**SECTION 27 51 19**

**SOUND MASKING SYSTEMS**

**Delete this note before transmitting to client.**

 **N. B.** This model specification is in the (2004) CSI format. Certain paragraphs will require editing, deleting, or supplementing depending on the requirements of a specific project. Paragraphs are automatically formatted: equipment, specification items, or pages may be deleted or added without manual reformatting. Project specific titling including headers and footers on the first page will require manual editing. Expect that the Owner or Architect may rewrite or reformat this information to fit specific job requirements.

Manufacturer contact information:

Cambridge Sound Management, Inc. Toll Free: 800.219.8199

404 Wyman Street Suite 200 Email: info@cambridgesound.com

Waltham, MA 02451 USA Web: [www.cambridgesound.com](http://www.cambridgesound.com)

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**Client Name**

**Project Name Title**

**DIVISION 27 51 19**

**SOUND MASKING AND PAGING SYSTEMS**

**DATE**

**Note to Specifier: this note and Highlighted text below is hidden and does not print.**

# **general**

## **Applicable provisions of the Conditions of the Contract and Division #1, General Requirements, govern work in this Section.**

## **DESCRIPTION OF WORK**

### The work of this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all Sound Masking System and related work for this project, as required by the schedules, and keynotes and drawings.

### Functional Requirements of Systems:

#### Distribute sound masking to all areas as indicated on the drawings.

#### Distribute paging signals to all areas as indicated on the drawings.

#### Distribute background music signals to all areas as indicated on the drawings.

#### Distribute night bell signals to all areas as indicated on the drawings.

### All active electronic components shall be conveniently accessible for service. Systems using above-ceiling active electronics are not permitted.

### Definitions:

#### Privacy Index: According to American Society of Testing and Materials (ASTM) Standard E1130.

#### Octave and 1/3-Octave Bands: Centered on ANSI/ISO preferred frequencies.

#### Sound Level Meter and Filter Set: Calibrated ANSI Type 1 or Type 2.

#### Pink Noise: Constant energy in constant percentage (e.g. 1/1 or 1/3 octave) frequency bands, random or pseudo-random noise.

#### SPL: Sound pressure level in dB re 0.00002 Pa (0.0002 microbar).

#### ISO: International Standards Organization

#### NEC: National Electrical Code

#### UL: Underwriters Laboratories

## **BID SUBMITTALS**

### Instructions to Bidders: To be considered, Bids must be made in accord with the Architect's Instructions to Bidders and this Article.

### Examinations: Carefully examine the contract documents and the construction site to obtain first-hand knowledge of existing conditions. Contractors will not be given extra payments for conditions that can be determined by examining documents on-site, and will not be relieved of any obligations with respect to bid.

### Questions: Submit all questions about the contract documents in writing. Replies requiring changes to the contract documents will be issued to all bidders as addenda and will become part of the Contract. The Architect and Owner may give but will not be responsible for oral clarifications. Questions received less than 10 days before bid date cannot be answered in writing.

### Basis of Bids:

#### All control, amplification, and loudspeaker equipment shall be supplied by Cambridge Sound Management LLC.

#### Substitutions not permitted.

## **QUALITY ASSURANCE**

### Project Management: Maintain the same person in charge of work throughout installation.

### Contract Documents: Maintain a complete set of system drawings and specifications on the job site.

### To be considered qualified for this work, the contracting firm must be experienced in the provision of sound systems similar in complexity to those required for this project, and meet the following:

#### The Contractor’s primary business is the provision, fabrication, and installation of distributed sound and related systems.

#### The Contractor is an authorized dealer for the major product components furnished.

### System Design: Performed by a representative or dealer approved by the manufacturer.

### Commissioning: Done by a representative or dealer approved by the manufacturer.

## **SUBMITTALS**

### General:

#### In keeping with the practices of LEED™, all submittals shall be delivered in electronic format as combined PDF files via FTP posting, CD-ROM, DVD, or e-mail.

#### Delivery Schedule:

##### By date specified for delivery of bid package provide:

###### Qualifications/References.

###### Certifications (including certificate of bonding, if required by Owner or Architect).

###### Proposed payment terms.

##### No later than ##7 days following award of contract, provide the following in one unified package:

###### Shop drawings.

###### Bill of materials.

###### Manufacturer product data sheets.

##### One week before acceptance testing (system “check-out”) provide:

###### System test and certification reports.

###### Manufacturers’ equipment owner’s manuals.

###### System operational manuals.

###### As-built system diagrams.

### CAD drawings will be in AutoCad 2010 dwg format and portable document format (PDF). All other submissions unless otherwise stated will be provide as PDFs.

