV Contact Card Reader
  - 1. Application Protocol Data Unit (APDU) Support: At a minimum, the contact interface shall support all card commands for contact based access specified in Section 7, End-point PIV Card Application Card Command Interface of SP 800-73-1, Interfaces for Personal Identity Verification.
  - 2. Buffer Size: The reader must contain a buffer large enough to receive the maximum size frame permitted by International Organization for Standardization International Electrotechnical Commission (ISO/IEC) 7816-3:1997, Section 9.4.
  - 3. Programming Voltage: PIV Readers shall not generate a Programming Voltage.

4. Support for Operating Class: PIV Readers shall support cards with Class A Vccs as defined in ISO/IEC 7816-3:1997 and ISO/IEC 7816-3:1997/Amd 1:2002.
5. Retrieval Time: Retrieval time<sup>1</sup> for 12.5 kilobytes (KB) of data through the contact interface of the reader shall not exceed 2.0 seconds.
6. Transmission Protocol: The PIV Reader shall support both the character-based T=0 protocol and block-based T=1 protocol as defined in ISO/IEC 7816-3:1997.
7. Support for PPS Procedure: The reader shall support Protocol and Parameters Selection (PPS) procedure by having the ability to read character TA1 of the Answer to Reset (ATR) sent by the card as defined in ISO/IEC 7816-3:1997.

S. Contactless Smart Cards and Readers

1. Smart card readers shall read credential cards whose characteristics of size and technology meet those defined by ISO/IEC 7816, 14443, 15693.
2. The readers shall have "flash" download capability to accommodate card format changes.
3. The card reader shall have the capability of reading the card data and transmitting the data to the main monitoring panel.
4. The card reader shall be contactless and meet or exceed the following technical characteristics:
  - a. Data Output Formats: FIPS 201 low outputs the FASC-N in an assortment of Wiegand bit formats from 40 – 200 bits. FIPS 201 medium outputs a combination FASC-N and HMAC in an assortment of Wiegand bit formats from 32 – 232 bits. All Wiegand formats or the upgradeability from Low to Medium Levels can be field configured with the use of a command card.
  - b. FIPS 201 readers shall be able to read, but not be limited to, DESfire and iCLASS cards.
  - c. Reader range shall comply with ISO standards 7816, 14443, and 15693, and also take into consideration conditions, are at a minimum 1" to 2" (2.5 – 5 cm).
  - d. APDU Support: At a minimum, the contactless interface shall support all card commands for contactless based access specified in Section 7, End-point PIV Card Application Card Command Interface of SP 800-73-1, Interfaces for Personal Identity Verification.
  - e. Buffer Size: The reader shall contain a buffer large enough to receive the maximum size frame permitted by ISO/IEC 7816-3, Section 9.4.
  - f. ISO 14443 Support: The PIV Reader shall support parts (1 through 4) of ISO/IEC 14443 as amended in the References of this publication.

- g. Type A and B Communication Signal Interfaces: The contactless interface of the reader shall support both the Type A and Type B communication signal interfaces as defined in ISO/IEC 14443-2:2001.
- h. Type A and B Initialization and Anti-Collision The contactless interface of the reader shall support both Type A and Type B initialization and anti-collision methods as defined in ISO/IEC 14443-3:2001.
- i. Type A and B Transmission Protocols: The contactless interface of the reader shall support both Type A and Type B transmission protocols as defined in ISO/IEC 14443-4:2001.
- j. Retrieval Time: Retrieval time for 4 KB of data through the contactless interface of the reader shall not exceed 2.0 seconds.
- k. Transmission Speeds: The contactless interface of the reader shall support bit rates of  $fc/128$  (~106 kbits/s),  $fc/64$ (~212 kbits/s), and configurable to allow activation/deactivation.
- l. Readability Range: The reader shall not be able to read PIV card more than 10cm(4inch) from the reader

## **2.4 CREDENTIAL CARDS**

- A. Personal Identity Verification (PIV) credential cards shall comply to Federal Information Processing Standards Publication (FIPS) 201.
- B. Visual Card Topography shall be compliant with NIST 800-104.
- C. PIV logical credentials shall contain multiple data elements for the purpose of verifying the cardholder's identity at graduated assurance levels. These mandatory data elements shall collectively comprise the data model for PIV logical credentials, and include the following:
  - 1. CHUID
  - 2. PIN

## **2.5 SYSTEM SENSORS AND RELATED EQUIPMENT**

- A. The PACS (Physical Access Control System) and related Equipment provided by the Contractor shall meet or exceed the following performer specifications:
- B. Request to Exit Detectors:
  - 1. Passive Infrared Request to Exit Motion Detector (REX PIR) (1) The Contractor shall provide a surface mounted motion detector to signal the physical access control system request to exit input. The motion detector shall be a passive infrared sensor designed for wall or ceiling mounting 2134 to 4572 mm (7 to 15 ft) height. The detector shall provide two (2) form "C" (SPDT) relays rated one (1) Amp. @ 30 VDC for DC resistive loads. The detectors relays shall be user adjustable with a latch time from 1-60 seconds. The detector shall also include a selectable relay reset mode to follow the timer or absence of motion. The detection pattern

shall be adjustable plus or minus fourteen ( $\pm 14$ ) degrees. The detector shall operate on 12 VDC with approximately 26 mA continuous current draw. The detector shall have an externally visible activation LED. The motion detector shall measure approximately 38 mm H x 158 mm W x 38 mm D (1.5 x 6.25 x 1.5 in). The detector shall be immune to radio frequency interference. The detector shall not activate or set-up on critical frequencies in the range 26 to 950 Megahertz using a 50 watt transmitter located 30.5 cm (1 ft) from the unit or attached wiring. The detector shall be available on gray or black enclosures. The color of the housing shall be coordinated with the surrounding surface.

C. Guard tour stations:

1. The guard tour station shall be single gang brushed steel plate flush mounted in a single gang box. The switch shall be a normally open momentary keyed switch.

D. Key Bypass:

1. Shall be utilized for all doors that have a mortise or rim mounted door hardware.
2. Each door shall be individually keyed with one master key per secured area.
3. Cylinders shall be six (6)-pin and made of brass or equivalent. Keys for the cylinders shall be constructed of solid material and produced and cut by the same distributor. Keys shall not be purchased, cut, and supplied by multiple dealers.
4. All keys shall have a serial number cut into the key. No two serial numbers shall be the same.
5. All keys and cylinders shall be stored in a secure area that is monitored by the Intrusion Detection System.

E. Automatic Door Opener and Closer:

1. Shall be low energy operators.
2. Door closing force shall be adjustable to ensure adequate closing control.
3. Shall have an adjustable back-check feature to cushion the door opening speed if opened violently.
4. Motor assist shall be adjustable from 0 to 30 seconds in five (5) second increments. Motor assist shall restart the time cycle with each new activation of the initiating device.
5. Unit shall have a three-position selector mode switch that shall permit unit to be switched "ON" to monitor for function activation, switched to "H/O" for indefinite hold open function or switched to "OFF," which shall deactivate all control functions but will allow standard door operation by means of the internal mechanical closer.
6. Door control shall be adjustable to provide compliance with the requirements of the Americans with Disabilities Act (ADA) and ANSI standards A117.1.
7. All automatic door openers and closers shall:
  - a. Meet UL standards.
  - b. Be fire rated.

- c. Have push and go function to activate power operator or power assist function.
  - d. Have push button controls for setting door close and door open positions.
  - e. Have open obstruction detection and close obstruction detection built into the unit.
  - f. Have door closer assembly with adjustable spring size, back-check valve, sweep valve, latch valve, speed control valve and pressure adjustment valve to control door closing.
  - g. Have motor start-up delay, vestibule interface delay; electric lock delay and door hold open delay up to 30 seconds. All operators shall close door under full spring power when power is removed.
  - h. Are to be hard wired with power input of 120 VAC, 60Hz and connected to a dedicated circuit breaker located on a power panel reserved for security equipment.
- F. Door Status Indicators:
- 1. Shall monitor and report door status to the SMS.
  - 2. Door Position Sensor:
    - a. Shall provide an open or closed indication for all doors operated on the PACS and report directly to the SMS.
    - b. Shall also provide alarm input to the Intrusion Detection System for all doors operated by the PACS and all other doors that require monitoring by the intrusion detection system.
    - c. Switches for doors operated by the PACS shall be double pole double throw (DPDT). One side of the switch shall monitor door position and the other side if the switch shall report to the intrusion detection system. For doors with electromagnetic locks a magnetic bonding sensor (MBS) can be used in place of one side of a DPDT switch, in turn allowing for the use of a single pole double throw (SPDT) switch in it place of a DPDT switch.
    - d. Switches for doors not operated by the PACS shall be SPDT and report directly to the IDS.
    - e. Shall be surface or flush mounted and wide gap with the ability to operate at a maximum distance of up to 2" (5 cm).

## **2.6 PUSH BUTTON SWITCHES**

- A. Push-Button Switches: Momentary-contact back-lighted push buttons, with stainless-steel switch enclosures.
- 1. Electrical Ratings:
    - a. Minimum continuous current rating of [10] <Insert number> A at 120 V ac or [5] <Insert number> A at 240-V ac.
    - b. Contacts that will make 720 VA at [60] <Insert number> A and that will break at 720 VA at [10] <Insert number> A.

2. Enclosures: Flush or surface mounting. Push buttons shall be suitable for flush mounting in the switch enclosures.
3. Enclosures shall additionally be suitable for installation in the following locations:
  - a. Indoors, controlled environment.
4. Power: Push-button switches shall be powered from their associated Controller, using dc control.

