

SECTION 27 40 00
AUDIO AND VISUAL COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: An overhead voice paging system that utilizes inputs from the phone system.
- B. Related Sections
 - 1. Comply with the Related Sections paragraph of Section 270511.

1.2 REFERENCES

- A. Comply with the References requirements of Section 270511.
- B. In addition to those codes, standards, etc., list in Section 270511, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
 - 1. Federal Communications Commission (FCC)
 - 2. FCC Regulation Part 15 - Radio Frequency Devices and Radiation Limits
 - 3. UL Underwriters Laboratories
 - 4. NEMA National Electrical Manufacturers Association
 - 5. ETL Electrical Testing Laboratories
 - 6. ISO International Standards Organization
 - 7. Sound Systems Engineering, 2nd Ed., Davis and Davis, Howard W. Sams Co., 1987.
 - 8. National Electrical Code
 - 9. National, state, local and any other binding building and fire codes
 - 10. Underwriters Laboratories (UL): Applicable listing and ratings
 - 11. American Society for Testing Materials (ASTM)
 - 12. American National Standards Institute (ANSI)
 - 13. Electronic Industries Association (EIA)
 - 14. Telecommunications Industries Association (TIA)

1.3 SYSTEM DESCRIPTION

- A. **DEFINTIONS:** Definitions shall apply to this section.
- B. **SYSTEM:** A system is defined as the entire set of components, equipment, and subsystems which must be coordinated to work together during normal operation to produce results for which the system intended purpose is and required per the scope of work.
- C. Section Includes:

1. Supply and install a turnkey paging system, to include equipment and materials, whether specifically mentioned herein or not, to ensure a complete and operating system.
 2. Generate submittal information for the complete fabrication, installation and wiring of the system. Provide installation and wiring, and provide on-site supervision and coordination during implementation.
 3. Provide for the initial adjustment of the systems as herein prescribed and provide test equipment for the system checkout and acceptance tests. Prior to the systems acceptance tests submit an initial testing and tuning report showing methods and results for tests performed.
 4. Provide a one year warranty for systems installed.
- D. System components, hardware, accessories, software, and firmware shall be from a single manufacturer and compatible with the existing system located in the facility.
- E. The System manufacturer shall have sole control over all of the System's software source code.
- F. The System, in its entirety, shall facilitate for the Owner's compliance to HIPAA, and no software or other component shall inhibit or hinder such compliance.
- G. General Requirements: Contractor shall include all requirements listed below but not limited to all components, parts, accessories, wires/cables, and similar System components and products to provide a fully functional stand-alone sound system for Palo Alto and Menlo Park Chapels. All items shall be listed for their intended purpose and for flammability requirements.
- H. Provide all necessary system components for a fully functional sound system fully integrated into the Menlo Park and Palo Alto Chapel audio and visual systems existing as required.
- I. Base Bid Work -**
1. The Work of this Section includes materials, accessories, fasteners, etc., and the labor and associated services necessary for a complete working nurse call system, herein "System". The Work also includes coordination through the General Contractor with other trades and with the VA COR.
 2. Stations, equipment, software etc. (as described in this Article)
 3. Wires, cables, terminations, programming, commissioning, and user training.
 4. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working audio system as described in this Section and shown on related drawings. Include cabling and equipment as shown on drawings as base bid work, unless otherwise noted.
 5. Refer to the related Drawings for additional information.
 6. In general, the base bid work includes:
 - a. Submittals

- b. Cable identification tags and system labeling
 - c. Testing
 - d. Record Documents
 - e. Warranty
7. System shall meet system requirements below.

