

**SECTION 27 31 00**  
**VOICE COMMUNICATIONS SWITCHING AND ROUTING EQUIPMENT**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the furnishing, installing, certification, testing, and guaranty of a complete and operating Telephone Electronic Private Branch Exchange (EPBX) equipment and interconnecting cable (not cable distribution plant) system (here-in-after referred to as "the *System*"), and associated equipment to be installed in the Bath VA Building 78 here-in-after referred to as "the Facility". The System shall include, but not be limited to, telephone processing switch, equipment cabinets, interface enclosures, and relay racks, stand-by battery(s), necessary combiners, traps, and filters; interconnection nodes and/or amplifiers; telephone instruments; auxiliary systems; and necessary passive devices such as: protectors, isolators, splitters, couplers, cable "patch", "punch down", and cross-connector blocks or devices, cable management items, voice and digital cable distribution system, and associated hardware. The System shall additionally include, but not be limited to: telecommunication closets (TC); telecommunication outlets (TCO) copper and fiber-optic interconnecting cables, connectors, "patch" cables, and/or "break out" devices.
- B. The System shall be delivered free of engineering, manufacturing, installation, and operating defects. It shall be designed, engineered and installed for ease of operation, maintenance, and testing.
- C. The term "provide", as used herein, shall be defined as: designed, engineered, furnished, installed, certified, and tested, by Contractor.
- D. The Telephone System is defined as an Emergency Critical Care Communication System by the National Fire Protection Association (NFPA). Therefore, its installation and operation shall adhere to all appropriate National, Government, and/or Local Life Safety and/or Support Codes, which ever are the more stringent for this Facility. At a minimum, the System shall be installed according to NFPA, Section 70, National Electrical Code (NEC), Article 517 and Chapter 7; NFPA, Section 99, Health Care Facilities, Chapter 3-4; NFPA, Section 101, Life Safety Code, Chapters 7, 12, and/or 13; Joint Commission on Accreditation of Health Care Organization (JCAHCO), Manual for Health Care Facilities, all necessary Life Safety and/or Support guidelines;

this specification; and the original equipment manufacturer's (OEM) suggested installation design, recommendations, and instructions. The 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.

- E. The VA Project Manager (PM) and/or if delegated, Contracting Officers Representative (COR) are the approving authorities for all contractual and mechanical changes to the System. The Contractor is cautioned to obtain in writing, all approvals for system changes relating to the published contract specifications and drawings, from the PM and/or COR before proceeding with the change.

#### **1.2 RELATED WORK**

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.  
B. Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.  
C. Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS.  
D. Section 27 10 00, STRUCTURED CABLING.  
E. Section 26 27 26, WIRING DEVICES.  
F. Section 27 05 26, GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS.  
G. Section 27 15 00, COMMUNICATIONS HORIZONTAL CABLING.  
H. Section 27 51 16, PUBLIC ADDRESS AND MASS NOTIFICATION SYSTEMS.

#### **1.3 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only. Except for a specific date given, the issue in effect (including amendments, addenda, revisions, supplements, and errata) on the date the system's submittal is technically approved by VA, shall be enforced.
- B. Joint Commission on Accreditation of Health Care Organization (JCAHO) Comprehensive Accreditation Manual for Hospitals
- C. National and/or Government Life Safety Code(s): The more stringent of each listed code.
- D. National Fire Protection Association (NFPA):

70	National Electrical Code (NEC)
75	Protection of Electronic Computer/Data Processing Systems
77	Recommended Practice on Static Electricity
99	Standard for Health Care Facilities

101	Life Safety Code
1221	Emergency Services Communication Systems

E. Underwriter's Laboratories, Inc. (UL):

65	Wired Cabinets
96	Lightning Protection Components
96A	Installation Requirements for Lightning Protection Systems
467	Grounding and Bonding Equipment
497/497A /497B	Protectors for Paired Conductors/Communications Circuits/Data Communication and Fire Alarm Circuits
884	Underfloor Raceways and Fittings

F. American National Standards Institute/Electronic Industries  
/Telecommunications Publications (ANSI/EIA/TIA):

568B	Commercial Building Telecommunications Wiring Standard
569B	Commercial Building Standard for Telecommunications Pathways and Spaces
598C	Optical Fiber Cable Color Coding
606A	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
607A	Grounding and Bonding Requirements for Telecommunications in Commercial Buildings
758	Customer-Owned Outside Plant Telecommunications Infrastructure Standard

G. Lucent Technologies: Document 900-200-318 "Outside Plant Engineering Handbook."

H. International Telecommunication Union - Telecommunication  
(Standardization Sector (ITU-T)).

I. Federal Information Processing Standards (FIPS) Publications.

J. Federal Communications Commission (FCC) Publications: Standards for telephone equipment and systems.

K. United States Air Force: Technical Order 33K-1-100 Test Measurement and Diagnostic Equipment (TMDE) Interval Reference Guide.

#### **1.4 QUALITY ASSURANCE**

- A. The authorized representative of the System's OEM shall be responsible for the design, satisfactory total operation of the system, and its certification.
- B. The OEM shall meet the minimum requirements identified in Paragraph 2.1.A. Additionally, the Contractor shall have had experience with three or more installations of systems of comparable size and complexity with regard to coordinating, engineering, testing, certifying, supervising, training, and documentation. Each of these installations shall have been in successful operation for a minimum of three years after final acceptance by the user. These installations shall be provided as a part of submittal identified in Paragraph 1.5.
- C. The System 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 System Contractor shall be authorized by the OEM to certify and warranty the installed equipment. In addition, the OEM and System Contractor shall accept complete responsibility for the design installation, certification, and physical support for the system. This documentation, along with the System Contractor and OEM certifications must be provided in writing as a part of the Contractor's Technical submittal.
- D. The Contractor's Telecommunications Technicians assigned to the system shall be fully trained, qualified, and certified by the OEM on the engineering, installation, 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 COR before being allowed to commence work on the System.