## **2.7 PORTAL CONTROL DEVICES**

- A. Shall be used to assist the PACS.
- B. Such devices shall:
  1. Provide a means of monitoring the doors status.
  2. Allow for exiting a space via either a push button, request to exit, or panic/crash bar.
  3. Provide a means of override to the PACS via a keypad or key bypass.
  4. Assist door operations utilizing automatic openers and closures.
  5. Provide a secondary means of access to a space via a keypad.
- C. Shall be connected to and monitored by the main PACS panel.
- D. Shall be installed in a manner that they comply with:
  1. The Uniform Federal Accessibility Standards (UFAS)
  2. The Americans with Disabilities Act (ADA)
  3. The ADA Standards for Accessible Design
- E. Shall provide a secondary means of physical access control within a secure area.
- F. Push-Button Switches:
  1. Shall be momentary contact, back lighted push buttons, and stainless steel switch enclosures for each push button as shown. Buttons are to be utilized for secondary means of releasing a locking mechanism.
    - a. In an area where a push button is being utilized for remote access of the locking device then no more than two (2) buttons shall operate one door from within one secure space. Buttons will not be wired in series with one other.
    - b. In an area where locally stationed guards control entry to multiple secure points via remote switches. An interface board shall be designed and constructed for only the amount of buttons it shall house. These buttons shall be flush mounted and clearly labeled for ease of use. All buttons shall be connected to the PACS and SMS system for monitoring purposes.
    - c. Shall have double-break silver contacts that will make 720 VA at 60 amperes and break 720 VA at 10 amperes.
- G. Entry Control Devices:

1. Shall be hardwired to the PACS main control panel and operated by either a card reader or a biometric device via a relay on the main control panel.
2. Shall be fail-safe in the event of power failure to the PACS system.
3. Shall operate at 24 VCD, with the exception of turnstiles and be powered by a separate power supply dedicated to the door control system. Each power supply shall be rated to operate a minimum of two doors simultaneously without error to the system or overload the power supply unit.
4. Shall have a diode or metal-oxide varistor (MOV) to protect the controller and power supply from reverse current surges or back-check.
5. Electric Strikes/Bolts: Shall be:
  - a. Made of heavy-duty construction and tamper resistant design.
  - b. Tested to over one million cycles.
  - c. Rated for a minimum of 1000 lbs. holding strength.
  - d. Utilize an actuating solenoid for the strike/bolt. The solenoid shall move from fully open to fully closed position and back in not more than 500 milliseconds and be rated for continuous duty.
  - e. Utilize a signal switch that will indicate to the system if the strike/bolt is not engaged or is unlocked when it should be secured.
  - f. Flush mounted within the door frame.
6. Electric Mortise Locks: Shall be installed within the door and an electric transfer hinge shall be utilized to allow the wires to be transferred from the door frame to the lock. If utilized with a double door then the lock shall be installed inside the active leaf. Electric Mortise Locks shall:
  - a. These locks shall be provided and installed by the Division 8 "DOOR HARDWARE" Contractor.
    - b. Have integrated Request to Exit switch for new doors receiving physical access control devices.
  - b. Provide integration of the Electric Mortise Locks with the PACS for:
    - 1) Lock Power
    - 2) Request to Exit switch.

## **2.8 WIRES AND CABLES**

- A. PVC-Jacketed, RS-232 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, and individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage; PVC jacket. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
  1. NFPA 70, Type CM.



2. Flame Resistance: UL 1581 Vertical Tray.
- B. Plenum-Type, RS-232 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, and individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage; plastic jacket. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
  1. NFPA 70, Type CMP.
  2. Flame Resistance: NFPA 262 Flame Test.
- C. RS-485 communications require 2 twisted pairs, with a distance limitation of 4000 feet (1220 m).
- D. PVC-Jacketed, RS-485 Cable: Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, PVC insulation, unshielded, PVC jacket, and NFPA 70, Type CMG.
- E. Plenum-Type, RS-485 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and fluorinated-ethylene-propylene jacket.
  1. NFPA 70, Type CMP.
  2. Flame Resistance: NFPA 262 Flame Test.
- F. Paired Readers and Wiegand Keypads Cables: Paired, 3 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, individual aluminum foil-polyester tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
  1. NFPA 70, Type CM.
  2. Flame Resistance: UL 1581 Vertical Tray.
- G. Paired Readers and Wiegand Keypads Cable: Paired, 3 pairs, twisted, No. 20 AWG, stranded (7x28) tinned copper conductors, polyethylene (polyolefin) insulation, individual aluminum foil-polyester tape shielded pairs each with No. 22 AWG, stranded (19x34) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
  1. NFPA 70, Type CM.
  2. Flame Resistance: UL 1581 Vertical Tray.
- H. Plenum-Type, Paired, Readers and Wiegand Keypads Cable: Paired, 3 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum foil-polypropylene tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene-propylene jacket.
  1. NFPA 70, Type CMP.
  2. Flame Resistance: NFPA 262 Flame Test.
- I. Paired Lock Cable: 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
  1. NFPA 70, Type CMG.

2. Flame Resistance: UL 1581 Vertical Tray.
- J. Paired Lock Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
  1. NFPA 70, Type CMG.
  2. Flame Resistance: UL 1581 Vertical Tray.
- K. Paired Input Cable: 1 pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, overall aluminum foil-polyester tape shield with No. 22 AWG, stranded (7x30) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
  1. NFPA 70, Type CMR.
  2. Flame Resistance: UL 1666 Riser Flame Test.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. The Contractor shall install all system components and appurtenances in accordance with the manufacturers' instructions, ANSI C2, and shall furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified. Control signals, communications, and data transmission lines grounding shall be installed as necessary to preclude ground loops, noise, and surges from affecting system operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with manufacturers' recommendations and as modified herein.
- B. Consult the manufacturers' installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Refer to the Riser/Connection diagram for all schematic system installation/termination/wiring data.
- C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., sensors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

### **3.2 CURRENT SITE CONDITIONS**

- A. The Contractor shall visit the site and verify that site conditions are in agreement with the design package. The Contractor shall report all changes to the site or conditions which will affect performance of the system to the Owner in a report as defined in paragraph Group II Technical Data Package. The Contractor shall not take any corrective action without written permission from the Owner.

### **3.3 EXAMINATION**

- A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

- B. Examine roughing-in for LAN and control cable conduit systems to PCs, Controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.4 PREPARATION**

- A. Comply with recommendations in SIA CP-01.
- B. Comply with EIA/TIA-606, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings."
- C. Obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.
  - 1. Record setup data for control station and workstations.
  - 2. For each Location, record setup of Controller features and access requirements.
  - 3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
  - 4. Set up groups, linking, and list inputs and outputs for each Controller.
  - 5. Assign action message names and compose messages.
  - 6. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.
  - 7. Prepare and install alarm graphic maps.
  - 8. Develop user-defined fields.
  - 9. Develop screen layout formats.
  - 10. Propose setups for guard tours and key control.
  - 11. Discuss badge layout options; design badges.
  - 12. Complete system diagnostics and operation verification.
  - 13. Prepare a specific plan for system testing, startup, and demonstration.
  - 14. Develop acceptance test concept and, on approval, develop specifics of the test.
  - 15. Develop cable and asset management system details; input data from construction documents. Include system schematics and Technical Drawings.
- D. In meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

### **3.5 CABLING**

- A. Comply with NECA 1, "Good Workmanship in Electrical Contracting."
- B. Install cables and wiring according to requirements in Division 28 Section "Conductors and Cables for Electronic Safety and Security."

- C. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.
- D. Install LAN cables using techniques, practices, and methods that are consistent with Category 5E rating of components and that ensure Category 5E performance of completed and linked signal paths, end to end.
- E. Install cables without damaging conductors, shield, or jacket.
- F. Boxes and enclosures containing security system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered to be accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.
- G. Install end-of-line resistors at the field device location and not at the Controller or panel location.

### **3.6 CABLE APPLICATION**

- A. Comply with EIA/TIA-569, "Commercial Building Standard for Telecommunications Pathways and Spaces."
- B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.
- C. RS-232 Cabling: Install at a maximum distance of 50 feet (15 m).
- D. RS-485 Cabling: Install at a maximum distance of 4000 feet (1220 m).
- E. Card Readers and Keypads:
  - 1. Install number of conductor pairs recommended by manufacturer for the functions specified.
  - 2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from Controller to the reader is 250 feet (75 m), and install No. 20 AWG wire if maximum distance is 500 feet (150 m).
  - 3. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.
- F. Install minimum No. 16 AWG cable from Controller to electrically powered locks. Do not exceed [250 feet (75 m)].
- G. Install minimum No. 18 AWG ac power wire from transformer to Controller, with a maximum distance of [25 feet (8 m)].

### **3.7 GROUNDING**

- A. Comply with Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Comply with IEEE 1100, "Power and Grounding Sensitive Electronic Equipment."
- C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- D. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.