J. Chapel Sound System Requirements -

1. The Contractor shall be required to provide a professional acoustic system installed by a professional acoustic group having at least ten (10) years of experience installing sound systems. The contractor shall provide on-site supervision and staff that have at least five (5) years of experience installing sound systems and have worked on at least three (3) chapels or churches. The contractor shall deliver all hardware, software, and services necessary to provide new and fully complete Chapel Sound System for the Palo Alto and Menlo Park Chapels that meet and shall provide the following to meet all requirements listed below:
2. The Contractor shall promote and provide a quality sound system to produce natural acoustics that support and enhance the spoken and sung responses of the assembly. Suitable locations and spatial configurations for the primary sound sources shall be determined by the contractor and installed at those locations.
3. The Contractor shall perform a pre-installation site visit to test for Radio Frequency (RF) interference and to identify optimum installation locations for the sound system to avoid interference.
4. The sound system shall provide adequate control of noise using the system to cover sounds produced by building systems within the church. Sound isolation shall be analyzed and tuned to prevent the intrusion of distracting sounds to allow privacy and confidentiality where needed. The Contractor shall provide a pre-installation site survey to include the effective range boundary and minimum signal to noise ratio needed to support wireless mic and assistive hearing system so it does not interfere with other wireless systems.
5. The sound system shall deliver evenly distributed sound throughout each Chapel building up to 85dB maximum. The Contractor shall provide all IR Repeaters, Antennas, RF Transmitters, receivers, mixers, mounting kits, racks, switchers, switches, transmitters, cables, adapters, speakers, microphones, amplifiers, and all other equipment and materials required to have fully operational sound systems at each Chapel. The main system shall be installed and used through a VA computer for each Chapel and easily accessed by Chapel staff.
6. The Contractor shall provide (20) twenty intelligent assistive listening equipment/speakers for each Chapel in order to serve veterans hard of hearing. The assistive listening devices shall have a standard operating procedure for properly cleaning the devices for multiple patient use and do not contain disposable material to change out for patients. The hearing impaired system shall operate at a frequency that does not interfere with other frequencies throughout each site and shall use a commonly found frequency for both sites. The contractor shall provide and

develop a standard operating procedure with VA staff for the cleaning of the assistive listening devices that meet infection control requirements.

7. Contractor shall provide an audio system that is integral matching our current setup of having the audio feed matched to video feed of the chaplains.
 8. The sound systems shall be controlled from the control pedestal on the rostrum and from the rear rooms behind the podium. The sound system shall be equalized for optimum performance with all microphones and auxiliary connections. Microphones shall be directional to reject unwanted sound from behind it. Volume range shall be adjustable between the range without giving any feedback. Contractor shall provide a reverberation period of at least 2 to 3 seconds.
 9. Auxiliary multi-input adapter box shall be connected to inputs to reproduce sound from iPods, VCR, CD/DVD's, tape players and other audio playback devices.
 10. Contractor shall provide three wireless Lavalier microphones for each Chapel and three wireless hand held microphones, charging stations, and required equipment to ensure system is fully functional and operational. The Contractor shall provide two wired microphones with on/off capability at each Chapel podium as backup to the wireless components.
- K. Coordination Requirements with Other Trades
1. Coordinate wiring routes and maintenance access at locations of the chapels and hospital. Coordinate trim features and finishes at these locations to present a unified design appearance.
 2. Coordinate the installation with other trades and coordinate to use existing pathways or new best routes for pathways.
- L. Services
1. The installer shall provide final design services. These final design services include the following:
 - a. Verify existing field conditions and compatibility with audio/visual equipment in the chapels.
 - b. Conduct a meeting with the VA COR. Meeting shall gather details specific to the project; document other pertinent details that will affect the final design with Chaplain services.
 - c. Conduct a follow up meeting with the VA COR. Meetings shall review the shop drawings - floor plans, system diagrams, etc., confirm the function and operation of the System and equipment, and confirm any System programming needed. Coordinate with VA electronics shop and COR on anything regarding the sound system.
- M. The installer shall provide extended support services, including extended warranty, for a period of 5 years (labor and material)

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. Manufacturer shall have at least 20 years of regular (non-interrupted) experience in manufacturing sound system equipment similar to that required for this Project.
2. Manufacturer shall provide to Owner, at no cost to the Owner, factory training and training manuals.

B. Installer Qualifications

1. Installer shall have successfully completed factory training and shall be authorized by the manufacturer as a distributor and installer for the proposed System. The Installer shall submit a copy of the manufacturer's authorization Certificate with proposal (during bid).
2. The Installer shall be certified by the manufacturer for equipment, software, components, etc. The Installer shall make a Certificate copy available upon request

C. Instructor Qualifications: Factory authorized service representatives shall be experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.

