

## SECTION 27 51 19

## (AM0003) SOUND MASKING SYSTEMS

## PART 1 GENERAL

## 1.1 RELATED SECTIONS

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, applies to this section, with the additions and modifications specified herein. In addition, refer to the following sections for related work and coordination:

Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM.  
Section 07 84 00 FIRESTOPPING for additional work related to firestopping.

## 1.2 SUMMARY

## 1.2.1 Scope

- a. This work includes design and providing a new, complete, white noise system as described herein for the Special Access Program Facility. Provide a turnkey system capable of transmitting indicated input signals including the system wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, amplifiers, speakers, mounting hardware and other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described. Provide system complete and ready for operation. See paragraph titled SYSTEM DESCRIPTION for additional requirements.
- b. The system layout on the drawings show the intent of coverage and are shown in suggested locations. Submit plan view drawing showing all component locations, cable routing, junction boxes, other related equipment, conduit routing, and wire counts for all floors.

## 1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ELECTRONIC COMPONENTS INDUSTRY ASSOCIATION (ECIA)

ECIA EIA/ECA 310-E (2005) Cabinets, Racks, Panels, and Associated Equipment

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1 (2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE C62.41.2 (2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2023; ERTA 1 2024; TIA 24-1) National Electrical Code

## NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST SP 800-82 (2015; Rev 2) Guide to Industrial Control Systems (ICS) Security

## U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 8510.01 (2022) Risk Management Framework (RMF) for DoD Systems

UFC 4-010-06 (2023) Cybersecurity of Facility-Related Control Systems

## U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 15 Radio Frequency Devices (47 CFR 15)

## UL SOLUTIONS (UL)

UL 1449 (2021; Reprint Dec 2022) UL Standard for Safety Surge Protective Devices

UL 2043 (2015) Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

## SD-01 Preconstruction Submittals

Qualifications; G

## SD-02 Shop Drawings

Detail Drawings; G

System Layout; G

## SD-03 Product Data

Spare Parts

## SD-05 Design Data

Design Analysis and Calculations; G

## SD-06 Test Reports

Approved Test Procedures; G

Acceptance Tests

Accreditation; G

## SD-07 Certificates

Components

## SD-10 Operation and Maintenance Data

Sound Masking System; G

Submit Data Package 5 for each component in accordance with the requirements of Section 01 78 23 OPERATION AND MAINTENANCE DATA.

## 1.5 SYSTEM DESCRIPTION

## 1.5.1 Design Requirements

Provide a Sound Masking System, capable of distributing the indicated audio signals from equipment including electronic noise generators, LAN controllers, communication links, cabling, battery backup, power line surge protection and all other necessary components to make a complete and operational system. Complete coverage will be provided for spaces as indicated on the drawings.

Provide a zoned system capable of evenly distributing white noise or babbling sound masking sources. Provide uniform sound distribution free of noise and distortion. Provide acoustic privacy and ambient noise enhancement across multiple zones.

Provide all headend interface, amplification components, conditioners and any other equipment necessary. Provide system capable of interfacing with the GFGI telephone system for zone paging.

Provide all materials and labor needed for a complete and operational system for the services in this specification plus the additional system capabilities as indicated. This includes but not limited to all necessary equipment, interfaces, jumpers, terminations, cabling, amplifiers, conditioners, power supplies, battery backup, software and all components required for system operation.

## 1.5.2 System Application Design

Provide the system application design required to provide a sound masking system that complies with and satisfies all of the requirements specified in this Section and indicated on the Security Drawings for this application and project.

## 1.5.3 Standard Products

Provide an application design that utilizes standard system components that are the product of a Manufacturer regularly engaged in the manufacture of sound masking system, and that have been in satisfactory

use for at least six months. Provide all major components from the same manufacturer. The System must be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the facility. Do not deliver material to the project site more than six months prior to the scheduled date of installation.

Provide hardware, software, and installation of a complete and engineered system. Provide a submitted design that is properly engineered for the operational requirements. Include all components required to meet this specification section in the design, other than a change in, or in addition to the operational frequencies identified herein.

#### 1.5.4 Local Products

Incorporate local materials to the greatest extent possible. All proposed local products must meet all applicable hardware and software requirements set forth in these specifications.

#### 1.5.5 Minimum Requirements

Specifications are minimum requirements. If the provided system requires enhanced specifications that exceed those specified herein in order to satisfy the specified design, configuration, capability, and performance requirements, then a provide a system with the enhanced specifications.