### **3.8 INSTALLATION**

- A. System installation shall be in accordance with UL 294, manufacturer and related documents and references, for each type of security subsystem designed, engineered and installed.
- B. Components shall be configured with appropriate "service points" to pinpoint system trouble in less than 30 minutes.
- C. The Contractor shall install all system components including Government furnished equipment, and appurtenances in accordance with the manufacturer's instructions, documentation listed in Sections 1.4 and 1.5 of this document, and shall furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a operable system.
- D. Integration with these security subsystems shall be achieved by computer programming or the direct hardwiring of the systems.
- E. For programming purposes refer to the manufacturers requirements for correct system operations. Ensure computers being utilized for system integration meet or exceed the minimum system requirements outlined on the systems software packages.
- F. The Contractor shall visit the site and verify that site conditions are in agreement with the design package. The Contractor shall report all changes to the site or conditions that will affect performance of the system. The Contractor shall not take any corrective action without written permission from the Government.
- G. The Contractor shall visit the site and verify that site conditions are in agreement/compliance with the design package. The Contractor shall report all changes to the site or conditions that will affect performance of the system to the Contracting Officer in the form of a report. The Contractor shall not take any corrective action without written permission received from the Contracting Officer.
- H. Existing Equipment:
  1. The Contractor shall connect to and utilize existing door equipment, control signal transmission lines, and devices as outlined in the design package. Door equipment and signal lines that are usable in their original configuration without modification may be reused with Contracting Officer approval.
  2. The Contractor shall perform a field survey, including testing and inspection of all existing door equipment and signal lines intended to be incorporated into the PACS, and furnish a report to the Contracting Officer as part of the site survey report. For those items considered nonfunctioning, provide (with the report) specification sheets, or written functional

- requirements to support the findings and the estimated cost to correct the deficiency. As part of the report, the Contractor shall include a schedule for connection to all existing equipment.
3. The Contractor shall make written requests and obtain approval prior to disconnecting any signal lines and equipment, and creating equipment downtime. Such work shall proceed only after receiving Contracting Officer approval of these requests. If any device fails after the Contractor has commenced work on that device, signal or control line, the Contractor shall diagnose the failure and perform any necessary corrections to the equipment.
  4. The Contractor shall be held responsible for repair costs due to Contractor negligence, abuse, or improper installation of equipment.
  5. The Contracting Officer shall be provided a full list of all equipment that is to be removed or replaced by the Contractor, to include description and serial/manufacturer numbers where possible. The Contractor shall dispose of all equipment that has been removed or replaced based upon approval of the Contracting Officer after reviewing the equipment removal list. In all areas where equipment is removed or replaced the Contractor shall repair those areas to match the current existing conditions.
- J. Control Panels:
1. Connect power and signal lines to the controller.
  2. Program the panel as outlined by the design and per the manufacturer's programming guidelines.
- K. SMS:
1. Coordinate with the VA agency's IT personnel to connect to the computer on the local LAN or Intranet security system.
  2. Program and set-up the SMS to ensure it is fully operation.
- L. Card Readers:
1. Connect all signal inputs and outputs as shown and specified.
  2. Terminate input signals as required.
  3. Program and address the reader as per the design package.
  4. Readers shall be surface or flushed mounted and all appropriate hardware shall be provided to ensure the unit is installed in an enclosed conduit system.
- M. Biometrics:
1. Connect all signal input and output cables along with all power cables.
  2. Program and ensure the device is in operating order.
- N. Portal Control Devices:
1. Install all signal input and output cables as well as all power cables.
  2. Devices shall be surface or flush mounted as per the design package.
  3. Program all devices and ensure they are working.

O. Door Status Indicators:

1. Install all signal input and output cables as well as all power cables.
2. RTE's shall be surface mounted and angled in a manner that they cannot be compromised from the non-secure side of a windowed door, or allow for easy release of the locking device from a distance no greater than 6 feet from the base of the door.
3. Door position sensors shall be surface or flush mounted and wide gap with the ability to operate at a maximum distance of up to 2" (5 cm).

P. Entry Control Devices:

1. Install all signal input and power cables.
2. Strikes and bolts shall be mounted within the door frame.
3. Mortise locks shall be mounted within the door and an electric transfer hinge shall be utilized to transfer the wire from within the door frame to the mortise lock inside the door.
4. Electromagnetic locks shall be installed with the mag-lock mounted to the door frame and the metal plate mounted to the door.

Q. System Start-Up:

1. The Contractor shall not apply power to the PACS until the following items have been completed:
  - a. PACS equipment items and have been set up in accordance with manufacturer's instructions.
  - b. A visual inspection of the PACS has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.
  - c. System wiring has been tested and verified as correctly connected as indicated.
  - d. All system grounding and transient protection systems have been verified as installed and connected as indicated.
  - e. Power supplies to be connected to the PACS have been verified as the correct voltage, phasing, and frequency as indicated.
2. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installation, defective equipment items, or collateral damage as a result of Contractor work efforts.
3. Coordinate the startup and contractor testing schedules with the Resident Engineer. Provide a minimum of 7 days prior notice.

R. Supplemental Contractor Quality Control:

1. The Contractor shall provide the services of technical representatives who are familiar with all components and installation procedures of the installed PACS; and are approved by the Contracting Officer.

2. The Contractor will be present on the job site during the preparatory and initial phases of quality control to provide technical assistance.
3. The Contractor shall also be available on an as needed basis to provide assistance with follow-up phases of quality control.
4. The Contractor shall participate in the testing and validation of the system and shall provide certification that the system installed is fully operational as all construction document requirements have been fulfilled.

### **3.9 SYSTEM SOFTWARE**

- A. Install, configure, and test software and databases for the complete and proper operation of systems involved. Assign software license to Owner.

### **3.10 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports:
- B. Perform the following field tests and inspections and prepare test reports:
  1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 5 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA-568-1, "Commercial Building Telecommunications Cabling Standards - Part 1 General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA/EIA-568-B.
  2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
  3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

### **3.11 PROTECTION**

- A. Maintain strict security during the installation of equipment and software. Rooms housing the control station, and workstations that have been powered up shall be locked and secured, with an activated burglar alarm and access-control system reporting to a Central Station complying with UL 1610, "Central-Station Burglar-Alarm Units," during periods when a qualified operator in the employ of Contractor is not present.



**3.12 DEMONSTRATION AND TRAINING**

- A. Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of units.
- B. All testing and training shall be compliant with the VA General Requirements, Section 01 00 00, GENERAL REQUIREMENTS.

-----END-----

**SECTION 28 26 00  
ELECTRONIC PERSONAL PROTECTION SYSTEM**

**PART 1 – GENERAL**

**1.1 DESCRIPTION**

- A. Provide and install an extension to the existing Duress-Panic Alarm, and Intercom Systems, data transmission wiring and a control station with its associated equipment, hereafter referred to as EPPS System.
- B. EPPS shall be integrated with monitoring and control system specified in Division 28 Section [VIDEO SURVEILLANCE SYSTEMS] [INTRUSION DETECTION] [PHYSICAL ACCESS CONTROL SYSTEM] that specifies systems integration.

**1.2 RELATED WORK**

- A. Section 01 00 00 - GENERAL REQUIREMENTS. For General Requirements.
- B. Section 07 84 00 - FIRESTOPPING. Requirements for firestopping application and use.
- C. Section 10 14 00 - SIGNAGE. Requirements for labeling and signs.
- D. Section 26 05 11 - REQUIREMENTS FOR ELECTRICAL INSTALLATIONS. Requirements for connection of high voltage.
- E. Section 26 05 21 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW). Requirements for power cables.
- F. Section 26 05 33 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS. Requirements for infrastructure.
- G. Section 28 13 00 - PHYSICAL ACCESS CONTROL SYSTEMS (PACS). Requirements for physical access control integration.

**1.3 QUALITY ASSURANCE**

- A. The Contractor shall be responsible for providing, installing, and the operation of the EPPS System as shown. The Contractor shall also provide certification as required.
- B. The security system shall be installed and tested to ensure all components are fully compatible as a system and can be integrated with all associated security subsystems, whether the security system is stand-alone or a part of a complete Information Technology (IT) computer network.
- C. The Contractor or security sub-contractor shall be a licensed security Contractor as required within the state or jurisdiction of where the installation work is being conducted.
- D. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.
- E. Product Qualification:

1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
2. The Government reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.

F. Contractor Qualification:

1. The Contractor or security sub-contractor shall be a licensed security Contractor with a minimum of five (5) years experience installing and servicing systems of similar scope and complexity. The Contractor shall be an authorized regional representative of the Security Management System's (PACS) manufacturer. The Contractor shall provide four (4) current references from clients with systems of similar scope and complexity which became operational in the past three (3) years. At least three (3) of the references shall be utilizing the same system components, in a similar configuration as the proposed system. The references must include a current point of contact, company or agency name, address, telephone number, complete system description, date of completion, and approximate cost of the project. The owner reserves the option to visit the reference sites, with the site owner's permission and representative, to verify the quality of installation and the references' level of satisfaction with the system. The Contractor shall provide copies of system manufacturer certification for all technicians. The Contractor shall only utilize factory-trained technicians to install, program, and service the PACS. The Contractor shall only utilize factory-trained technicians to install, terminate and service controller/field panels and reader modules. The technicians shall have a minimum of five (5) continuous years of technical experience in electronic security systems. The Contractor shall have a local service facility. The facility shall be located within 60 miles of the project site. The local facility shall include sufficient spare parts inventory to support the service requirements associated with this contract. The facility shall also include appropriate diagnostic equipment to perform diagnostic procedures. The COTR reserves the option of surveying the company's facility to verify the service inventory and presence of a local service organization.
2. The Contractor shall provide proof project superintendent with BICSI Certified Commercial Installer Level 1, Level 2, or Technician to provide oversight of the project.
3. Cable installer must have on staff a Registered Communication Distribution Designer (RCDD) certified by Building Industry Consulting Service International. The staff member shall provide consistent oversight of the project cabling throughout design, layout, installation, termination and testing.