#### **1.5 SUBMITTALS**

- A. Provide submittals in accordance with Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. The COR shall retain one copy for review and approval.
  - 1. If the submittal is approved the COR shall retain one copy for Official Records and return three (3) copies to the Contractor.
  - 2. If the submittal is disapproved, three copies will be returned to the Contractor with a written explanation attached indicating the areas where the submittal deviated from the System Specifications. The COR shall retain one copy for Official Records.

- B. Documents: The submittal shall be separated into sections for each subsystem and shall contain the following:
1. Title page to include:
    - a. VA Medical Center
    - b. Contractor's name, address, and telephone (including FAX) numbers
    - c. Date of Submittal
    - d. VA Project No.
  2. List containing a minimum of three locations of installations of similar size and complexity as identified herein. These locations shall contain the following:
    - a. Installation Location and Name: Owner's or User's name, address, and telephone (including FAX) numbers.
    - b. Date of Project Start and Date of Final Acceptance by Owner.
    - c. System Project Number.
    - d. Brief (three paragraphs minimum) description of each system's function, operation, and installation.
  3. Narrative Description of the system as it is expected to be installed.
  4. A list of the equipment to be furnished. The quantity, make and model number of each item is required.
  5. EPBX cabinet and each interface cabinet layout drawing, as each is to be installed.
  6. Equipment technical literature detailing the electrical and technical characteristics of each item of equipment to be furnished.
  7. Engineering drawings of the System, showing calculated signal levels at the EPBX output, each input and output distribution point, proposed telephone outlet values, and signal level at each telephone outlet multipin jack.
  8. List of test equipment as per paragraph 1.5.D below.
  9. Letter certifying that the Contractor understands the requirements of the Samples Paragraph 1.5.E.
  10. Letter certifying that the Contractor understands the requirements of Section 3.2 concerning tests.
- C. Environmental Requirements. Technical submittals shall confirm the environmental specifications for physical TC areas occupied by the System. These environmental specifications shall identify the requirements for initial and expanded System configurations for:
1. Floor loading for batteries and cabinets.

2. Minimum floor space and ceiling heights.
3. Minimum size of doors for equipment passage.

D. Test Equipment List

1. The Contractor is responsible for furnishing all test equipment required to test the System in accordance with the parameters specified. Unless otherwise stated, the test equipment shall not be considered part of the System. The Contractor shall furnish test equipment of an accuracy better than the parameters to be tested.
2. The test equipment 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:
  - a. Spectrum Analyzer
  - b. Signal Level Meter
  - c. Volt-Ohm Meter
  - d. Time Domain Reflectometer (TDR) with strip chart recorder
  - e. Bit Error Test Set (BERT)
  - f. Camera with a minimum of 60 pictures to that will develop immediately to include appropriate test equipment adapters. A video camera in VHS format is an acceptable alternate.

E. Samples: A sample of each of the following items shall be furnished to the COR for approval prior to installation. The samples may be returned to the Contractor at the discretion of the RE:

1. TCO Wall Outlet Box 100 mm x 100 mm x 63 mm (4" x 4"x 2.5") with:
  - a. One each telephone (or voice) RJ45 jack installed.
  - b. Two each multi pin data RJ45 jacks installed.
  - c. Cover Plate installed.
2. Data CCS patch panel, punch block or connection device with RJ45 connectors installed.
3. Telephone CCS system with IDC and/or RJ45 connectors, cable terminal, and cable management equipment installed.
4. 610 mm (2 foot) section of each copper cable to be used with connectors installed and OEM cable sweep compliance and/or certification tags as specified in Section 27 15 00, COMMUNICATIONS HORIZONTAL CABLING, paragraph 2.4.B.

F. Certifications:

1. Submit written certification from the OEM indicating that the proposed supervisor of the installation and the proposed provider of the contract maintenance are authorized representatives of the OEM. Include the individual's exact name and address and OEM credentials in the certification.
2. Submit written certification from the OEM that the wiring and connection diagrams meet National and/or Local (whichever is the more stringent) Life Safety Guidelines, NFPA, NEC, UL, this specification, and JCAHCO requirements and instructions, requirements, recommendations, and guidance set forth by the OEM for the proper performance of the System as described herein. The VA will not approve any submittal without this certification.
3. Pre-acceptance Certification: This certification shall be made in accordance with the test procedure paragraph 3.2.B.

G. Equipment Manuals: Ten (10) working days prior to the scheduled acceptance test, the Contractor shall deliver four (4) complete sets of commercial operation and maintenance manuals for each item of equipment furnished as part of the System to the RE. The manuals shall detail the theory of operation and shall include narrative descriptions, pictorial illustrations, block and schematic diagrams, and parts list.

H. Record Wiring Diagrams:

1. Fifteen (15) working days prior to the scheduled acceptance test, the Contractor shall deliver four complete sets of the record wiring diagrams of the System to the RE. The diagrams shall show all inputs and outputs of electronic and passive equipment correctly identified according to the markers installed on the interconnecting cables, equipment and room/area locations. The wiring diagrams shall show the signal levels of the aural carriers of each audio channel at the input and output of all electronic equipment, at the beginning and end of each distribution line, and at the speakers. The record wiring diagrams shall be provided in hard copy and two compact disk copies properly formatted to match the Facility's current operating version of Computer aided drafting (AUTO CAD) system. The COR shall verify and inform the Contractor of the current version of AutoCAD being used by the Facility.
2. Ten (10) days prior to the start of the intermediate test, provide a typewritten detailed description of the System testing plan that

meets this specification's performance standards as indicated in paragraph 2.1.B including illustrations and utilizes the test equipment specified in paragraph 1.5.D. The test plan will need to be evaluated and approved by the COR before intermediate testing begins.