#### 1.5.6 Current State-of-the-Art Technology

Provide application design and products that utilize current state-of-the-art products that provide the enhanced capability and performance specified herein. Provide design and products representing the latest manufacturer make and model.

#### 1.5.7 Design Analysis and Calculations

Include in the design analysis and calculations, at a minimum, the following:

- a. Power supply requirements for each component and each separate speaker zone of the system in accordance with the manufacturer's instructions. Provide power consumption and dissipation data under normal and maximum operating conditions.
- b. Cable types and sizes.
- c. Interfaces with all other systems such as the fire alarm and mass notification system for muting of sound masking system upon fire alarm or mass notification announcement.

#### 1.5.8 Environmental Requirements

Provide equipment to be used indoors rated for continuous duty operation under ambient environmental conditions of 35 to 120 degrees F dry bulb and 10 to 95 percent reflective humidity, noncondensing. Provide all other equipment rated for continuous operation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified or normally encountered for the installed location.

### 1.5.9 Electrical Requirements

105 VAC to 130 VAC at 60 Hz operating voltage range, plus or minus 2 percent.

#### 1.5.10 Power supplies

Provide power supplies that provide sufficient power for worst-case conditions of system operation that could occur without signal loss or perceptible degradation.

#### 1.5.11 Power Line Surge Protection

Provide power line surge protection for all equipment connected to AC power. Provide surge protection integral to the equipment or installed as an accessory item in accordance to manufacturer's recommendations. Do not use fuses for surge protection.

#### 1.5.12 Shielding and Grounding

Provide shielding and grounded as required by the system design, Manufacturer's instructions, FCC Part 15 listing, and regulatory requirements.

#### 1.5.13 System Capability and Configuration

##### 1.5.13.1 System Capability

Provide a sound masking system with capabilities to support volume adjustment per zone, noise type selection (white/babble), controllers, and interface modules.

#### 1.5.14 Performance Requirements

##### 1.5.14.1 System Initiation and Operation

Limited user controlled features are permitted on this system. System is to be active on power up and perform as specified with minimal form of manual control.

### 1.6 CYBERSECURITY

- a. The Risk Management Framework (RMF) is the process by which information systems are accredited for operation by a designated official from the Using Military Department. It is the standard process under which all DoD information systems must achieve and maintain their Authority To Operate. The Cyber Security process is documented in DOD 8510.01 and NIST SP 800-82. Refer to UFC 4-010-06 for additional requirements.
- b. All systems that are IP addressable or interface with the Assured Network must be certified to operate. Coordinate with the Government to initiate and complete the accreditation process.
- c. Cybersecurity requires input from the system vendor or provider and support from the local IMD. The local IMD-IA office is the point of contact for all Cybersecurity requirements. The local CMIO is the point of contact for all clinical and functional system requirements.

## 1.7 QUALIFICATIONS

### 1.7.1 General Qualification Requirements

- a. The System Contractor, Installer and Manufacturer must each have the minimum qualifications specified, related to the type of system specified for this project.
- b. The Government reserves the right to accept or reject the System Contractor, Installer or Manufacturer based upon qualifications and ability to conform to specified technical or licensing requirements of this Section. System Contractors, Installers and Manufacturers that do not have the specified qualifications will not be acceptable and will not be allowed to perform the work of this section.
- c. The Government will determine the acceptability of any proposed System Contractor, Installer and Manufacturer based on submitted and verified documentation that substantiates that the proposed System Contractor, Installer and Manufacturer have the qualifications specified in this Section.
- d. Submit documented verification of the specified qualifications as part of the Data Qualifications submittal. The Government maintains the right to request, inspect and verify references and resumes of all technical and managerial personnel assigned to the project.
- e. Include qualification documentation, but not limited to the information outlined below:
  - (1) A list of projects performed by the System Contractor and Installer during the last five years explicitly involving the type of system specified in this section, including:
    - (a) Name of facility where work was completed.
    - (b) Name, title, address and telephone number of a point of contact for the listed facility.
    - (c) The make and model of the system provided and total scope of work for the facility.
    - (d) Restrict list to the facilities where the same type of system was installed for the same purpose provided.