- G. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

#### 1.4 SUBMITALS

- A. Submit below items in accordance with Sections 01 33 23, SHOP DRAWING, PRODUCT DATA, AND SAMPLES, and Section 02 41 00, DEMOLITION.
- B. Provide certificates of compliance with Section 1.3, Quality Assurance.
- C. Provide a pre-installation and as-built design package in both electronic format and on paper, minimum size 48 x 48 inches (1220 x 1220 millimeters); drawing submittals shall be per the established project schedule.
- D. Shop drawings and as-built packages shall include, but not be limited to:
  1. Index Sheet that shall:
    - a. Define each page of the design package to include facility name, building name, floor, and sheet number.
    - b. Provide a list of all security abbreviations and symbols.
    - c. Reference all general notes that are utilized within the design package.
    - d. Specification and scope of work pages for all security systems that are applicable to the design package that will:
      - 1) Outline all general and job specific work required within the design package.
      - 2) Provide a device identification table outlining device Identification (ID) and use for all security systems equipment utilized in the design package.
  2. Drawing sheets that will be plotted on the individual floor plans or site plans shall:
    - a. Include a title block as defined above.
    - b. Define the drawings scale in both standard and metric measurements.
    - c. Provide device identification and location.
    - d. Address all signal and power conduit runs and sizes that are associated with the design of the electronic security system and other security elements (e.g., barriers, etc.).
    - e. Identify all pull box and conduit locations, sizes, and fill capacities.
    - f. Address all general and drawing specific notes for a particular drawing sheet.
  3. A riser drawing for each applicable security subsystem shall:
    - a. Indicate the sequence of operation.
    - b. Relationship of integrated components on one diagram.
    - c. Include the number, size, identification, and maximum lengths of interconnecting wires.
    - d. Wire/cable types shall be defined by a wire and cable schedule. The schedule shall utilize a lettering system that will correspond to the wire/cable it represents (example: A = 18 AWG/1 Pair Twisted, Unshielded). This schedule shall also provide the manufacturer's name and part number for the wire/cable being installed.
  4. A system drawing for each applicable security system shall:

- a. Identify how all equipment within the system, from main panel to device, shall be laid out and connected.
  - b. Provide full detail of all system components wiring from point-to-point.
  - c. Identify wire types utilized for connection, interconnection with associate security subsystems.
  - d. Show device locations that correspond to the floor plans.
  - e. All general and drawing specific notes shall be included with the system drawings.
5. A schedule for all of the applicable security subsystems shall be included. All schedules shall provide the following information:
- a. Device ID.
  - b. Device Location (e.g. site, building, floor, room number, location, and description).
  - c. Mounting type (e.g. flush, wall, surface, etc.).
  - d. Power supply or circuit breaker and power panel number.
6. Detail and elevation drawings for all devices that define how they were installed and mounted.
- E. Pre-installation design packages shall be reviewed by the Contractor along with a VA representative to ensure all work has been clearly defined and completed. All reviews shall be conducted in accordance with the project schedule. There shall be four (4) stages to the review process:
1. 35 percent
  2. 65 percent
  3. 90 percent
  4. 100 percent
- F. Provide manufacturer security system product cut-sheets. Submit for approval at least 30 days prior to commencement of formal testing, a Security System Operational Test Plan. Include procedures for operational testing of each component and security subsystem, to include performance of an integrated system test.
- G. Submit manufacture's certification of Underwriters Laboratories, Inc. (UL) listing as specified. Provide all maintenance and operating manuals per the VA General Requirements, Section 01 00 00, GENERAL REQUIREMENTS.

### **1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below (including amendments, addenda, revisions, supplement, and errata) form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American National Standards Institute (ANSI):

ANSI S3.2-09 .....Method for measuring the Intelligibility of Speech over  
Communications Systems

- C. Department of Justice American Disability Act (ADA)  
28 CFR Part 36 .....2010 ADA Standards for Accessible Design
- D. Federal Communications Commission (FCC):  
(47 CFR 15) Part 15.....Limitations on the Use of Wireless Equipment/Systems
- E. National Fire Protection Association (NFPA):  
70-11 .....National Electrical Code
- F. National Electrical Manufacturers Association (NEMA)  
250-08 .....Enclosures for Electrical Equipment (1000 Volts Maximum)
- G. Underwriters Laboratories, Inc. (UL):  
305-08 .....Standard for Panic Hardware  
444-08 .....Safety Communications Cables  
636-01 .....Standard for Holdup Alarm Units and Systems
- H. Uniform Federal Accessibility Standards (UFAS), 1984

#### **1.6 COORDINATION**

- A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed.

#### **1.7 WARRANTY OF CONSTRUCTION.**

- A. Warrant EPPS System work subject to the Article "Warranty of Construction" of FAR clause 52.246-21.
- B. Demonstration and training shall be performed prior to system acceptance.

#### **1.8 GENERAL REQUIREMENTS**

- A. For general requirements that are common to more than one section in Division 28 refer to Section 28 05 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY.
- B. General requirements applicable to this section include:

1. Performance Requirements,
2. Delivery, Handling and Storage,
3. Project Conditions,
4. Equipment and Materials,
5. Electrical Power,
6. Lightning, Power Surge Suppression, and Grounding,
7. Electronic Components,
8. Substitute Materials and Equipment, and
9. Like Items.

## **PART 2 – PRODUCTS**

### **2.1 EQUIPMENT AND MATERIALS**

#### **A. General:**

1. All equipment shall be rated for continuous operation. Environmental conditions (i.e. temperature, humidity, wind, and seismic activity) shall be taken under consideration at each facility and site location prior to installation of the equipment.
2. All equipment shall operate on a 120 or 240 volts alternating current (VAC); 50 hertz (Hz) or 60 Hz Alternating Current (AC) power system unless documented otherwise in subsequent sections listed within this spec. All equipment shall have a battery back-up source of power that will provide 12 hours (hrs.) of run time in the event of a loss of primary power to the security systems until a backup generator comes on-line.
3. The EPPS systems shall be designed, installed, and programmed in a manner that will allow for easy of operation, programming, servicing, maintenance, testing, and upgrading of the system.
4. The Contractor shall provide the Contracting Officer with written verification, that the type of wire/cable being provided is recommended and approved by the OEM. Cabling shall meet the interconnecting wiring requirements of NFPA 70, National Electrical Code. The Contractor is responsible for providing the correct protection cable duct and/or conduit and wiring.
5. When interfacing with other communications or security subsystems the Contractor shall utilize interfacing methods that are approved by the Contracting Officer. At a minimum, an acceptable interfacing method requires not only a physical and mechanical connection; but also a matching of signal, voltage, and processing levels with regard to signal quality and impedance. The interface point must adhere to all standards described herein.
6. Wireless systems shall use ultrasonic, infrared and radio frequency waves to link distributed transmitters and receivers. Specific characteristics of particular facility will determine best

application. Contractor is responsible for determining best system using prediction program to determine where readable signals can be obtained and identify "dead spots".

7. All hardwired alarms, switches, and junction boxes shall be protected from tampering and include line supervision.
8. The installation and placement of intercom units and emergency-call boxes in strategic locations shall also require that signage be posted near these devices. The signage, in accordance with Section 10 14 00, SIGNAGE shall communicate the location of the device and its unique identification number, and brief instruction on how to access/use the device. The signage may appear on the device, on a pole or wall near the device location and shall be printed in a manner that is easily read during daylight and hours of darkness.

## **2.2 EQUIPMENT ITEMS**

- A. All systems shall be designed to provide continuous electrical supervision of the complete and entire system.
- B. Duress-Panic Alarms:
  1. Housing shall be a rugged corrosion-resistant housing of stainless steel or Acrylonitrile Butadiene Styrene (ABS) molded plastic or similar material that is weather and dust proof.
  2. Actuating device shall include a minimum of a plunger button whose head is recessed from the face/front edge of the housing and be designed to avoid accidental activation using switch guard or multiple buttons (i.e., requires pressing two (2) buttons simultaneously)
  3. Wireless stationary devices will meet the same specifications as Personal Duress/Panic Alarms.
  4. Alarm switch/button shall lock-in upon activation until manually reset with key or manufacture provided device.
  5. The switch shall be a positive-acting, double-pole, and double-throw switch.
  6. Duress/Panic alarms shall meet UL 305 Standard for Panic Alarms. To reduce the possibility of false alarms and ensure installation functionality UL 636 Standard for Holdup Alarms standards shall be met.
  7. Alarms used for concealed application requires silent alarm notification to a monitoring station. They shall annunciate at the Physical Access Control System and Database Management, monitored by a central station or direct connect to local police, depending on local ordinance requirements.
  8. Shall be capable of being mounted for hand or foot use in a manner that is unable to be viewed by the public. Larger systems use a computer that intercepts and processes alarms and displays them on a monitor. The central computer can make an announcement over facility hand held radios, pagers or telephones, or at the Physical Access Control System and



Database Management so that the other security personnel can be immediately notified.

These systems shall be hardwired.