### Unless otherwise directed by contract, do not order equipment until the bill of materials has been reviewed and approved by the Owner and Architect. Coordinate all submittals with requirements set forth in Section 01300.

## **JOB CONDITIONS**

### Sequencing and Scheduling:

#### Coordinate work with adjacent work of other trades to facilitate construction and prevent conflicts.

#### Afford other trades reasonable opportunity for installation of work and for the storage of materials.

#### Staff the job to keep pace with the other Trades; otherwise, the Architect will require an increase in force or overtime work without additional expenses to the Owner.

#### Abide by the decision of the Architect in case of conflict or interference by other trades.

#### Refuse: Remove all refuse from the job site to the satisfaction of the Architect and Owner.

### Insurances on the work of this specialty trade shall be provided if specified in Section 00810.

## **WARRANTY**

### Warrant all equipment to be free of faulty workmanship and defects and from damage due to contamination by construction dust and debris for a minimum period of one year from date of final acceptance for control modules and five years from date of final acceptance for loudspeakers.

## **SERVICE CONTRACT**

### Provide a one-year service contract to commence after acceptance of installation without additional cost. Service to include two semi-annual visits to the site for routine adjustment and maintenance of all equipment. Provide a preliminary schedule for the semi-annual visits.

### Toward the end of each year's Service Contract, provide the owner with a proposal for continued service during the next year.

## **TRAINING**

### The Owner may assign personnel to participate with the contractor during installation. Without delaying the work, familiarize the Owner's personnel with the installation, equipment, and maintenance.

### During tests and adjustments, permit the Owner's personnel to observe. When feasible explain the significance of each test.

### Provide sufficient training to personnel selected by the Owner on operation and basic maintenance of all systems and equipment. Explain operation of control systems, set-up and operation of individual pieces of equipment, and functions of overall systems.

## **INSPECTION**

### Notify the Architect of any defects in work by other trades affecting installation.

# **products**

## **gENERAL**

### The loudspeakers shall be direct field, radiating directly into the space.

### The sound masking and paging/music system shall have controllers that power one or more individually controllable zones. The system shall provide:

#### One or more rack or wall-mounted controllers, each with one or more zones and one or more line level audio inputs.

#### Four uncorrelated noise sources per zone. The signals to adjacent loudspeakers shall be uncorrelated.

#### Direct field loudspeakers that automatically sequence the four noise channels and that are mounted either in office ceiling tiles or other enclosures.

#### Cat 3/5/6 preterminated cable assemblies.

## **LABELS**

### Except where otherwise specified, label each item of control equipment as shown on drawings.

#### Controllers: Constructed of engraved and filled anodized aluminum plates. Minimum 1/8" plate thickness. Dry transfer or other types of adhesive labels not acceptable.

#### Identification Panel: Install panel with 1/8"-high engraved characters. Clearly identify the Project, System Installation Contractor, and Project Architect.

### Identify all wires and cables at every connection point to controllers with reference number keyed to the as-built wiring diagrams.

### Room numbers appear on the contract documents for reference only. All labels shall reflect the Owner's final room designations.

### Cable Markers:

#### High-grade PVC clip-on or permanent-type cable markers with permanent markings, or printed vinyl tape protected by clear shrink tubing or adhesive wrap.

## **MANUFACTURERS**

### Acceptable Manufacturer: Cambridge Sound Management; 404 Wyman St., Suite 200, Waltham, MA 02451. Toll Free Tel: (800) 219.8199. Tel: (617) 349-3779. Fax: (617) 349.3788. Email: info@cambridgesound.com. Web: <http://www.cambridgesound.com>.

## **controllers**

### All sound masking loudspeakers shall be directly powered and managed by a controller.

\*\* NOTE TO SPECIFIER \*\* This specification includes three models of masking and paging controllers within the Qt Quiet technology™ product suite. The sections below provide specifications from the most general to those that are specific for each controller. The system designer may choose to specify one or more type of controller based upon end user’s zoning requirements and/or paging and music configuration. Delete controllers and associated specifications that are not required.

### Each controller and zone shall:

\*\* NOTE TO SPECIFIER \*\* Include this section for all controller models.