### 1.7.2 System Contractor Qualifications

- a. Contractor qualifications must include the following:
  - (1) The Contractor is regularly engaged in the system application design, documentation, installation, testing, training, and maintenance of the type of system specified in this section.
  - (2) The Contractor has a minimum of five years experience providing these services for systems having the same level of features and functions as the system being provided.
  - (3) The Contractor has a minimum of five years as the manufacturer or an authorized distributor and service organization for the manufacturer of the system provided.

## b. Contactor personnel qualifications must:

- (1) Be factory trained or certified for the make and model of the system provided.
- (2) Have a minimum of five years experience performing the services specified in this specification section.
- (3) Maintain a full compliment of spare parts for the provided system with the ability to furnish on-call maintenance 24 hours per day, 365 days per year.

## 1.7.3 Installer Qualifications

- a. The installer personnel must be regularly engaged in the installation of the type of system in this specification section.
- b. The installation supervisor must be factory trained or certified for the make and model of the system provided.
- c. The installation supervisor must have a minimum of five years experience providing services having the same level of features and functions for the system included in this specification section.
- d. The installation personnel must have a minimum of three years experience providing services having the same level of features and functions for the system included in this specification section.

## 1.7.4 Manufacturer Qualifications

The system manufacturer must:

- a. Have a minimum of five years experience in producing the products and type of system included in this specification section.
- b. Produce a system that satisfies all specified features, functions and product requirements.
- c. Guarantee the availability of the replacement parts for the designed system for a minimum of seven years from the date of final acceptance of the system by the Contracting Officer.

## 1.8 DELIVERY, STORAGE, AND HANDLING

Equipment placed in storage until installation must be stored with protection from the weather, humidity and temperature variations, dirt and dust, and other contaminants.

## 1.9 EXTRA MATERIALS

Submit spare parts data for each different item of material and equipment specified, after approval of the detail drawings and not later than 2 months prior to the date of beneficial occupancy. The data must include a complete list of parts and supplies, with current unit prices and source of supply.

## PART 2 PRODUCTS

### 2.1 SYSTEM DESCRIPTION

The sound masking system must consist of an analog audio distribution network to include sound masking generators, amplifiers, noise generators, speakers, cabling, and ancillary components required to meet the required system configuration and operation. Submit Data Package 3 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

#### 2.1.1 Multi-Zone System

The system must include sound masking generators, single channel sound masking, control for each input, power amplifying equipment, and accessories required to output the sound masking signals through selected portions of the audio distribution network as indicated.

#### 2.1.2 Single-Channel System

The system must control and amplify sound masking program for distribution within the areas indicated. Components of the system must include a sound masking generator and power amplifier, speaker system, cabling and other associated hardware.

#### 2.1.3 System Performance

The system must be capable of delivering 75 dB average program level with additional 10 dB peaking margin sound pressure level (SPL) in the area at an acoustic distortion level below 5 percent total harmonic distortion (THD). Unless otherwise specified the sound pressure reference level is 20 micro Pascal (0.00002 Newtons per square meter).

#### 2.1.4 Detail Drawings

Submit detail drawings consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Note that the contract drawings show layouts based on typical speakers. Check the layout based on the actual speakers to be installed and make necessary revisions in the detail drawings. Detail drawings must also contain complete point to point wiring, schematic diagrams and other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings must show proposed layout of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

### 2.2 STANDARD PRODUCTS

Provide materials and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of such products, and that essentially duplicate material and equipment that have been in satisfactory use at least 2 years. All components used in the system must be commercial designs that comply with the requirements specified. Submit copies of current approvals or listings issued by UL, or other nationally recognized testing laboratory for all components. Equipment must be supported by a service organization that is within 100 miles of the site.

### 2.2.1 Identical Items

Items of the same classification must be identical. This requirement includes equipment, modules, assemblies, parts, and components.

### 2.2.2 Nameplates

Each major component of equipment must have the manufacturer's name, address, model and catalog number, and serial number on a plate secured to the equipment.

## 2.3 ANALOG AUDIO SYSTEM

### 2.3.1 Programmable Audio-Level Control Unit

Built-in zone-level control shall drive other amplifiers and provide minimum 7 position level control.

Program Memory: Nonvolatile for at least one year without power. When re-energized after power outage, control starts at zero level and automatically advances system sound level at same rate used for programmed level changes.