9. Wiring will be four (4) conductor #18 American Wire Gauge (AWG).
10. Duress-Panic Alarm Technical Characteristics:

Temperature Range	0° to 110°F (-17.8°C to 43.3°C)
Nominal Voltage	12 V DC @ 6 mA
Current	Max 8 mA
Operational Voltage	7 V DC to 15 V DC
Operational life	Rated for 0,000 activations
Battery Activations	500
Actuator	Dual button plunger with activation lock
LED	Bi-color – on and activated

### 2.3 INSTALLATION KIT

- A. General: A kit shall be provided that, at a minimum, includes all connectors and terminals, labeling systems, barrier strips, wiring blocks or wire wrap terminals, heat shrink tubing, cable ties, solder, hangers, clamps, bolts, etc., required to accomplish a neat and secure installation. Unfinished or unlabeled wire connections will not be allowed. Contractor shall turn over to the Contracting Officer all unused and partially opened installation kit boxes, coaxial cable reels, conduit, cable tray, and/or cable duct bundles, wire rolls, and physical installation hardware. This is an acceptable alternate to the individual spare equipment requirement as long as the minimum spare items are provided in this count. The following installation sub-kits are required as a minimum:
  - B. System Grounding:
    1. The grounding kit shall include all cable in accordance with UL 444 Communications Cables, and installation hardware required. All grounding will be according to the NEC.
  - C. Wire And Cable: The wire and cable kit shall include all connectors and terminals, barrier straps, wiring blocks, wire wrap strips, heat shrink tubing, tie wraps, solder, hangers, clamps, labels etc., required to accomplish a neat and orderly installation.
  - D. Equipment Interface: The equipment interface kit shall include any item or quantity of equipment, cable, mounting hardware and materials needed to interface Systems and Subsystems according to the OEM requirements and this specification.
  - E. Labels: The labeling kit shall include any item or quantity of labels, tools, stencils, and materials needed to label each subsystem according to the OEM requirements, as-installed drawings, and this specification.

- F. Documentation: The documentation kit shall include any item or quantity of items, computer discs, as installed drawings, equipment, maintenance, and operation manuals, and OEM materials needed to correctly provide the system documentation as required by this document and explained herein.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION**

- A. System installation shall be installed in accordance with NFPA 731 Standards for the Installation of Electric Premises Security Systems and appropriate installation manual for each type of subsystem designed, engineered, and installed.
- B. The location and type of duress, intercom, or call-box to be installed will be in accordance with physical security requirements unique to each VA facility.
- C. For EPPS systems (i.e. use current panic/duress and emergency call boxes) that can operate through existing VA facility telephone system lines, software programming and hardware, refer to Section 27 51 23, INTERCOMMUNICATIONS AND PROGRAM SYSTEMS to integrate additional EPPS equipment.
- D. Concealed duress/panic devices shall be mounted in such a way that their location is only known by the person having knowledge of the activating device location. No wiring shall be exposed to identify the location of the activation device.
- E. Floor mounted duress alarms shall be attached to millwork on floor. When mounted under millwork, wiring shall be routed in millwork to conduit system via flexible conduit.
- F. Hard-wired switches shall be wired to individual alarm points within the Advanced Processing Controller (APC).
- G. Wall and post mounted stations shall be mounted to meet UFAS/ADA requirements and use tamper proof bolts and screws. Testing will be finished before installation of fasteners.
- H. Cleaning: Subsequent to installation, clean each system component of dust, dirt, grease, or oil incurred during installation in accordance to manufacture instructions.
- I. Provisions shall be made for systems in high-noise areas or areas with electrical interference environments.
- J. Adjustment/Alignment/Synchronization: Contractor shall prepare for system activation by following manufacturer's recommended procedures for adjustment, alignment, or programming. Prepare each component in accordance with appropriate provisions of the component's installation, operations, and maintenance instructions.

### **3.2 WIRELINE DATA TRANSMISSION**

- A. Installation: The Contractor shall install all system components including Owner furnished equipment, and appurtenances in accordance with the manufacturer's instructions, ANSI C2 and

as shown, and shall furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable data transmission system.

- B. Identification and Labeling: The Contractor shall supply permanent identification labels for each cable at each end that will appear on the as-built drawings. The labeling format shall be identified and a complete record shall be provided to the Owner with the final documentation. Each cable shall be identified by type or signal being carried and termination points. The labels shall be printed on letter size label sheets that are self laminated vinyl that can be printed from a computer data base or spread sheet. The labels shall be E-Z code WES12112 or equivalent.
- C. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing.
- D. Contractor's Field Test: The Contractor shall verify the complete operation of the data transmission system during the Contractor's Field Testing. Field test shall include a bit error rate test. The Contractor shall perform the test by sending a minimum of 1,000,000 bits of data on each DTM circuit and measuring the bit error rate. The bit error rate shall not be greater than one (1) bit out of each 100,000 bits sent for each dial-up DTM circuit, and one (1) bit out of 1,000,000 bits sent for each leased or private DTM circuit. The Contractor shall submit a report containing results of the field test.
- E. Acceptance Test and Endurance Test: The wire line data transmission system shall be tested as a part of the completed IDS and EECS during the Acceptance test and Endurance Test as specified.
- F. Identification and Labeling: The Contractor shall supply identification tags or labels for each cable. Cable shall be labeled at both end points and at intermediate hand holes, manholes, and junction boxes. The labeling format shall be identified and a complete record shall be provided to the Owner with the final documentation. Each cable shall be identified with type of signal being carried and termination points.

### **3.3 WIRING**

- A. Wiring Method: Install cables in raceways [except in accessible indoor ceiling spaces, in attics,] [in hollow gypsum-board partitions,] and as otherwise indicated. Conceal raceways and wiring except in unfinished spaces.
- B. Wiring Method: Install cables concealed in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical

connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

- E. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

### **3.4 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation and supervise pretesting, testing, and adjusting of video surveillance equipment.
- B. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
- C. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
- D. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
- E. Remove and replace malfunctioning items and retest as specified above.
- F. Record test results for each piece of equipment.
- G. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

### **3.5 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions and to optimize performance of the installed equipment. Tasks shall include, but are not limited to, the following:
  1. Check cable connections.
  2. Check proper operation of detectors.
  3. Recommend changes to walk trough detectors, X-ray machines, and associated equipment to improve Owner' utilization of security access detection system.
  4. Provide a written report of adjustments and recommendations.

### **3.6 CLEANING**

- A. Clean installed items using methods and materials recommended in writing by manufacturer.

### **3.7 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain electronic personal protection system (EPSS) equipment.
  1. Train Owner's maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining equipment.

2. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.
3. Review equipment list and data in maintenance manuals.
4. Conduct a minimum of [four] <Insert number> hours' training.

### **3.8 TESTS AND TRAINING**

- A. All testing and training shall be compliant with the VA General Requirements, Section 01 00 00, GENERAL REQUIREMENTS.

-----END-----

**SECTION 28 31 00  
FIRE DETECTION AND ALARM**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section of the specifications includes the furnishing, installation, and connection of the fire alarm equipment to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control units, fire safety control devices, annunciators, power supplies, and wiring as shown on the drawings and specified. The fire alarm system shall not be combined with other systems such as building automation, energy management, security, etc.
- B. Fire alarm systems shall comply with requirements of the most recent VA FIRE PROTECTION DESIGN MANUAL and NFPA 72 unless variations to NFPA 72 are specifically identified within these contract documents by the following notation: "variation". The design, system layout, document submittal preparation, and supervision of installation and testing shall be provided by a technician that is certified NICET level III or a registered fire protection engineer. The NICET certified technician shall be on site for the supervision and testing of the system. Factory engineers from the equipment manufacturer, thoroughly familiar and knowledgeable with all equipment utilized, shall provide additional technical support at the site as required by the COTR or his authorized representative. Installers shall have a minimum of 2 years experience installing fire alarm systems.
- C. Fire alarm signals:
  - 1. Building(s) shall have an automatic digitized voice fire alarm signal with emergency manual voice override to notify occupants to evacuate. The digitized voice message shall identify the area of the building (smoke zone) from which the alarm was initiated.
  - 2. Building(s) shall have a general evacuation fire alarm signal in accordance with ASA S3.41 to notify all occupants in the respective building to evacuate.
- D. Alarm signals (by device), supervisory signals (by device) and system trouble signals (by device not reporting) shall be distinctly transmitted to the main fire alarm system control unit located in the security office.
- E. The main fire alarm control unit is an existing system.

**1.2 SCOPE**

- A. An extension to the fully addressable fire alarm system shall be designed and installed in accordance with the specifications and drawings. Device location and wiring runs shown on the drawings are for reference only unless specifically dimensioned. Actual locations shall be in accordance with NFPA 72 and this specification.
- B. All existing fire alarm equipment, wiring, devices and sub-systems that are not shown to be reused shall be removed. All existing fire alarm conduit not reused shall be removed.
- C. Existing fire alarm bells, chimes, door holders, 120VAC duct smoke detectors, valve tamper switches and waterflow/pressure switches may be reused only as specifically indicated on the drawings and provided the equipment:
  1. Meets this specification section
  2. Is UL listed or FM approved
  3. Is compatible with new equipment being installed
  4. Is verified as operable through contractor testing and inspection
  5. Is warranted as new by the contractor.
- D. Existing 120 VAC duct smoke detectors, waterflow/pressure switches, and valve tamper switches reused by the Contractor shall be equipped with an addressable interface device compatible with the new equipment being installed.
- E. Existing reused equipment shall be covered as new equipment under the Warranty specified herein.
- F. Basic Performance:
  1. Alarm and trouble signals from each building fire alarm control panel shall be digitally encoded by UL listed electronic devices onto a multiplexed communication system.
  2. Response time between alarm initiation (contact closure) and recording at the main fire alarm control unit (appearance on alphanumeric read out) shall not exceed 5 seconds.
  3. The signaling line circuits (SLC) between building fire alarm control units shall be wired Style 7 in accordance with NFPA 72. Isolation shall be provided so that no more than one building can be lost due to a short circuit fault.
  4. Initiating device circuits (IDC) shall be wired Style C in accordance with NFPA 72.
  5. Signaling line circuits (SLC) within buildings shall be wired Style 4 in accordance with NFPA 72. Individual signaling line circuits shall be limited to covering 22,500 square feet (2,090 square meters) of floor space or 3 floors whichever is less.
  6. Notification appliance circuits (NAC) shall be wired Style Y in accordance with NFPA 72.