#### Have four button control and LCD readout of system settings on front panel.

#### Provide DSP-based sound generation with four (4) uncorrelated masking signal outputs per zone.

#### Have built in signal logic for sequential channel operation by adjacent loudspeakers.

#### Provide pre-set industry standard frequency equalization, specifically tailored to the operating characteristics of the loudspeaker or speakers provided and requiring no frequency equalization during the commissioning process.

#### Provide separate level controls for masking and paging/music adjustable in 1 dB steps over a minimum range of 30 decibels, and off.

#### Have dedicated compressor and peak limiter for paging inputs.

#### Be wall and/or rack mountable (except single zone controllers wall mountable only).

#### Have UL/CUL/CE listed power supply.

#### Be Green Spec-Listed for energy efficiency.

### Single-Zone Controllers:

#### Capable of controlling background sound and paging for a single zone of sound masking with paging, and from 1 to 120 speakers and 100 to 12,000 square feet.

#### One audio input on rear panel operable in balanced or single ended configuration for distribution of externally generated signals via 4 terminal compression type connector.

#### Optional Bluetooth wireless control connectivity for automated control of masking level setting during system commissioning.

#### Wall mountable.

#### Minimum Performance Requirements:

##### Supply Power: 110 – 240 VAC 0.9 Amperes.

##### Rated ambient temperature range: 40 to 90 degrees F (4 to 32 degrees C).

##### Output Voltage: 20 volts RMS minimum sine wave at full load, each channel to meet NEC Class 2 requirements for low voltage distribution.

##### Audio (paging) input: 600 ohm line bridging, differential or single ended, 1 volt nominal, adjustable between -10 dBv and +4 dBv RMS.

#### Acceptable Products:

##### Cambridge Sound Management Model Qt 100

##### Bluetooth connectivity Option

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

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NOTE TO SPECIFIER \*\* Delete if not required.

### Three-Zone Controllers

#### Network capable management of system acoustic output of all zones.

#### Control software that is pre-installed and resident on controller and accessible via any standard browser from a computer resident on the network.

#### Capability of controlling background sound and paging for up to three separate zones of sound masking with paging selectable by zone, and from one to 120 speakers per zone covering from 100 to 12,000 square feet or from 100 to 36,000 square feet total.

#### Capable of automatic background sound level adjustment (ramping) based on time of day and day of week.

#### Time source provided by integrated Real Time Clock with battery backup or user selectable SNTP server. Field adjustable using provided EthernetTM connection and factory installed software.

#### Dedicated 1/3 octave equalizer covering ISO bands from 200 Hz to 5,000 Hz for background sound spectrum, preset at factory for recommended operation. Field adjustable using provided EthernetTM connection and factory installed software.

#### Dedicated 1/1 octave equalizer covering ISO bands from 250 Hz to 8000 Hz for paging input. Field adjustable using provided EthernetTM connection and factory installed software.

#### Loudspeaker network fault detection capability.

#### Two audio inputs (A and B) on rear panel operable in balanced or single ended configuration for distribution of externally generated signals via 4 terminal compression type connectors.

#### Two contact closure interfaces on rear panel: one turns off masking on closure; one turns off Audio B on closure. May be used to duck masking and/or Audio B during emergency situations.

#### Minimum Performance Requirements:

##### Supply Power: 110 – 240 VAC 0.9 Amperes.

##### Rated ambient temperature range: 40 to 90 degrees F (4 to 32 degrees C).

##### Output Voltage: 7 volts RMS minimum sine wave at full load, each channel to meet NEC Class 2 requirements for low voltage distribution.

##### Audio (paging) input: 600 ohm line bridging, differential or single ended, 1 volt nominal, adjustable between -10 dBv and +4 dBv RMS.

#### Acceptable Product:

##### Cambridge Sound Management Model Qt 300

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

### Six-Zone Controllers

#### Network capable management of system acoustic output of all zones.

#### Control software that is pre-installed and resident on controller and accessible via any standard browser from a computer resident on the network.

#### Capability of controlling background sound and paging for up to six separate zones of sound masking with paging selectable by zone, and from one to 120 speakers per zone covering from 100 to 12,000 square feet per zone or from 100 to 72,000 square feet per controller in 6 zones.

#### Capable of automatic background sound level adjustment (ramping) based on time of day and day of week.

#### Time source provided by integrated Real Time Clock with battery backup or user selectable SNTP server. Field adjustable using provided EthernetTM connection and factory installed software.

#### Dedicated 1/3 octave equalizer covering ISO bands from 200 Hz to 5,000 Hz for background sound spectrum, preset at factory for recommended operation. Field adjustable using provided EthernetTM connection and factory installed software.