### 2.3.2 Noise Generator and Filter Units

- a. Digital Masking Generator Spectra: White and babble.
- b. Mixer Inputs: Two high-level and one microphone level.
- c. Mounting: Shelf or rack 3-1/2 inches high.
- d. White Noise Generator (flat spectral density):
  - (1) Frequency Range: 20 Hz to 20 kHz.
  - (2) Output Level: Adjustable from -60 dB to 0 dB.
  - (3) Signal-to-Noise Ratio (SNR): > 90 dB.
  - (4) Total Harmonic Distortion (THD): < 0.01 percent.
- e. Babble Noise Generator (simulated multi-speaker speech):
  - (1) Frequency Range: 100 Hz to 8 kHz.
  - (2) Output Level: Adjustable from -60 dB to 0 dB.
  - (3) Signal-to-Noise Ratio (SNR): > 85 dB.
  - (4) Modulation: Optional dynamic modulation to simulate natural crowd fluctuations.

### 2.3.3 POWER AMPLIFIERS

Power amplifiers as a minimum conform to the following specifications and comply with CEA-426:

- a. Output Regulation: Less than 2 dB from zero to full load.

- b. Total Harmonic Distortion: Less than 3 percent, at rated power output from 50 to 12,000 Hz.
- c. Signal-to-Noise Ratio: 60 dB or greater, at rated output.
- d. Frequency Response: Within +/- dB from 50 to 12,000 Hz.
- e. Input: from internal masking or mixer board, or from an exterior source such as an automatic level control or other mixer.

## 2.4 LOUDSPEAKERS

### 2.4.1 Cone Speaker

The cone speaker must as a minimum conform to the following specifications:

- a. Minimal Axial Sensitivity: 45dB.
- b. Frequency Response: Within +/-3 dB from 50 to 15,000 Hz.
- c. Size: 8 inches with 1-inch voice coil and minimum 5-oz. ceramic magnet unless otherwise indicated.
- d. Dispersion Angle: 100 degrees.
- e. Rated Output level: 10 W.
- f. Configuration: Dual 8-inch and dual 5-inch units mounted on metal baffles and arranged form optimum, multi-directional, angular sound distribution. Arrange units for suspension from the building structure.
- g. Matching Transformers: Full-power rated with 4 standard taps, and a maximum insertion loss of 0.5 dB.
- h. Assemblies installed in air-handling spaces shall comply with NFPA 70 requirements for rate of heat-release and rate of smoke-release characteristics. Tests for these requirements shall be according to UL 2043.

### 2.4.2 Ceiling Speaker Enclosures

Ceiling speaker enclosure must be constructed of heavy gauge cold steel with interior undercoating and 1-1/2 inch thick high density fiberglass 1-1/2 lbs/cu. ft. The unit must be round or square and designed for surface installations which will be accomplished via standard screw mounting. Recessed models must have a rust-preventive, textured black coating and the surface mount unit finished in textured white . Enclosure must include four triple compound conduit knockouts.

## 2.5 SPEAKER SWITCHING PANEL

### 2.5.1 System Power supply

Power supply must be provided for priority relays and controls, rack-mounted and sized for a capacity equal to 200 percent of the as-built control system, and must operate at 24 Vdc. Input and output must be protected to permit Class 2 wiring in accordance with NFPA 70.

## 2.6 PRIORITY RELAYS AND CONTROLS

Provide priority relays and controls required to accomplish operations specified. Relays must be completely enclosed with a plastic dust cover for maximum protection against foreign matter, and must be plug-in type. Relays must be provided with a diode wired across the relay coil for transient suppression and must be installed utilizing factory-rewired, rack-mounted receptacle strips. Coil must be maximum 24 volts dc.

## 2.7 EQUIPMENT RACKS AND CABINETS

Equipment must be mounted on shelf or floor mounted cabinets with 19 inch mounting rails as indicated on the drawings UL listed and in accordance with ECIA EIA/ECA 310-E and located as shown on drawings. Ventilated rear panels, solid side panels, and solid top panels must be provided for cabinets. Equipment cabinets must be provided with lockable front panels that limit access to equipment. The lockable front must not cover items that require operator access.

## 2.8 CABLES

### 2.8.1 Speaker Cable

Cables must be of the gauge required depending upon the cable run length. In no case are cables to be used which is smaller than 18 AWG. Insulation on the conductors must be polyvinyl chloride (PVC) or an equivalent synthetic thermoplastic not less than 0.009 inch. Cables must be jacketed with a PVC compound. The jacket thickness must be 0.02 inch minimum.