### **1.3 RELATED WORK**

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.  
Requirements for procedures for submittals.

- B. Section 07 84 00 - FIRESTOPPING. Requirements for fire proofing wall penetrations.
- C. Section 08 71 00 - DOOR HARDWARE. For combination Closer-Holders.
- E. Section 28 05 00 – COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY. Requirements for general requirements that are common to more than one section in Division 28.
- F. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for conductors and cables.
- G. Section 28 05 26 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY. Requirements for grounding of equipment.
- H. Section 28 05 28.33 - CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for infrastructure.
- I. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for conductors and cables.
- J. Section 28 08 00, COMMISSIONING OF ELECTRONIC SAFETY AND SECURITY SYSTEMS. Requirements for commissioning - systems readiness checklists, and training.
- K. Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEMS (PACS). Requirements for integration with physical access control system.

#### **1.4 SUBMITTALS**

- A. General: Submit 5 copies in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, and Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. Drawings:
  - 1. Prepare drawings using AutoCAD Release 14 software and include all contractors information. Layering shall be by VA criteria as provided by the Contracting Officer's Representative (COR). Bid drawing files on AutoCAD will be provided to the Contractor at the pre-construction meeting. The contractor shall be responsible for verifying all critical dimensions shown on the drawings provided by VA.
  - 2. Floor plans: Provide locations of all devices (with device number at each addressable device corresponding to control unit programming), appliances, panels, equipment, junction/terminal cabinets/boxes, risers, electrical power connections, individual circuits and raceway routing, system zoning; number, size, and type of raceways and conductors in each raceway; conduit fill calculations with cross section area percent fill for each type and size of conductor and raceway. Only those devices connected and incorporated into the final system shall be on these floor plans. Do not show any removed devices on the floor plans. Show all interfaces for all fire safety functions.



3. Riser diagrams: Provide, for the entire system, the number, size and type of riser raceways and conductors in each riser raceway and number of each type device per floor and zone. Show door holder interface, elevator control interface, HVAC shutdown interface, fire extinguishing system interface, and all other fire safety interfaces. Show wiring Schedules on the riser diagram for all circuits. Provide diagrams both on a per building and campus wide basis.
  4. Detailed wiring diagrams: Provide for control panels, modules, power supplies, electrical power connections, auxiliary relays and annunciators showing termination identifications, size and type conductors, circuit boards, LED lamps, indicators, adjustable controls, switches, ribbon connectors, wiring harnesses, terminal strips and connectors, spare zones/circuits. Diagrams shall be drawn to a scale sufficient to show spatial relationships between components, enclosures and equipment configuration.
  5. Two weeks prior to final inspection, the Contractor shall deliver to the COR 3 sets of as-built drawings and one set of the as-built drawing computer files (using AutoCAD 2007 or later). As-built drawings (floor plans) shall show all new and/or existing conduit used for the fire alarm system.
- C. Manuals:
1. Submit simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals including technical data sheets for all items used in the system, power requirements, device wiring diagrams, dimensions, and information for ordering replacement parts.
    - a. Wiring diagrams shall have their terminals identified to facilitate installation, operation, expansion and maintenance.
    - b. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
    - c. Include complete listing of all software used and installation and operation instructions including the input/output matrix chart.
    - d. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate, inspect, test and maintain the equipment and system. Provide all manufacturer's installation limitations including but not limited to circuit length limitations.
    - e. Complete listing of all digitized voice messages.
    - f. Provide standby battery calculations under normal operating and alarm modes. Battery calculations shall include the magnets for holding the doors open for one minute.
    - g. Include information indicating who will provide emergency service and perform post contract maintenance.



All work performed and all material and equipment furnished under this contract 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.

**1.6 APPLICABLE PUBLICATIONS**

- A. The publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. The publications are referenced in text by the basic designation only and the latest editions of these publications shall be applicable.
- B. National Fire Protection Association (NFPA):
  - NFPA 13 .....Standard for the Installation of Sprinkler Systems, 2010 edition
  - NFPA 14 ..... Standard for the Installation of Standpipes and Hose Systems, 2010 edition
  - NFPA 20 ..... Standard for the Installation of Stationary Pumps for Fire Protection, 2010 edition
  - NFPA 70.....National Electrical Code (NEC), 2010 edition
  - NFPA 72.....National Fire Alarm Code, 2010 edition
  - NFPA 90A .....Standard for the Installation of Air Conditioning and Ventilating Systems, 2009 edition
  - NFPA 101.....Life Safety Code, 2009 edition
- C. Underwriters Laboratories, Inc. (UL): Fire Protection Equipment Directory
- D. Factory Mutual Research Corp (FM): Approval Guide, 2007-2011
- E. American National Standards Institute (ANSI):
  - S3.41 .....Audible Emergency Evacuation Signal, 1990 edition, reaffirmed 2008
- F. International Code Council, International Building Code (IBC), 2009 edition

**PART 2 – PRODUCTS**

**2.1 EQUIPMENT AND MATERIALS, GENERAL**

- A. All equipment and components shall be new and the manufacturer's current model. All equipment shall be tested and listed by Underwriters Laboratories, Inc. or Factory Mutual Research Corporation for use as part of a fire alarm system. The authorized representative of the manufacturer of the major equipment shall certify that the installation complies with all manufacturers' requirements and that satisfactory total system operation has been achieved.

**2.2 CONDUIT, BOXES, AND WIRE**

- A. Conduit shall be in accordance as follows:

1. All new conduits shall be installed in accordance with NFPA 70.
2. Conduit fill shall not exceed 40 percent of interior cross sectional area.
3. All new conduits shall be 3/4 inch (19 mm) minimum.

B. Wire:

1. Wiring shall be in accordance with NEC article 760, Section 28 05 13, CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY, and as recommended by the manufacturer of the fire alarm system. All wires shall be color coded. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for initiating device circuits and 14 AWG for notification device circuits.
2. Addressable circuits and wiring used for the multiplex communication loop shall be twisted and shielded unless specifically excepted by the fire alarm equipment manufacturer in writing.
3. Any fire alarm system wiring that extends outside of a building shall have additional power surge protection to protect equipment from physical damage and false signals due to lightning, voltage and current induced transients. Protection devices shall be shown on the submittal drawings and shall be UL listed or in accordance with written manufacturer's requirements.
4. All wire or cable used in underground conduits including those in concrete shall be listed for wet locations.

C. Terminal Boxes, Junction Boxes, and Cabinets:

1. Shall be galvanized steel in accordance with UL requirements.
2. All boxes shall be sized and installed in accordance with NFPA 70.
3. covers shall be repainted red in accordance with Section 09 91 00, PAINTING and shall be identified with white markings as "FA" for junction boxes and as "FIRE ALARM SYSTEM" for cabinets and terminal boxes. Lettering shall be a minimum of 3/4 inch (19 mm) high.
4. Terminal boxes and cabinets shall have a volume 50 percent greater than required by the NFPA 70. Minimum sized wire shall be considered as 14 AWG for calculation purposes.
5. Terminal boxes and cabinets shall have identified pressure type terminal strips and shall be located at the base of each riser. Terminal strips shall be labeled as specified or as approved by the COR.

## **2.3 FIRE ALARM CONTROL UNIT**

A. General:

1. Each building expansion shall be provided with a fire alarm control unit and shall operate as a supervised zoned fire alarm system.
2. Each power source shall be supervised from the other source for loss of power.
3. All circuits shall be monitored for integrity.

4. Visually and audibly annunciate any trouble condition including, but not limited to main power failure, grounds and system wiring derangement.
  5. Transmit digital alarm information to the main fire alarm control unit.
- B. Enclosure:
1. The control unit shall be housed in a cabinet suitable for both recessed and surface mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
  2. Cabinet shall contain all necessary relays, terminals, lamps, and legend plates to provide control for the system.
- C. Operator terminal at main control unit:
1. Operator terminal shall consist of the central processing unit, display screen, keyboard and printer.
  2. Display screen shall have a minimum 15-inch (380 mm) diagonal non-glare screen capable of displaying 24 lines of 80 characters each.
  3. Keyboard shall consist of 60 alpha numeric and 12 user/functional control keys.
  4. Printer shall be the automatic type, printing the date, time and location for all alarm, supervisory, and trouble conditions.
- D. Power Supply:
1. The control unit shall derive its normal power from a 120 volt, 60 Hz dedicated supply connected to the emergency power system. Standby power shall be provided by a 24 volt DC battery as hereinafter specified. The normal power shall be transformed, rectified, coordinated, and interfaced with the standby battery and charger.
  2. The door holder power shall be arranged so that momentary or sustained loss of main operating power shall not cause the release of any door.
  3. Power supply for smoke detectors shall be taken from the fire alarm control unit.
  4. Provide protectors to protect the fire alarm equipment from damage due to lightning or voltage and current transients.
  5. Provide new separate and direct ground lines to the outside to protect the equipment from unwanted grounds.
- E. Circuit Supervision: Each alarm initiating device circuit, signaling line circuit, and notification appliance circuit, shall be supervised against the occurrence of a break or ground fault condition in the field wiring. These conditions shall cause a trouble signal to sound in the control unit until manually silenced by an off switch.
- F. Supervisory Devices: All sprinkler system valves, standpipe control valves, post indicator valves (PIV), and main gate valves shall be supervised for off-normal position. Closing a valve shall sound a supervisory signal at the control unit until silenced by an off switch. The specific location

of all closed valves shall be identified at the control unit. Valve operation shall not cause an alarm signal. Low air pressure switches and duct detectors shall be monitored as supervisory signals.