- I. Provide two copies of an OEM developed training videotape presentation (reference paragraph 3.3.B) for evaluation and approval by the RE.
- J. Provide a typewritten document that details the complete record program in memory for all associated station assignments.
  1. Projected Maximum Growth: The Contractor shall identify the projected maximum growth for each item identified in Paragraph 1.5.B.4. as a part of the needs analysis. For this purpose, the following definitions are provided to detail the System's capability:
    - a) All software and hardware required to completely equip the EPBX with all items listed under equipped capacity, shall be provided and installed by the contractor 30 days prior to system cut-over.
    - b) Wired Capacity" is to include all wiring and equipment listed under wired capacity, with the exception of line, data, and trunk cards, and shall be provided, installed, and tested 30 days prior to system cutover.
    - c) The EPBX shall be capable of expansion to the projected maximum growth through the use of printed circuit boards and/or modular cabinets that do not require extensive re-wiring and reprogramming.
  2. Cable Distribution System: See Specification Section 27 15 00, COMMUNICATIONS HORIZONTAL CABLING, for specific cable distribution system requirements. The Contractor is required to formulate a projected cable and TCO count that coincides with the Projected Maximum Growth described herein.
  3. Telephone Instruments (Stations): Telephone instruments are an integral component of the System. The Contractor shall indicate each instrument location, type of instrument and class of service as determined by the needs analysis.

## **PART 2 - PRODUCTS**

### **2.1 EQUIPMENT AND MATERIALS**

#### **A. SYSTEM REQUIREMENTS:**



1. The System shall perform the following minimum services that are designed in accordance with and supported by an Original Equipment Manufacturer (OEM), and as specified herein. The System shall provide continuous inter and/or intra-Facility voice service. The System shall be capacity sized so that loss of connectivity to an external telephone system(s) shall not affect the Facility's operation in specific designated emergency operating locations and instruments. The System shall:
  - a. Inter-operate, connect, and function fully with the existing telephone system in the Building, Local (Telephone) Exchange Company (LEC) Network(s), Federal Telephone System (FTS) Inter-city Network(s), Inter-exchange Carriers, and Integrated Services Digital Network (ISDN), at a minimum.
  - b. Contain control and switching equipment that shall be a voice and digital EPBX.
  - c. Direct access to trunk level equipment including audio paging, Industry Standard "T" and/or "DS" carrier protocols, and external protocol converters. Additionally, connections to "T" and/or "DS" access/equipment or Customer Service Units (CSU) that are used in FTS and other trunk applications shall be included in the System design. The Contractor shall provide all T-1 equipment necessary to terminate and make operational the quantity of circuits designated. The CSUs shall be connected to the System's emergency battery power supply. The System shall be fully capable of operating in the Industry Standard "DS" protocol and provide that level of service when required.
  - d. Be capable of interfacing and operating with existing Direct-Incoming-Dial (DID) service to stations as identified herein. Assignment to DID shall not affect intra-Facility operation. A DID trunk group, which will operate as a separate trunk group from other Central Office (CO) trunks shall be provided as described herein.
2. The System shall be designed to minimize cross talk, background processor noise, inter-modulation, and other signal interference. The EPBX equipment shall be installed and interfaced according to the OEM head-end schematic diagram for adjacent audio channel operation. Each audio input channel shall be processed as a single separate channel and combined into one output channel. Additionally,

an audio and visual monitoring panel shall be provided in the telephone switch room to test each converted audio input and distribution channel transmitted and received signal functions as described herein. The System shall continuously electronically or electrically supervise the EPBX's Alternating Current (AC) power input, stand by batteries and charger, and internal Direct Current (DC) power supply primary Voltages and/or Currents; each remote control unit, interface unit, from the new server rooms.

B. System Performance:

1. The System shall support and fully operate in the following functional modes, at a minimum:
  - a. Bit Rate Interchange (BRI) Functions.
  - b. ISDN in both Standard and Broad Bandwidths.
  - c. Fiber-optic Distributed Data Interface (FDDI).
  - d. Industry Standard "T" Carrier in single and multiple channels.
  - e. Industry Standard "DS" Carrier in single and multiple channels.
2. System Sensitivity: Satisfactory service shall be provided for at least 3,000 feet (ft) for all voice locations.

C. The following auxiliary systems shall be provided as required by system design

1. The system shall interface and provide a Public Address System (PA) as described in SPECIFICATION SECTION 27 51 16, PUBLIC ADDRESS AND MASS NOTIFICATION SYSTEMS. Each telephone console shall have direct access to selected zones and all zone(s) paging. The console attendant shall also have "priority access" (or ALL CALL or CODE ONE or BLUE) to all zones. Selected station users shall have access to appropriate zone(s) via sub zone (s), by dialing the proper access. The Telephone Contractor is responsible for providing the required NFPA and UL certified device(s) for the PA to be interfaced to a designated Critical Care Emergency Communications Telephone System. The PA System "Emergency Life/Public Safety Rating" will be upgraded to include "Critical Care" by the connection to the telephone system, therefore the system will be installed to all appropriate Life Safety Code Standards and Instructions. The system shall provide a feature to prevent the PA from being "locked up" by a user placing the system on hold or leaving the receiver "off-hook".