D. Test Equipment Calibration: The Contractor shall comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.5 SUBMITTALS

A. Submittal Requirements at Start of Construction:

1. Product Data Submittal, including cables
2. Shop drawings showing system design and locations by a licensed sound engineer with at least 5 years of experience.
3. Shop Drawings Submittal: Shop drawings to include:
 - a. Plans (floor and reflected ceiling as applicable), showing device locations and pathways
 - b. Point-to-point wiring diagram in block or riser format, showing System components, conduit and wire connections with legend (listing types and sizes), and signal, control, and power connections with legend (listing requirements). Include all power and data wiring.
 - c. Elevations, including equipment cabinets, wall-mounted equipment, central controller, elevations shall note installation heights.
 - d. Station installation details, including conduit and back box requirements
 - e. Include as-built conditions
4. Schedule Submittal: Submit proposed schedule of work.
5. Testing Procedures Submittal:

- a. Submit a step-by-step manual for which the System will be tested.
- B. Submittal Requirements at Close Out:
1. As-Built Drawings
 2. Final testing documentation, listing test results of each station, device, etc.
 3. O&M Manual
 4. Warranty Certificate, including System manufacturer's obligations, services, terms, and conditions. Warranty certificate shall describe renewal options.
- C. Preliminary Commissioning Plan Submittal: The Contractor shall provide a Preliminary Commissioning Plan based on the final shop drawings. The Preliminary Commissioning Plan is provided for information only. It contains preliminary information about the following commissioning activities:
1. Systems to be commissioned
 2. Commissioning Documents: A preliminary list of commissioning-related documents, include identification of the parties responsible for preparation, review, approval, and action on each document.
 3. Pre-Functional Checklists: Preliminary Pre-Functional Checklists for equipment, components, subsystems, and systems to be commissioned. These Preliminary Pre-Functional Checklists provide guidance on the level of detailed information the Contractor shall include on the final submission.
 4. Systems Functional Performance Test Procedures: Preliminary step-by-step System Functional Performance Test Procedures to be used during Systems Functional Performance Testing. These Preliminary Systems Functional Performance procedures provide information on the level of testing rigor, and the level of Contractor support required during performance of system's testing.
- D. Final Commissioning Plan Submittal: The VA shall review the Commissioning Plan and provide any comments to the Contractor. The Contractor will incorporate review comments into the Final Commissioning Plan as directed by the VA.
- E. Systems Functional Performance Test Procedure: The Contractor shall submit preliminary Systems Functional Performance Test Procedures to the VA for review and comment. The VA shall return review comments to the Contractor. The Contractor shall incorporate review comments into the Final Systems Functional Test Procedures to be used in Systems Functional Performance Testing.
- F. Pre-Functional Checklists: The Contractor shall submit Pre-Functional Checklists to be completed by the Contractor.

- G. Test and Inspection Reports: The Contractor shall submit test and inspection reports to the VA.
- H. Corrective Action Documents: The Contractor shall submit corrective action documents to the VA Contracting Officer's Technical Representative (COTR).
- I. Preliminary Commissioning Report Submittal: The Contractor shall submit three electronic copies of the preliminary commissioning report. One electronic copy, with review comments for preparation of the final submittal.
- J. Final Commissioning Report Submittal: The Contractor shall submit four sets of electronically formatted information of the final commissioning report to the VA. The final submittal will incorporate comments as directed by the VA.
- K. Data for Commissioning:
 - 1. The Contractor shall request in writing from the Contractor specific information needed about each piece of commissioned equipment or system to fulfill requirements of the Commissioning Plan.
 - 2. The Contractor may request further documentation as is necessary for the commissioning process or to support other VA data collection requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Bear costs of shipping to the site, and of unusual storage requirements. Make appropriate arrangements, and coordinate with authorized personnel at the site, for the proper acceptance, handling, protection, and storage of equipment so delivered.

PART 2 - PRODUCTS

2.1 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 4 speakers installed both at Palo Alto and Menlo Park.

2.2 CABLES

- A. Plenum-rated distributed speaker cable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify pathways and infrastructure before submitting shop drawings. Confirm with CO locations and issues from existing field conditions before doing any shop drawings or submittals.

3.2 INSTALLATION

- A. General: Include the delivery, unloading, setting in place, fastening to walls, floors, ceilings, counters, or other structures where required, interconnecting wiring of the system components, equipment alignment and adjustment, and other work, whether or not expressly required, which is necessary to result in complete operational systems.
- B. Physical Installation:
 1. Firmly secure equipment in place unless requirements of portability dictate otherwise.
 2. Provide adequate support for fastenings and supports with a safety load factor of at least three.
 3. Secure plumb and square boxes, equipment, etc.
- C. Cable Installation:
 1. Label cables, with permanent, machine generated number or letter cable markers within six inches of both ends. There shall be no unmarked cables in the system. Marking codes used on cables shall correspond to codes shown on drawings and/or run sheets.