The power supply to the elevator shunt trip breaker shall be monitored by the fire alarm system as a supervisory signal.

G. Trouble signals:

1. Arrange the trouble signals for automatic reset (non-latching).
2. System trouble switch off and on lamps shall be visible through the control unit door.

H. Function Switches: Provide the following switches in addition to any other switches required for the system:

1. Remote Alarm Transmission By-pass Switch: Shall prevent transmission of all signals to the main fire alarm control unit when in the "off" position. A system trouble signal shall be energized when switch is in the off position.
2. Alarm Off Switch: Shall disconnect power to alarm notification circuits on the local building alarm system. A system trouble signal shall be activated when switch is in the off position.
3. Trouble Silence Switch: Shall silence the trouble signal whenever the trouble silence switch is operated. This switch shall not reset the trouble signal.
4. Reset Switch: Shall reset the system after an alarm, provided the initiating device has been reset. The system shall lock in alarm until reset.
5. Lamp Test Switch: A test switch or other approved convenient means shall be provided to test the indicator lamps.
6. Drill Switch: Shall activate all notification devices without tripping the remote alarm transmitter. This switch is required only for general evacuation systems specified herein.
7. Door Holder By-Pass Switch: Shall prevent doors from releasing during fire alarm tests. A system trouble alarm shall be energized when switch is in the abnormal position.
8. Elevator recall By-Pass Switch: Shall prevent the elevators from recalling upon operation of any of the devices installed to perform that function. A system trouble alarm shall be energized when the switch is in the abnormal position.
9. HVAC/Smoke Damper By-Pass: Provide a means to disable HVAC fans from shutting down and/or smoke dampers from closing upon operation of an initiating device designed to interconnect with these devices.

I. Remote Transmissions:

1. Provide capability and equipment for transmission of alarm, supervisory and trouble signals to the main fire alarm control unit.
2. Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.

- J. Remote Control Capability: Each building fire alarm control unit shall be installed and programmed so that each must be reset locally after an alarm, before the main fire alarm control unit can be reset. After the local building fire alarm control unit has been reset, then the all system acknowledge, reset, silence or disabling functions can be operated by the main fire alarm control unit
- K. System Expansion: Design the control units and enclosures so that the system can be expanded in the future (to include the addition of 20 percent more alarm initiating, alarm notification and door holder circuits) without disruption or replacement of the existing control unit and secondary power supply.

## **2.4 ANNUNCIATION**

- A. Annunciator, Alphanumeric Type (System):
  - 1. Shall be a supervised, LCD display containing a minimum of 2 lines of 40 characters for alarm annunciation in clear English text.
  - 2. Message shall identify building number, floor, zone, etc on the first line and device description and status (pull station, smoke detector, waterflow alarm or trouble condition) on the second line.
  - 3. The initial alarm received shall be indicated as such.
  - 4. A selector switch shall be provided for viewing subsequent alarm messages.
  - 5. The display shall be UL listed for fire alarm application.
  - 6. Annunciators shall display information for all buildings connected to the system. Local building annunciators, for general evacuation system buildings, shall be permitted when shown on the drawings and approved by the COR.

## **2.5 VOICE COMMUNICATION SYSTEM (VCS)**

- A. General:
  - 1. An emergency voice communication system shall be installed throughout.
  - 2. Upon receipt of an alarm signal from the building fire alarm system, the VCS shall automatically transmit a pre-recorded fire alarm message throughout the building.
  - 3. A digitized voice module shall be used to store each prerecorded message.
  - 4. The VCS shall be arranged as a single channel system.
  - 5. The VCS shall supervise all speaker circuits, control equipment, remote audio control equipment, and amplifiers.
- B. Speaker Circuit Control Unit:
  - 1. The speaker circuit control unit shall include switches to manually activate or deactivate speaker circuits grouped by floor in the system.

2. Speaker circuit control switches shall provide on, off, and automatic positions and indications.
3. The speaker circuit control unit shall include visual indication of active or trouble status for each group of speaker circuits in the system.
4. A trouble indication shall be provided if a speaker circuit group is disabled.
5. A lamp test switch shall be provided to test all indicator lamps.
6. A single "all call" switch shall be provided to activate all speaker circuit groups simultaneously.
7. A push-to-talk microphone shall be provided for manual voice messages.
8. Remote microphones shall be provided in the // identify location of 24 hour manned location such as security office and/or telephone operators area/boiler plant/ fire department for manual "all call" messages to each individual building and throughout all buildings identify all buildings to receive voice messages at one time.
9. A voice message disconnect switch shall be provided to disconnect automatic digitized voice messages from the system. The system shall be arranged to allow manual voice messages and indicate a system trouble condition when activated.

C. Speaker Circuit Arrangement:

1. Speaker circuits shall be arranged such that there is one speaker circuit per smoke zone.
2. Audio amplifiers and control equipment shall be electrically supervised for normal and abnormal conditions.
3. Speaker circuits shall be either 25 VRMS or 70.7 VRMS with a minimum of 50 percent spare power available.
4. Speaker circuits and control equipment shall be arranged such that loss of any one speaker circuit will not cause the loss of any other speaker circuit in the system.

D. Digitized Voice Module (DVM):

1. The Digitized Voice Module shall provide prerecorded digitized evacuation and instructional messages. The messages shall be professionally recorded and approved by the COTR prior to programming.
2. The DVM shall be configured to automatically output to the desired circuits following a 10-second slow whoop alert tone.
3. Prerecorded magnetic taped messages and tape players are not permitted.
4. The digitized message capacity shall be no less than 15 second in length.
5. The digitized message shall be transmitted 3 times.
6. The DVM shall be supervised for operational status.
7. Failure of the DVM shall result in the transmission of a constant alarm tone.



8. The DVM memory shall have a minimum 50 percent spare capacity after those messages identified in this section are recorded. Multiple DVM's may be used to obtain the required capacity.

E. Audio Amplifiers:

1. Audio Amplifiers shall provide a minimum of 50 Watts at either 25 or 70.7 VRMS output voltage levels.
2. Amplifiers shall be continuously supervised for operational status.
3. Amplifiers shall be configured for either single or dual channel application.
4. Each audio output circuit connection shall be configurable for Style X.
5. A minimum of 50 percent spare output capacity shall be available for each amplifier.

## 2.6 ALARM NOTIFICATION APPLIANCES

A. Bells:

1. Shall be electric, single-stroke or vibrating, heavy-duty, under-dome, solenoid type.
2. Unless otherwise shown on the drawings, shall be 6 inches (150 mm) diameter and have a minimum nominal rating of 80 dBA at 10 feet (3,000 mm).
3. Mount on removable adapter plates on outlet boxes.
4. Bells located outdoors shall be weatherproof type with metal housing and protective grille.
5. Each bell circuit shall have a minimum of 20 percent spare capacity.

B. Speakers:

1. Shall operate on either 25 VRMS or 70.7 VRMS with field selectable output taps from 0.5 to 2.0W and originally installed at the 1/2 watt tap. Speakers shall provide a minimum sound output of 80 dBA at 10 feet (3,000 mm) with the 1/2 watt tap.
2. Frequency response shall be a minimum of 400 HZ to 4,000 HZ.
3. Four inches (100 mm) or 8 inches (200 mm) cone type speakers ceiling mounted with white colored baffles in areas with suspended ceilings and wall mounted in areas without ceilings.

C. Strobes:

1. Xenon flash tube type minimum 15 candela in toilet rooms and 75 candela in all other areas with a flash rate of 1 HZ. Strobes shall be synchronized where required by the National Fire Alarm Code (NFPA 72).
2. Backplate shall be red with 1/2 inch (13 mm) permanent red letters. Lettering to read "Fire", be oriented on the wall or ceiling properly, and be visible from all viewing directions.
3. Each strobe circuit shall have a minimum of 20 percent spare capacity.
4. Strobes may be combined with the audible notification appliances specified herein.

D. Fire Alarm Horns:

1. Shall be electric, utilizing solid state electronic technology operating on a nominal 24 VDC.

2. Shall be a minimum nominal rating of 80 dBA at 10 feet (3,000 mm).
3. Mount on removable adapter plates on conduit boxes.
4. Horns located outdoors shall be of weatherproof type with metal housing and protective grille.
5. Each horn circuit shall have a minimum of 20 percent spare capacity.

## **2.7 ALARM INITIATING DEVICES**

### **A. Manual Fire Alarm Stations:**

1. Shall be non-breakglass, address reporting type.
2. Station front shall be constructed of a durable material such as cast or extruded metal or high impact plastic. Stations shall be semi-flush type.
3. Stations shall be of single action pull down type with suitable operating instructions provided on front in raised or depressed letters, and clearly labeled "FIRE."
4. Operating handles shall be constructed of a durable material. On operation, the lever shall lock in alarm position and remain so until reset. A key shall be required to gain front access for resetting, or conducting tests and drills.
5. Unless otherwise specified, all exposed parts shall be red in color and have a smooth, hard, durable finish.