#### Dedicated 1/1 octave equalizer covering ISO bands from 250 Hz to 8000 Hz for paging input. Field adjustable using provided EthernetTM connection and factory installed software.

#### Loudspeaker network fault detection capability.

#### Two audio inputs (A and B) on rear panel operable in balanced or single ended configuration for distribution of externally generated signals via 4 terminal compression type connectors.

#### Two contact closure interfaces on rear panel: one turns off masking on closure; one turns off Audio B on closure. May be used to duck masking and/or Audio B during emergency situations.

#### Minimum Performance Requirements:

##### Supply Power: 110 – 240 VAC 0.9 Amperes.

##### Rated ambient temperature range: 40 to 90 degrees F (4 to 32 degrees C).

##### Output Voltage: 7 volts RMS minimum sine wave at full load, each channel to meet NEC Class 2 requirements for low voltage distribution.

##### Audio (paging) input: 600 ohm line bridging, differential or single ended, 1 volt nominal, adjustable between -10 dBv and +4 dBv RMS.

#### Acceptable Product:

##### Cambridge Sound Management Model Qt 600

**\*\* NOTE TO SPECIFIER \*\* Delete if not required.**

## **loudSPEAKERS**

### Miniature self-contained ceiling mounted loudspeaker/enclosure/baffle system.

#### Designed specifically for distributing background masking. music, and paging. Ultra wide dispersion to maximize spatial uniformity.

#### Twist and lock retaining ring construction to minimize installation time in ceiling tiles and enclosures.

#### All connections via modular RJ45 connectors for plug-and-play installation.

#### Eye loop for securing unit with safety wire.

#### UL 2043 certified for plenum installation.

#### UL approved. Approvals and certifications labeling must be on speakers.

#### Acceptable Products: Cambridge Sound Management Qt loudspeaker with optional mounting enclosures as follows:

\*\* NOTE TO SPECIFIER \*\* Delete mountings not required.

##### UB- W(white) or B(black): universal mounting for wooden beam or wall mounting.

##### BB-W(white) or B(black): 1″ beam clamp mounting for suspended applications.

##### CM: conduit mounting for sheetrock ceilings.

##### DM: mounting for sheetrock/drywall ceilings.

##### PBC: metal plenum back can for use in locations where required by fire code or conduit connectivity.

## **loudSPEAKER CABLING**

### Cables terminated with RJ45 modular connectors.

#### Type: CAT3 provided with system: CAT5/5A, CAT6 are compatible.

#### Unshielded solid twisted pair construction; stranded optional.

#### Meet EIA/TIA Standard 568b.

#### Optional AWG #24 stranded conductors with overall plenum-rated jacket (CMP (UL)/C(UL) 4PR 24 AWG Plenum).

### Acceptable Products:

\*\* NOTE TO SPECIFIER \*\* Home runs and longer runs may require longer cable, and field fabricated cable is acceptable for these if tested before installation in accordance with Part 3 hereinafter.

#### Cambridge Sound Management pre-assembled 16 foot (4.9 m) or 30 foot (9.1m) Loudspeaker Cable Assembly.

#### Site fabricated and tested with overall plenum-rated jacket (CMP (UL)/C(UL) 4PR 24 AWG Plenum).

# **EXECUTION**

## **General**

### All types of equipment installed by competent workers at locations shown on the drawings in strict accordance with approved shop drawings and manufacturer's instructions.

### All equipment except portable equipment firmly held in place. This shall include loudspeakers, enclosures, amplifiers, cables, etc. Fastenings and supports adequate to support their loads with a safety factor of at least three unless otherwise stated.

### Take such precautions as necessary to prevent and guard against electro-magnetic and electro-static hum and to install the equipment so as to provide safety for the operator.

## **Generator/Controller**

### Locate Generator/Controllers as shown on drawings, and near an available dedicated 110VAC receptacle.

### Locate at a convenient location for operation from floor level.

### Mount Generator/Controller and Processor securely to wall or other vertical surface with screws or mounting brackets provided.

### Attach line level and loudspeaker cables connecting to controllers securely with suitable strain-relief clamps.

### Identify all loudspeaker home run wires and cables at termination and connection points with approved cable markers. Label each cable with cable marker keyed to a wiring schedule indicating the corresponding area of building served. Designate building floor level and zone, and whether area served is open plan, enclosed offices, circulation or other.