D. General:

1. All equipment to be supplied under this specification shall be new and the current model of a standard product of an 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:
  - a. Maintains a factory production line for the item submitted.
  - b. Maintains a stock of replacement parts for the item submitted.
  - c. Maintains engineering drawings, specifications, and operating manuals for the items submitted.
  - d. 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.
2. Specifications of equipment as set forth in this document are minimum requirements, unless otherwise stated, and shall not be construed as limiting the overall quality, quantity, or performance characteristics of items furnished in the System. When the Contractor furnishes an item of equipment for which there is a specification contained herein, the item shall meet or exceed the specification for that item of equipment.
3. Each item of 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.
4. All supplies and materials shall be listed, labeled or certified by UL or a nationally recognized testing laboratory where such standards have been established for the supplies, materials or equipment. See paragraph Minimum Requirements Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and the guidelines listed in paragraph 2.J.2.
5. The Contractor shall provide written verification, to the COR at time of installation, that the type of wire/cable being provided is recommended and approved by the OEM. Cabling shall meet the requirements of U.L., the ANSI/EIA/TIA Wiring Standards and the requirements of NFPA 70 (NEC). The Contractor is responsible for providing the correct protection, cable duct and/or conduit and wiring even though the actual installation may be by another subcontractor.

6. The Telephone Contractor is responsible for interfacing the telephone, PA and, data systems with the System. The Contractor shall utilize 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, includes matching of signal, voltage, and processing levels, with regard to signal quality and impedance. Each interface point must adhere to all standards described herein for full separation of the Critical Care, Life Safety, and Emergency systems.
7. The telephone equipment and PA interface equipment shall be the interface points for connection of the PA interface cabling from the telephone switch via the System telephone interface unit. The telephone interface unit and PA interface unit shall be provided by the Telephone Contractor.
8. Active electronic component equipment shall consist of solid state components, be rated for continuous duty service, and comply with the FCC standards for telephone equipment, systems, and service.
9. All passive distribution equipment shall meet or exceed -80 dB radiation shielding specifications.
10. All interconnecting twisted pair, fiber-optic cables shall be terminated on equipment terminal boards, punch blocks, breakout boxes, splice blocks, and unused equipment ports/taps shall be terminated according to the OEM's instructions for telephone cable systems without adapters. The Contractor shall not leave unused or spare twisted pair wire, fiber-optic cable unterminated, unconnected, loose or unsecured.
11. The System shall utilize microprocessor components for all signaling, programming circuits and functions. Program memory shall be non-volatile or protected from erasure during power outages for a minimum of three days.
12. The System shall provide continuous electrical supervision of all telephone switch cabinet mounted equipment, interconnecting cabling, distribution cable plant, and the UPS back up battery and charger to determine change in status and to assist in trouble shooting System faults.
13. All voltages, except for the primary power to the power supply circuits, shall not exceed 30V AC Root Mean Squared (RMS) or 42V direct current (DC).

14. Color code all distribution wiring to conform to the Telephone Industry standard, ANSI/EIA/TIA, and this document, which ever 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 wiring diagrams, to facilitate installation and maintenance. Reference Specification (Section 27 10 00, STRUCTURED CABLING ) and Section 27 15 00, COMMUNICATIONS HORIZONTAL CABLING.
15. Connect the System's primary input AC power to the Facility' Critical Branch of the Emergency AC Power Distribution System as shown on the Drawings or if not shown on the Drawings consult with the COR regarding a suitable circuit location, prior to bidding.
16. Plug-in connectors shall be provided to connect all equipment, with the exception of interface points. Base band cable systems shall utilize barrier terminal screw type connectors, at a minimum. Crimp type connectors installed with a ratchet type installation tool are an acceptable alternate as long as the cable dress, pairs, shielding, grounding, connections and labeling are provided 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.
17. All equipment faceplates utilized in the System shall be stainless steel, anodized aluminum, or UL approved cycolac plastic that matches the equipment item where it is installed. All faceplates shall be constructed of the same material throughout the Facility.
18. Noise filters and surge protectors shall be provided for each equipment interface cabinet, switch equipment cabinet, control console, local, and remote active equipment locations to ensure protection from input primary AC power surges and noise glitches are not induced into low voltage circuits.

E. Equipment Functional Characteristics

FUNCTIONS	CHARACTERISTICS
Input Voltage	105 to 130 VAC
POWER LINE FREQUENCY	60 Hz $\pm$ 2.0 Hz
Operating Temperature	0 to 50 degrees (°) Centigrade (C)
Humidity	80 percent (%) minimum rating

## 2.2 EQUIPMENT ITEMS

### A. Stand Alone Equipment Rack:

1. The rack shall be constructed of heavy 16 gauge cold rolled steel and have fully adjustable equipment front mounting rails that allows front panel equipment mounting and access. It shall have baked-on iron phosphate primer and baked enamel paint finish in a color to be selected by the using Facility Service Chief or RE. It shall be floor or wall mounted or mounted on casters as directed by the RE.

### 2. Technical Characteristics:

Overall Height	2180 MM (85 7/8"), MAXIMUM
Overall Depth	650 mm (25 1/2"), maximum
Overall Width	535 mm (21 1/16"), maximum
Front Panel Opening	484 mm (19 1/16"), EIA horizontal width
Hole Spacing	per EIA

### B. Cross-Connection System (CCS) Equipment - Breakout, Termination Connector (or Bulkhead), and Patch Panels, and Connection Assemblies

1. The connector panel(s) shall be made of flat smooth 1/8 inch thick solid aluminum, custom designed, fitted and installed in the cabinet. Bulkhead equipment connectors shall be mounted on the panel to enable all cabinet equipment's signal, control, and coaxial cables to be connected through the panel. Each panel shall be color matched to the cabinet installed.

#### a. Voice (or Telephone)

- 1) The CCS for voice or telephone service will be Industry Standard 110 type punch blocks. This represents the minimum requirement for voice or telephone, and control wiring in lieu of patch panels, each being certified for category six service. IDC punch blocks (with internal RJ45 jacks) are acceptable for use in all CCS and shall be specifically designed for category six telecommunications service suitable for the size and type of UTP cable used as described herein. As a minimum punch block strips shall be secured to an OEM designed physical anchoring unit located on a wall in the MTC, IMTC, and TC. However, console, cabinet, rail, panel, etc. mounting is allowed at the OEM recommendation and as approved

by the RE. Punch blocks shall not be used for Class II or 120 VAC power wiring.