### **B. Smoke Detectors:**

1. Smoke detectors shall be photoelectric type and UL listed for use with the fire alarm control unit being furnished.
2. Smoke detectors shall be addressable type complying with applicable UL Standards for system type detectors. Smoke detectors shall be installed in accordance with the manufacturer's recommendations and NFPA 72.
3. Detectors shall have an indication lamp to denote an alarm condition. Provide remote indicator lamps and identification plates where detectors are concealed from view. Locate the remote indicator lamps and identification plates flush mounted on walls so they can be observed from a normal standing position.
4. All spot type and duct type detectors installed shall be of the photoelectric type.
5. Photoelectric detectors shall be factory calibrated and readily field adjustable. The sensitivity of any photoelectric detector shall be factory set at 3.0 plus or minus 0.25 percent obscuration per foot.
6. Detectors shall provide a visual trouble indication if they drift out of sensitivity range or fail internal diagnostics. Detectors shall also provide visual indication of sensitivity level upon testing. Detectors, along with the fire alarm control units shall be UL listed for testing the sensitivity of the detectors.

### **C. Heat Detectors:**

1. Heat detectors shall be of the addressable restorable rate compensated fixed-temperature spot type.
2. Detectors shall have a minimum smooth ceiling rating of 2,500 square feet (230 square meters).
3. Intermediate temperature rated (200 degrees F (93 degrees C)) heat detectors shall be utilized in all areas.

## **2.9 SUPERVISORY DEVICES**

### **A. Duct Smoke Detectors:**

1. Duct smoke detectors shall be provided and connected by way of an address reporting interface device. Detectors shall be provided with an approved duct housing mounted exterior to the duct, and shall have perforated sampling tubes extending across the full width of the duct (wall to wall). Detector placement shall be such that there is uniform airflow in the cross section of the duct.
2. Interlocking with fans shall be provided in accordance with NFPA 90A and as specified hereinafter under Part 3.2, "TYPICAL OPERATION".
3. Provide remote indicator lamps, key test stations and identification nameplates (e.g. "DUCT SMOKE DETECTOR AHU-X") for all duct detectors. Locate key test stations in plain view on walls or ceilings so that they can be observed and operated from a normal standing position.

## **2.10 ADDRESS REPORTING INTERFACE DEVICE**

- A. Shall have unique addresses that reports directly to the building fire alarm panel.
- B. Shall be configurable to monitor normally open or normally closed devices for both alarm and trouble conditions.
- C. Shall have terminal designations clearly differentiating between the circuit to which they are reporting from and the device that they are monitoring.
- D. Shall be UL listed for fire alarm use and compatibility with the panel to which they are connected.
- E. Shall be mounted in weatherproof housings if mounted exterior to a building.

## **2.11 SMOKE BARRIER DOOR CONTROL**

### **A. Electromagnetic Door Holders:**

1. New Door Holders shall be standard wall mounted electromagnetic type. In locations where doors do not come in contact with the wall when in the full open position, an extension post shall be added to the door bracket.
  2. Operation shall be by 24 volt DC supplied from a battery located at the fire alarm control unit. Door holders shall be coordinated as to voltage, ampere drain, and voltage drop with the battery, battery charger, wiring and fire alarm system for operation as specified.
- B. A maximum of twelve door holders shall be provided for each circuit. Door holders shall be wired to allow releasing doors by smoke zone.

- C. Door holder control circuits shall be electrically supervised.
- D. Smoke detectors shall not be incorporated as an integral part of door holders.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION:

- A. Installation shall be in accordance with NFPA 70, 72, 90A, and 101 as shown on the drawings, and as recommended by the major equipment manufacturer. Fire alarm wiring shall be installed in conduit. All conduit and wire shall be installed in accordance with, Section 28 05 13 CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY, Section 28 05 26 GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY, Section 28 05 28.33 CONDUIT AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY, and all penetrations of smoke and fire barriers shall be protected as required by Section 07 84 00, FIRESTOPPING.
- B. All conduits, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.
- C. All new and reused exposed conduits shall be painted in accordance with Section 09 91 00, PAINTING to match surrounding finished areas and red in unfinished areas.
- D. All existing accessible fire alarm conduit not reused shall be removed.
- E. Existing devices that are reused shall be properly mounted and installed. Where devices are installed on existing shallow backboxes, extension rings of the same material, color and texture of the new fire alarm devices shall be used. Mounting surfaces shall be cut and patched in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Restoration, and be re-painted in accordance with Section 09 91 00, PAINTING as necessary to match existing.
- F. All fire detection and alarm system devices, control units and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas. Exact locations are to be approved by the COR.
- G. Speakers shall be ceiling mounted and fully recessed in areas with suspended ceilings. Speakers shall be wall mounted and recessed in finished areas without suspended ceilings. Speakers may be surface mounted in unfinished areas.
- H. Strobes shall be flush wall mounted with the bottom of the unit located 80 inches (2,000 mm) above the floor or 6 inches (150 mm) below ceiling, whichever is lower. Locate and mount to maintain a minimum 36 inches (900 mm) clearance from side obstructions.
- I. Manual pull stations shall be installed not less than 42 inches (1,050 mm) or more than 48 inches (1,200 mm) from finished floor to bottom of device and within 60 inches (1,500 mm) of a stairway or an exit door.

- J. Where possible, locate water flow and pressure switches a minimum of 12 inches (300 mm) from a fitting that changes the direction of the flow and a minimum of 36 inches (900 mm) from a valve.
- K. Mount valve tamper switches so as not to interfere with the normal operation of the valve and adjust to operate within 2 revolutions toward the closed position of the valve control, or when the stem has moved no more than 1/5 of the distance from its normal position.
- L. Connect combination closer-holders installed under Section 08 71 00, DOOR HARDWARE.

### **3.2 TYPICAL OPERATION**

- A. Activation of any manual pull station, water flow or pressure switch, heat detector, kitchen hood suppression system, gaseous suppression system, or smoke detector shall cause the following operations to occur:
  - 1. Operate the emergency voice communication system in Buildings indicate buildings. For sprinkler protected buildings, flash strobes continuously only in the zone of alarm. For buildings without sprinkler protection throughout, flash strobes continuously only on the floor of alarm.
  - 2. Continuously sound a temporal pattern general alarm and flash all strobes in the building in alarm until reset at the local fire alarm control unit in Buildings indicate buildings.
  - 3. Release only the magnetic door holders in the smoke zone on the floor from which alarm was initiated after the alert signal.
  - 4. Transmit a separate alarm signal, via the main fire alarm control unit to the fire department.
  - 5. Unlock the electrically locked exit doors within the zone of alarm.
- D. Smoke detectors in the remaining elevator lobbies, elevator machine room, or top of hoistway shall, in addition to the above functions, return all elevators in the bank to the primary floor.
- E. Operation of a smoke detector at a corridor door used for automatic closing shall also release only the magnetic door holders on that floor in that smoke zone.
- F. Operation of duct smoke detectors shall cause a system supervisory condition and shut down the ventilation system and close the associated smoke dampers as appropriate.
- G. Operation of any sprinkler or standpipe system valve supervisory switch, high/low air pressure switch, or fire pump alarm switch shall cause a system supervisory condition.
- H. Alarm verification shall not be used for smoke detectors installed for the purpose of early warning.

### **3.3 TESTS**

- A. Provide the service of a NICET level III, competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. Make all adjustments and tests in the presence of the COR.

- B. When the systems have been completed and prior to the scheduling of the final inspection, furnish testing equipment and perform the following tests in the presence of the COR. When any defects are detected, make repairs or install replacement components, and repeat the tests until such time that the complete fire alarm systems meets all contract requirements. After the system has passed the initial test and been approved by the COR, the contractor may request a final inspection.
1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
  2. Test the insulation on all installed cable and wiring by standard methods as recommended by the equipment manufacturer.
  3. Run water through all flow switches. Check time delay on water flow switches. Submit a report listing all water flow switch operations and their retard time in seconds.
  4. Open each alarm initiating and notification circuit to see if trouble signal actuates.
  5. Ground each alarm initiation and notification circuit and verify response of trouble signals.

### **3.4 FINAL INSPECTION AND ACCEPTANCE**

- A. Prior to final acceptance a minimum 30 day "burn-in" period shall be provided. The purpose shall be to allow equipment to stabilize and potential installation and software problems and equipment malfunctions to be identified and corrected. During this diagnostic period, all system operations and malfunctions shall be recorded. Final acceptance will be made upon successful completion of the "burn-in" period and where the last 14 days is without a system or equipment malfunction.
- B. At the final inspection a factory trained representative of the manufacturer of the major equipment shall repeat the tests in Article 3.3 TESTS and those required by NFPA 72. In addition the representative shall demonstrate that the systems function properly in every respect. The demonstration shall be made in the presence of a VA representative.

### **3.5 INSTRUCTION**

- A. The manufacturer's authorized representative shall provide instruction and training to the VA as follows:
1. A 1-hour sessions to engineering staff, security police and central attendant personnel for simple operation of the system. Two sessions at the start of installation, 2 sessions at the completion of installation and 2 sessions 3 months after the completion of installation.
  2. Four 2-hour sessions to engineering staff for detailed operation of the system. Two sessions at the completion of installation and 2 sessions 3 months after the completion of installation.
  3. Three 8-hour sessions to electrical technicians for maintaining, programming, modifying, and repairing the system at the completion of installation and one 8-hour refresher session 3 months after the completion of installation.

- B. The Contractor and/or the Systems Manufacturer's representative shall provide a typewritten "Sequence of Operation" including a trouble shooting guide of the entire system for submittal to the VA. The sequence of operation will be shown for each input in the system in a matrix format and provided in a loose leaf binder. When reading the sequence of operation, the reader will be able to quickly and easily determine what output will occur upon activation of any input in the system. The INPUT/OUTPUT matrix format shall be as shown in Appendix A to NFPA 72.
- C. Furnish the services of a competent instructor for instructing personnel in the programming requirements necessary for system expansion. Such programming shall include addition or deletion of devices, zones, indicating circuits and printer/display text.

**-- END --**