2. Group cables according to the signals being carried. In order to reduce signal contamination, form separate groups for the following cables:
 - a. Control cables
 - b. Audio cables
3. Provide a service loop of appropriate length within racks and at boxes or points of termination.
4. Install no cable with a bend radius less than that recommended by the cable manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Initial Tests and Measurements: Before final adjusting and acceptance tests are scheduled, perform system checkout. Furnish required test equipment and perform work necessary to determine and/or modify performance of the system to meet the requirements of this specification. Include the following:
 1. Test audio systems for compliance with the functional requirements and Performance Standards.
 2. Adjust, balance, and align equipment for optimum quality and to meet the manufacturer's published specifications.
 3. Prepare and maintain documentation of performance tests, including numerical values of established equipment settings, for reference during the System Acceptance Tests. Submit final results prior to scheduling Final Acceptance Tests Manual.
- B. Audio System:
 1. Loudspeaker-Line Impedance: Measure the impedance at 250 Hz, 1 kHz, and 4 kHz and the resistance of each loudspeaker line leaving the sound equipment rack with the line disconnected from its normal driving source. For lines to full-range distributed loudspeaker systems, measure the magnitude of impedance at 1 kHz.
 2. Power-Output and Signal-Level Adjustment within System:
 - a. Measure the electrical distortion of the overall system for each line-level input channel.
 3. Audio Test Signal Paths: Verify operation from source inputs through mixers, etc., to signal destinations.

3.4 COMMISSIONING

- A. The Contractor shall provide a common sense and simple commissioning plan to ensure the entire system and all components are working correctly according to shop drawings, manufacturer recommendations, and the scope of work. Engineering and the COR shall be scheduled to witness the testing.
- B. Systems Functional Performance Test: Contractor shall provide a test, or tests, of the dynamic function and operation of the equipment and systems using manual (direct observation) or monitoring methods. Systems Functional Performance Testing is performed by the Contractor and the manufacturer of the system. Systems Functional Performance

Tests are performed after startups, systems are complete and operational, and Pre-Functional Checklists are complete.

- C. Pre-Functional Checklist: Contractor shall provide a list of items provided that require inspection and elementary component tests conducted to verify proper installation of equipment per manufacturer recommendations and overall SOW requirements. Pre-Functional Checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation. The term "Pre-Functional" refers to before Systems Functional Performance Testing. Pre-Functional Checklists augment and are combined with the manufacturer's startup checklist and the Contractor's Quality Control checklists.
- D. Seasonal Functional Performance Testing: Contractor shall provide a test or tests that are deferred until the system will experience conditions closer to manufacturer's recommendations and VA SOW requirements.
- E. VA: Includes the Contracting Officer, Contracting Officer's Technical Representative (COTR), or other authorized representative of the Department of Veterans Affairs.
- F. Systems Functional Performance Test Procedures: The Contractor shall develop Systems Functional Performance Test Procedures for the sound system to be commissioned, including subsystems, or equipment and interfaces or interlocks with other systems. Systems Functional Performance Test Procedures will include a separate entry, with space for comments, for each item to be tested. Preliminary Systems Functional Performance Test Procedures will be provided to the VA, Architect/Engineer, and Contractor for review and comment. The Systems Performance Test Procedure will include test procedures for each mode of operation and provide space to indicate whether the mode under test responded as required. Each System Functional Performance Test procedure, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:
 - 1. Name and identification code of tested system.
 - 2. Test number.
 - 3. Time and date of test.
 - 4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
 - 5. Dated signatures of the person performing test and of the witness, if applicable.
 - 6. Individuals present for test.
 - 7. Observations and Issues.
 - 8. Issue number, if any, generated as the result of test.

3.5 SYSTEM ACCEPTANCE TESTS

- A. Objectives and Scope: The objective of Systems Functional Performance Testing is to demonstrate that each system is operating according to SOW requirements. Systems Functional Performance Testing facilitates bringing the systems from a state of substantial completion to full dynamic operation.

- B. System acceptance tests shall not be performed until the initial system checkout and the initial testing and tuning report has been completed by the Contractor. The system acceptance tests consist of the following:
1. Demonstrate the operation of system equipment.
 2. Provide final, "as-built" drawings, run sheets, manuals, and other required documents, as detailed in Part 1.

- - - E N D - - -