2) Technical Characteristics:

Number of horizontal rows	100, minimum
Number of terminals per row	4, minimum
Terminal protector	required for each used or unused terminal
Insulation splicing	required between each row of terminals

b. Fiber optic

- 1) Product reference of a Government Approved (US State Department) type is Telewire, PUP-17 with prepunched chassis mounting holes arranged in two horizontal rows. This panel may be used for fiber optic, audio, control cable, and Class II Low Voltage Wiring installations when provided with the proper connectors. This panel IS NOT allowed to be used for 120 VAC power connections.

2) Technical Characteristics:

Size	
Height	Two RUs, 89 mm (3.5") minimum
Width	484 mm (19 1/16"), EIA minimum
Number of connections	12 pairs, minimum
Connectors	
Audio Service	Use RCA 6.35 mm (1/4") Phono, XL or Barrier Strips, surface mounted with spade lugs (punch block or wire wrap type strips are acceptable alternates for barrier strips as long as system design is maintained )
Control Signal Service	Barrier strips surface mounted with spade lugs (punch block or wire wrap type strips are acceptable alternates for barrier strips as long as system design is maintained )
Low voltage power (class II)	Barrier strips with spade lugs and clear full length plastic cover, surfaced mounted
FIBER OPTIC	"ST" STAINLESS STEEL, FEMALE

c. Mounting Strips and Blocks:

1) Barrier Strips:

- a) Barrier strips are approved for AC power, data, voice, and control cable or wires. Barrier strips shall accommodate the size and type of audio spade (or fork type) lugs used with insulating and separating strips between the terminals for securing separate wires in a neat and orderly fashion. Each cable or wire end shall be provided with an audio spade lug, which is connected to an individual screw terminal on the barrier strip. The barrier strips shall be surface secured to a console, cabinet, rail, panel, etc. 120 VAC power wires shall not be connected to signal barrier strips.

b) Technical Characteristics:

Terminal size	6-32, minimum
Terminal Count	ANY COMBINATION
Wire size	20 AWG, minimum
Voltage handling	100 V, minimum
Protective connector cover	Required for Class II and 120 VAC power connections

- 2) Solderless Connectors. The connectors (or fork connectors) shall be crimp-on insulated lug to fit a 6-32 minimum screw terminal. The fork connector shall be installed using a standard lug-crimping tool.
- 3) Punch Blocks. Industry Standard 110 type punch blocks are approved for voice and control wiring at a minimum. Punch blocks shall be specifically designed for the size and type of wire used. Punch block strips shall be secured to a console, cabinet, rail, panel, etc. Punch blocks shall not be used for Class II or 120 VAC power wiring.
- 4) Wire Wrap Strips. Wire wrap strips (minimum of 0.065" wire wrap) are approved for voice and control wiring and shall meet Industry Standards. Wire wrap strips shall be secured to a cabinet, rail, panel, etc. Wire wrap strips shall not be used for Class II or 120 VAC power wiring.

I. Wire Management System and Equipment:

1. Wire Management System. The system(s) shall be provided as the management center of the respective cable system, CCS, and TC it is



- incorporated. It shall perform as a platform to house peripheral equipment in a standard relay rack or equipment cabinet. It shall be arranged in a manner as to provide convenient access to all installation management and other equipment. All cables and connections shall be at the rear of each system interface to IDC and/or patch panels, punch blocks, wire wrap strips, and/or barrier strip.
2. Wire Management Equipment. The wire management equipment shall be the focal point of each wire management system. It shall provide an orderly interface between outside and inside wires and cables (where used), distribution and interface wires and cables, interconnection wires and cables and associated equipment, jumper cables, and provide a uniform connection media for all System fire retardant wires and cables and other subsystems. It shall be fully compatible and interface to each cable tray, duct, wireway, or conduit used in the system. All interconnection or distribution wires and cables shall enter the system at the top (or from a wireway in the floor) via a overhead protection system and be uniformly routed down either side (or both at the same time) of the frame in side protection system then laterally via a anchoring or routing shelf for termination on the rear of each respective terminating assembly. Each system shall be custom configured to meet the System design and user needs.

### **2.3 DISTRIBUTION EQUIPMENT AND SYSTEMS**

The System shall be provided with a complete cable backbone and building distribution system consisting of copper, fiber optic, and other specified cable and connectors, signal closets, cross connection or terminating systems, telecommunication outlets and interface points as identified in Section 27 15 00, COMMUNICATIONS HORIZONTAL CABLING and with technical instructions and approval from the RE.

### **2.4 INSTALLATION KIT**

The kit provided shall include, at a minimum, 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, cable duct, and/or cable tray, 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. The Contractor shall turn over all unused and partially opened

installation kit boxes, coaxial, fiber-optic and twisted pair cable reels, conduit, cable tray, and/or cable duct bundles, wire rolls and physical installation hardware to the RE. At a minimum, the following installation sub-kits are required:

A. System Grounding:

1. The grounding kit shall include all cable and installation hardware required. All EPBX equipment shall be connected to earth ground via internal building wiring, according to the NEC.
2. This includes, but is not limited to:
  - a. Voice Cable Shields
  - b. Control Cable Shields
  - c. Cable Trays
  - d. Equipment Racks
  - e. Equipment Cabinets
  - f. Conduits
  - g. Cable Duct
  - h. Cable Trays
  - i. Power Panels
  - j. Connector Panels
  - k. Grounding Blocks

B. 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.

C. 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.

D. Equipment Interface. The equipment kit shall include any item or quantity of equipment, cable, mounting hardware and materials needed to interface the System with the identified sub-system(s) according to the OEM requirements and this document.