## **LOUDSPEAKERS (in ceiling tiles)**

### Cut hole in center of each ceiling tile using the hole saw provided or similar.

### Taking care not to visibly distort tile, slip provided locking collar on back of loudspeaker and firmly tighten against ceiling.

### If required by Local Authority in Charge, secure loudspeaker to building or ceiling suspension structure using safety wire and eye loop on loudspeaker.

### Connect cabling to loudspeakers with system live, starting at controller end of distribution lines. Connect line from output of operating controller set to maximum output to socket designated as input on loudspeaker. Verify operation of each loudspeaker by listening before tile is finally installed in ceiling. If loudspeaker does not operate, fault may be in lines or defective loudspeakers upstream of inoperative unit: correct before continuing. Note that inadvertent connection of line to output of loudspeaker rather than to input will cause some downstream loudspeakers (up to 4 loudspeakers after misconnected unit) to be rendered inoperative.

## **loudspeaker cabling**

### Cabling routed within return air plenums shall be plenum-rated unless installed in conduit.

### Using a CAT cable tester, test all field fabricated cables, before installation, for open circuits, shorts, crossed pairs, reversed pairs, split pairs and proper pin-out.

### Install signal cables secured to ceiling hanger support or building structure per local code and electrical inspector requirements. Cabling shall not contact ceiling tiles or inhibit their removal for access to the plenum. Provide adequate service loop for convenient access to loudspeaker.

### Connect no more than 60 loudspeakers/home run.

### Install no more than 1000’ of cable between Generator/Controller unit and last loudspeaker on each home run.

## **System Tests and Adjustments**

### Initial Test and Adjustments: Perform and record results of the following tests:

#### Loudspeaker Operation: Near field output of each loudspeaker shall match the zone average within +/- 1.5 decibels. Listen directly below each installed loudspeaker to confirm it is operating. For any loudspeakers found to be inoperative, or possibly operating at an incorrect level, use a sound level meter set to A-weighting and slow response to check the output. Place the microphone so as to contact each grille.

#### Replace any defective loudspeakers or cabling, or otherwise correct cause for any loudspeakers found to be operating outside this range.

#### Buzzes, Rattles, and Distortion: With system operating at maximum level, listen for any buzzes, rattles, and objectionable distortion in all areas covered. Correct all causes of these defects.

#### Control Settings: Adjust all spectrum and level controls for normal operation. Measure the A-weighted sound pressure level using a sound level meter set to A-weighting and slow response at representative locations within each zone. Adjust average initial levels in open plan areas to 45 dBA at normal occupants’ locations and in closed offices or rooms to 42 dBA.

### If requested, demonstrate to the Owner’s Representative that the system is fully operable and installed in compliance with the terms of the performance specifications hereunder.

### Test the system to demonstrate that the design goal of Privacy Index (PI) = 80% (Normal Privacy) or better is met between representative workstations separated by partitions of 66” or greater height. For this test, select adjacent workstation pairs without direct line of sight or significant sound reflecting ceiling or wall elements between, and with a ceiling material rated at NRC of 0.85 or higher. Tests shall be in accordance with ASTM Standard E1130 except that the octave band calculation method of ANSI Standard S3.5 may be used. Lower levels of PI are acceptable only if the ceiling or partition requirements described hereinbefore are not met.

### Test the system in each open plan area zone served to demonstrate that the design goal for spatial uniformity is met. Tests shall be carried out per ASTM Standard E1573 as measured in the 2,000 Hz octave band. At each location, the average sound pressure levels shall be measured over an interval of at least 4 seconds at four positions at 90° intervals around a circle of 0.3 m (1 ft) radius centered on the location. The arithmetic mean sound pressure level shall be calculated from the four measured values. For at least 75% of the test locations, the arithmetic mean sound pressure level in the 2,000 Hz octave band shall not vary by more than 1 dB from the average of the arithmetic mean sound pressure levels measured at all locations.

### Test the system to demonstrate that the PI is at least 95% (Confidential Privacy) between representative private (enclosed) offices served by the system. For this test, select adjacent offices with closed doors. Tests shall be in accordance with ASTM Standard E1130 except that the octave band calculation method of ANSI Standard S3.5 may be used. Lower levels of PI are acceptable if the common walls between the offices do not extend to the deck above the acoustical ceiling and the ceiling material is not rated at STC 35 or greater. If the PI achieved is lower than 95% and caused by these or other architectural factors, bring this to the attention of the Owner or General Contractor.

END OF SECTION