## 2.9 TERMINALS

Terminals must be solderless or tool-crimped pressure type.

## 2.10 SURGE PROTECTION

### 2.10.1 Power Line Surge Protection

Major components of the system such as power amplifiers, mixer-preamplifiers, and tuners, must have a device, whether internal or external, which provides protection against voltage spikes and current surges originating from commercial power sources in accordance with IEEE C62.41.1/IEEE C62.41.2 B3 combination waveform and NFPA 70. Fuses must not be used for surge protection. The surge protector must be rated for a maximum let thru voltage of 350 Volts ac (line-to-neutral) and 350 Volt ac (neutral-to-ground). Surge protection device must be UL listed and labeled as having been tested in accordance with UL 1449.

### 2.10.2 SIGNAL SURGE PROTECTION

Major components of the system must have internal protection circuits which protects the component from mismatched loads, direct current, and shorted output lines. Communication cables/conductors must have surge protection installed at each point where it exits or enters a building.

## PART 3 EXECUTION

### 3.1 EXAMINATION

After becoming familiar with the details of the work and working

conditions, verify dimensions in the field, and advise the Contracting Officer of any discrepancies before performing the work.

### 3.2 INSTALLATION

Install equipment as indicated and specified, and in accordance with the manufacturer's recommendations except where otherwise indicated.

#### 3.2.1 Equipment Racks

Group items of the same function together, either vertically or side-by-side. Arrange controls symmetrically at a height as indicated. Make audio input and interconnections with approved shielded cable and plug connectors; output connections may be screw terminal type. All connections to power supplies must utilize standard male plug and female receptacle connectors with the female receptacle being the source side of the connection. Inputs, outputs, interconnections, test points, and relays must be accessible for maintenance and testing. Each item must be removable without disturbing other items or connections.

#### 3.2.2 Wiring

Install wiring in rigid steel conduit, intermediate metal conduit, cable trays, or electric metallic tubing as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Wiring for grounding, line level, speaker and power cables must be isolated from each other by physical isolation and metallic shielding. Shielding must be terminated at only one end.

### 3.3 GROUNDING

All grounding practices must comply with NFPA 70. Equipment must be grounded to the serving panelboard ground bus through a green grounding conductor. Metallic conduits serving the equipment must be isolated on the equipment end with an insulating bushing to prevent noise from being transferred to the circuit. Equipment racks must be grounded to the panelboard ground bus utilizing a 8 AWG conductor. Grounding conductor must be terminated to the rack using connector suitable for that purpose.

### 3.4 TRAINING

Conduct a training course for 5 members of the operating and maintenance staff as designated by the Contracting Officer. The training course will be given at the installation during normal working hours for a total of 4 hours and must start after the system is functionally complete but prior to final acceptance tests. The field instructions must cover all of the items contained in the approved operating and maintenance manuals, as well as demonstrations of routine maintenance operations. Notify the Contracting Officer at least 14 days prior to the start of the training course.

### 3.5 ACCEPTANCE TESTS

Submit test reports in booklet form showing all field tests performed to adjust each component and to prove compliance with the specified performance criteria, upon completion and testing of the installed system. The reports must include the manufacturer, model number, and serial number of test equipment used in each test. Each report must indicate the final position of controls and operating mode of the system. After installation has been completed, conduct acceptance tests, utilizing

the approved test procedures, to demonstrate that equipment operates in accordance with specification requirements. Submit test plan and test procedures for the acceptance tests. The test plan and test procedures must explain in detail, step-by-step actions and expected results to demonstrate compliance with the requirements specified. The procedure must also explain methods for simulating the necessary conditions of operation to demonstrate system performance. Notify the Contracting Officer 14 days prior to the performance of tests. In no case will notice be given until after the Contractor has received written Contracting Officer approval of the test plans as specified.

### 3.5.1 Testing Requirements

Include the following minimum testing:

- a. Operational Test: Perform tests that include originating sound masking generator, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.
- b. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.
- c. Power Outage Test: Turn off AC power at the circuit breaker for AC powered components connected to a UPS unit to ensure components continue to operate for a minimum of 15 minutes.
- d. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

Sound masking system will be considered defective if it does not pass any of the required individual tests and inspections listed above.

-- End of Section --

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