E. 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, record wiring diagrams, and this document.

- 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 completely and correctly provide the System documentation as required by this document and explained herein.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

A. Product Delivery, Storage and Handling:

1. Delivery: Deliver materials to the job site in OEM's original unopened containers, clearly labeled with the OEM's name and equipment model and serial identification numbers. The COR may inventory the EPBX equipment at the time of delivery and reject items that do not conform to this requirement.
2. Storage and Handling: Store and protect equipment in a manner which will preclude damage as directed by the RE.

B. System Installation:

1. After the contract's been awarded, and within the time period specified in the contract, the Contractor shall deliver the total System in a manner that fully complies with the requirements of this specification. The Contractor shall make no substitutions or changes in the System without written approval from the COR and PM.
2. The Contractor shall install all equipment and systems in a manner that complies with accepted industry standards of good practice, the requirements of this specification, and in a manner which does not constitute a safety hazard. The Contractor shall insure that all installation personnel understands and complies with all the requirements of this specification.
3. The Contractor shall install suitable filters, traps, directional couplers, splitters, telephone outlets, and pads for minimizing interference and for balancing the amplifiers and distribution system(s). Items used for balancing and minimizing interference shall be able to pass telephone signals in the frequency bands selected, in the directions specified, with low loss, and high isolation and with minimum delay of specified frequencies and signals. The Contractor shall provide all equipment necessary to meet the requirements of paragraph 2.1.C and the System performance standards.

4. All passive equipment shall be connected according to the OEM's specifications to insure correct termination, isolation, impedance match and signal level balance at each telephone outlet.
5. All lines shall be terminated in a suitable manner to facilitate future expansion of the System.
6. All vertical and horizontal copper and fiber optic, and coaxial lines shall be terminated so shall require modifications of the system EPBX or signal closet equipment only.
7. Terminating resistors or devices shall be used to terminate all unused branches, outlets, equipment ports of the system, and shall be devices designed for the purpose of terminating fiber optic or twisted pair, and coaxial cable systems.
8. Equipment installed indoors shall be installed in metal cabinets with hinged doors and locks. Provide a minimum of two keys for each lock.

C. Equipment Assembly:

1. Cabinets:

- a. Each enclosure shall be: Floor mounted with standard knockout holes for conduit connection or cable entrance; provide for ventilation of the equipment; have front and rear locking doors (except, wall mounted cabinets that require only a front locking door); power outlet strip(s), bulkhead connector and patch panel(s).
- b. Enclosures and stand alone racks shall be installed plumb and square. Each shall be permanently attached to the building structure and be held firmly in place as approved by the RE.
- c. Rack mounted equipment shall be installed on the enclosure's equipment adjustable mounting racks with equipment normally requiring adjustment or observation mounted so operational adjustment(s) can be conveniently made. Heavy equipment shall be mounted with rack slides or rails allowing servicing from the front of the enclosure. Heavy equipment shall not depend only upon front panel mounting screws for support. Equipment shall be provided with sufficient cable slack to permit servicing by removal of the installed equipment from the front of the enclosure. A color matched blank panel (spacer) of 44 mm (1.75 inches) high, shall be installed between each piece of equipment (active or passive) to insure adequate air circulation. The

enclosure shall be designed for efficient equipment cooling and air ventilation.

- d. Provide 380 mm (15 inches) of front vertical space opening for additional equipment. Install color matched blank panels to cover any unused enclosure openings.
  - e. Signal connector, patch, and bulkhead panels (i.e. PA, telephone, control, etc.) shall be connected so that outputs from each source, device or system component shall enter the panel at the top row of jacks, beginning left to right as viewed from the front. These will be called "inputs". Each connection to a load, device or system component shall exit the panel at the bottom row of jacks, beginning left to right as viewed from the front. These will be called "outputs".
    - 1) Equipment located indoors shall be installed in metal racks or enclosures with hinged doors and be accessible for maintenance without interference to other nearby equipment.
    - 2) Cables shall enter the equipment racks or enclosures in a manner that allows all doors or access panels to open and close without disturbing or damaging the cables.
    - 3) All distribution hardware shall be securely mounted in a manner that allows access to the connections for testing and provides sufficient room for the doors or access panels to open and close without disturbing the cables.
- D. Conduit, Cables And Wiring, Cable Tray, Raceways, Signal Ducts, Etc.
- 1. General:
    - a. The Contractor shall employ the latest installation practices and materials.
    - b. All cables shall be installed in conduit and/or signal ducts. Conduits shall be installed in accordance with Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS and Section 27 15 00, COMMUNICATIONS HORIZONTAL CABLING.
    - c. Ensure that Telephone, and PA Systems (as identified by NEC Section 517) are completely separated and protected from all other systems.

### **3.2 PROOF OF PERFORMANCE TESTS**

#### **A. Interim Inspection:**

1. An interim inspection of the installed equipment will be conducted in the presence of the COR prior to the proof of performance testing. This inspection shall verify that the equipment provided, adheres to the installation requirements of this document.
2. The Contractor shall have 50% of the system equipment installed to include, but not be limited to: EPBX, interface, origination and junction enclosures powered with the permanent AC wiring, outlets, conduit and cables, before the interim inspection can take place.
3. The Contractor shall notify the RE, in writing, of the estimated date the Contractor expects to be ready for the interim inspection, at least 7 working days before the requested inspection date.
4. Results of the interim inspection shall be provided to the COR and PM. If major or multiple deficiencies are discovered, a second interim inspection may be required before permitting the Contractor to continue with the System installation.
5. The COR in conjunction with PE shall determine if an additional inspection is required, or if the Contractor will be allowed to proceed with the installation. In either case, re-inspection of deficiencies noted during the interim inspection(s), will be part of the proof of performance test. The interim inspection shall not affect the Systems' completion date. The COR shall ensure all test documents will become a part of the Systems record wiring diagrams.

B. Pretesting. Upon completing the installation of the System, the Contractor shall align and balance the system. The Contractor shall pretest the entire system.

C. Pretesting Procedure. During the System pretest, the Contractor shall verify (utilizing the approved spectrum analyzer and test equipment) that the System is fully operational and meets all the System performance requirements of this document. The Contractor shall measure and record the aural carrier levels of each system telephone, at each of the following points in the system:

1. Local Exchange Company (LEC) Inputs.
2. EPBX inputs and outputs;
3. MDU, BIU, amplifiers, channel processor and converter inputs and outputs.

4. PBX output S/NR for each telephone.
  5. Signal Level at each interface point to the distribution system, the last outlet on each trunk line plus all outlets installed as part of this contract.
  6. Four copies of the recorded system pretest measurements shall be submitted, along with the pretest certification, to the RE. The COR shall forward three copies of the pretest documents and a copy of the certification to the PM.
- D. Pretesting Certification. After pretesting the System, Contractor shall notify COR in writing, that system is ready for proof of performance testing in the presence of a Government Representative, and that it meets all requirements stated in this document. Contractor as described herein shall accomplish submission of this notification of system readiness no later than twenty (20) working days prior to the beginning of the scheduled Government proof of performance test. Failure of the Contractor to comply with these pretest requirements, shall be grounds for automatically canceling the scheduled acceptance test.
- E. Acceptance Test
1. After the System has been pretested and the Contractor has submitted the pretest results and certification to the COR, the Contractor shall schedule an acceptance test date and give the COR 30 days written notice prior to the date the acceptance test is expected to begin. The System shall be tested in the presence of a Government Representative and an OEM certified representative. The System shall be tested utilizing the approved test equipment to certify proof of performance. The test shall verify that the total System meets all the requirements of this document under operating conditions, and complies with all system performance standards listed herein. The notification of 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 the operational 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 the system testing, and which cannot be repaired

within 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 effect repairs, shall cause the entire System to be declared unacceptable. Retesting of the entire System shall be rescheduled at the convenience of the Government.

F. Acceptance Test Procedure:

1. Mechanical and Physical Inspection:

- a. The Government Representative will tour all major areas where the System and all sub-systems are located to insure they are completely and properly installed in place and are operationally ready for proof of performance acceptance 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, AutoCAD 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. Subsystem Operational Test:

- a. After the Mechanical and Physical Inspection, the Contractor shall perform an operational test of each sub-system to verify that all equipment is properly connected, interfaced and is functionally operational to meet the requirements of this document. If any sub-system is not functionally ready, that sub-system shall be declared unacceptable and all testing shall be terminated. At this point, the Contractor shall be permitted one hour to correct the deficiencies.
- b. It may be mutually agreed upon, at this time, to wait one hour or to commence testing of the next sub-system.
- c. Repeated failures of sub-system testing or total system testing, which results in a cumulative time of four hours to effect repairs, shall be grounds for declaring the entire system unacceptable and all testing to be terminated. Retesting shall be rescheduled at the convenience of the Government.

3. Sub-system Performance Test: After the operational test, each sub-system shall be checked to verify that all performance requirements and standards are met. The performance requirements shall be



- verified using the necessary test equipment. A spectrum analyzer, signal level meter and BERT shall be used to verify there are no visible signal distortions, such as intermodulation, beats, etc. appearing on any received or generated telephone.
4. Total System Test: The testing shall proceed until the System and sub-systems have been operationally and functionally tested and accepted. The total System tests shall verify that the requirements have been met for all system signals as described herein.
- a. LEC Point of Demarcation: The System output(s) shall be checked to verify that all performance requirements are met.
- b. EPBX: This test shall be conducted within 30 days following successful pretesting of the EPBX. In addition to compliance with the technical characteristics and quantities of equipment specified herein, the Final Acceptance Test shall contain the provision that 30 continuous days of uninterrupted telephone service, must be completed prior to the Contractor being deemed to be in compliance with the contract.
- 1) For the purpose of final acceptance, the telephone service shall be considered interrupted when the failure of any Contractor provided telephone equipment including batteries, results in an interruption of service. This includes a failure of more than 20% of any trunk group, 15% of any number group (15 or more stations), operator console, or telephone service to any area determined to be critical by the Facility Director. Response time to restore service shall have no bearing upon the term "interrupted service".
- 2) To facilitate the EPBX Acceptance Test and to allow familiarization and training of VA employees, the Contractor shall activate the EPBX, including the operator consoles, stations, and equipment a minimum of 30 days prior to the acceptance test date. All installed equipment and circuits shall be fully tested prior to the acceptance by VA. During this "burn-in" period, the Contractor shall de-bug the EPBX. The Contractor shall make the EPBX available for in-house communications and demonstrate to the Facility staff the required features. The VA and Contractor will make certain trunks available to the EPBX during this "burn-in" period for testing.

5. Individual Item Test: The Government Representative may select individual items of equipment for detailed proof-of-performance testing. The item(s) selected shall meet or exceed the minimum requirements of the specification.
6. Interface Cable Sub-system: To ensure that the System meets all performance requirements, a minimum of 75% of the System outlets and interface points shall be checked. Additionally, each sub-system interface, junction, and connection point or location will be checked. Each distribution active and passive item of equipment, signal input(s) and output(s) will be tested.
7. Distribution Cable Plant Sub-system: For specific distribution testing instructions refer to Section 27 15 00, COMMUNICATIONS HORIZONTAL CABLING.

G. Test Conclusion:

1. 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.
2. If the System is declared unacceptable without conditions, all rescheduled retest expenses will be born by the Contractor as described herein.

**3.3 TRAINING**

- A. Furnish the services of an OEM trained and certified engineer or technician for two eight-hour classes to instruct designated Facility maintenance personnel. Instruction shall include cross connection, corrective, and preventive maintenance of the telephone system and equipment.
- B. Also, furnish the services of an OEM trained and certified engineer or technician, familiar with the functions and operation of the System and equipment, for two eight-hour periods to train designated Facility IRM personnel. Instructions shall be provided for staff personnel in each area where the System is installed under this contract. When multiple areas are involved, classes will be grouped. Periods of training shall be coordinated with the RE. The COR shall coordinate with the Facility to ensure all shifts receive the required training. Each session shall include instructions utilizing "hands-on" operation and functions of the system.

- C. Before the System can be accepted by VA, this training must be accomplished. Training will be scheduled at the convenience of the Facilities Contracting Officer and Chief of Engineering Service.

### **3.4 WARRANTY**

- A. Comply with FAR 52.246-21, except that warranty shall be as follows:
- B. Contractor's Responsibility: The Contractor shall warranty that all installed 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 COR, that certifies each item of equipment installed under this document conforms to its OEM published specifications.
- C. The Contractor shall provide a written commitment from the System equipment OEM to supply parts and on-site engineering support services for the one year warranty service (materials and labor) in the event of default or unsatisfactory service by the Contractor.
  - 1. The OEM certification shall describe, in the event of default or unsatisfactory service by the Contractor, the OEM or an authorized distributor shall fully support the contract (initial installation, warranty service for the one year warranty period of the contract).
  - 2. The System equipment OEM's signatory of the certified written commitment must be of an individual who has the full authority to obligate the OEM to this commitment. Names, corporate addresses, and telephone numbers of the individuals who have this authority shall be provided as a part of the commitment.
- D. The Contractor's maintenance personnel shall have the ability to contact the Contractor and OEM's central emergency assistance maintenance center and request remote diagnostic testing and assistance in resolving technical problems at any time, 365 days a year. The Contractor via a business telephone line at no additional cost shall provide this contact capability to VA. Each Contractor maintenance and supervisor individual shall be fully qualified by the OEM and provide the COR with copies of current and qualified OEM training certificates.
- E. Additionally, defining the FAR's warranty outlines concerning this System, the Contractor shall accomplish the following minimum requirements during the one year warranty period:

1. Response Time During the One Year Warranty Period:
  - a. The Contractor shall respond on-site, during the standard workweek, to a routine trouble call within 24 hours of its report. A routine trouble is considered a trouble that causes a sub-system to be inoperable.
  - b. Contractor shall respond on-site to an emergency trouble call within four hours of its report. An emergency trouble is considered a trouble that causes a System to be inoperable at anytime.
    - 1) An emergency trouble call shall be deemed appropriate when a failure involves more than 20 voice circuits.
    - 2) In addition, the failure of a common control unit, power supply, signal generating device or attendant console shall also be deemed as an emergency maintenance call.
  - c. The Contractor shall respond on-site to a catastrophic trouble call within two hours of its report. A catastrophic trouble call is considered an EPBX failure.
    - 1) If an EPBX failure cannot be corrected within six hours, the Contractor shall be responsible for providing an alternate CPU equipped for a minimum of 100 main station lines, 10 CO trunks, 10 FTS access lines and two operator's console.
    - 2) This alternate system shall be operational within 12 hours (time to commence at the end of the six-hour trouble shooting period) and shall provide emergency service to critical areas as determined by the VAMC Director.
    - 3) The alternate system shall be a programmable system and a pre-written program tape shall be provided to the VAMC Contracting Officer prior to cut-over of the main telephone system.
  - d. Failures affecting operation of critical emergency health care facilities (i.e., cardiac arrest teams, intensive care units, etc.) shall also be deemed as a catastrophic trouble call if so determined by the Facility Director. The Facility Contracting Officer shall notify the Contractor of this type of trouble call at the direction of the Facility Director.
  - e. The Contractor shall respond on-site to installation of station or equipment requests or service within:
    - 1) Eight hours for emergency installations designated by the Facility Contracting Officer, and

- 2) Three working days for routine installations designated by the Facility Contracting Officer.
- f. A standard workweek is considered 8:00 A.M. to 5:00 P.M., Monday through Friday exclusive of Federal Holidays. If any 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 completed.
- g. The COR is the Contractor's reporting and contact official for System trouble calls, during the warranty period.
2. Required On-Site Visits During The Warranty Period
  - a. The Contractor shall visit, on-site, for a minimum of eight hours, once every twelve (12) weeks, during the warranty period, to perform system preventive maintenance, equipment cleaning and operational adjustments to maintain the System according the descriptions identified in this document.
    - 1) The Contractor shall arrange all Facility visits with the COR or Facility Contracting Officer prior to performing the required maintenance visits.
    - 2) Preventive maintenance shall be performed by the Contractor in accordance with the OEM's recommended practice and service intervals during non-busy times agreed to by the COR or Facility Contracting Officer and Contractor.
    - 3) The preventive maintenance schedule shall be provided to and approved by the COR.
    - 4) Provide on-site a stock of replacement spare parts and equipment, plus test equipment, as specified herein, ensuring they meet the OEM's minimum recommended spare parts stock sizing requirements for this specific system.
  - b. The Contractor shall provide the 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 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:
    - 1) The Contractor shall provide a monthly summary of all equipment and sub-systems serviced during this warranty period

to the COR by the fifth 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.

- 2) 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. The COR shall convey to the Facility Engineering Officer, two (2) copies of actual reports for evaluation.

- 3) The COR shall ensure a copy of these reports is entered into the System's official acquisition documents.

- 4) The COR shall ensure a copy of these reports is entered into the System's official technical record documents.

3. Government Furnished Equipment (GFE). GFE that was accepted by the Contractor and interfaced and installed in this System shall become part of this System and included in the Warranty requirements.

F. 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 discovery of these incidents. The COR will investigate all reported incidents and render findings concerning any Contractor's responsibility.

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