

**PART 1 - GENERAL****1.1 RELATED SECTIONS**

- .1 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

**1.2 SYSTEM DESCRIPTION**

- .1 Empty telecommunications raceways system consists of outlet boxes, cover plates, conduits, cabletroughs, pull boxes, sleeves and caps, fish wires, service poles, service fittings, concrete encased ducts.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal conduit and wiring materials from landfill to metal recycling facility.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

**PART 2 - PRODUCTS****2.1 MATERIAL**

- .1 Conduits: EMT type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
  - .2 Outlet boxes type, conduit boxes size, and fittings: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.
  - .3 Fish wire: polypropylene type.
-

**PART 3 - EXECUTION****3.1 INSTALLATION**

- .1 Install empty raceway system, in ceiling space distribution system, fish wire, terminal cabinets, outlet boxes, pull boxes, cover plates, conduit, sleeves and caps, cabletroughs, miscellaneous and positioning material to constitute complete system.
- .2 For each data communication outlet shown, provide a minimum 21 mm C from outlet, up to ceiling space or as indicated.
- .3 Provide sleeves with bushings, min. 27 mm, from common corridor ceiling space to each enclosed room or as indicated.

## SOUND MASKING SYSTEM SPECIFICATION

---

### 1. PART ONE – GENERAL

#### 1.1. SECTION INCLUDES

- A. Sound masking systems

#### 1.2. DETAIL DRAWINGS

- A. Indicative Design Soundmasking layout drawings prepared by The Attain Group Inc. and attached to this specification:

<u>Sheet No.</u>	<u>Sheet Name</u>	<u>Date</u>
SM-111	RHC-22 Sound Masking Indicative Design	June 9, 2015
SM-211	RHC-23 Sound Masking Indicative Design	June 9, 2015
SM-311	RHC-17 Sound Masking Indicative Design	June 9, 2015
SM-411	RHC-15 Sound Masking Indicative Design	June 9, 2015

#### 1.3. REFERENCES

- A. UL6500 / ULC 60065 – Standard for Audio/Video and Musical Instrument Apparatus for Household, Commercial and Similar General Use
- B. UL 2043 – Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; 1996
- C. ASTM E 1374-06 – Standard Guide for Open Office Acoustics and Applicable ASTM Standards
- D. ASTM E 1573-09 – Standard Test Method for Evaluating Masking Sound in Open Office Using A-Weighted and One-Third Octave Band Sound Pressure Levels
- E. ASTM E 1130-08 – Standard Test Method for Objective Measurement of Speech Privacy in Open Offices Using Articulation Index
- F. ASTM E2638 - Standard Test Method for Objective Measurement of Speech Privacy Provided by Closed Rooms
- G. FCC – EN 55103-1&2 – Audio, Video and Entertainment Lighting Control
- H. ANSI s12.2-2008 – Criteria for Evaluating Room Noise
- I. 2011 ASHRAE Handbook – HVAC Applications

#### 1.4. DESIGN AND PERFORMANCE REQUIREMENTS

- A. System Architecture
  - 1. The sound masking systems and associated components requiring communications and transfer of electronic data between them shall use wired connections and shall not use wireless, Wi-Fi, or other telemetry based systems in any aspect of their functionality.
  - 2. The sound masking system shall be a plenum based system (above ceiling).
  - 3. The sound masking system shall provide digital controls for the adjustment of sound masking volume and frequency at the sound generator level.
  - 4. The system shall include PC Control Software capable of making and displaying all sound masking and sound masking timer settings.
  - 5. The sound masking system shall include all necessary hardware, software, cabinets, wiring to provide masking noise in an occupied space using only line power supplied by the building's electrical system.

B. Sound Masking Zone Design

1. The departmental representative shall provide qualifying suppliers tendering information which includes, scaled fit-up drawings of overall floor plans and/or specifications indicating,
  - i. open office areas; fully and partially enclosed rooms; public lobbies, corridors and waiting areas
  - ii. fully and partially enclosed rooms partition types (e.g. slab to slab; slab to ceiling; plenum barriers)
  - iii. the ceiling type(s), heights; plenum
  - iv. structural/architectural/mechanical/electrical or other design details limiting or restricting access to plenum space and proper installation of sound masking system components (e.g. primary air duct routing),
  - v. wiring routing requirements (e.g., conduit sleeves if required for slab to slab walls)
  - vi. rooms requiring in room occupant controls;
  - vii. speech security zones and specific requirements for rooms requiring speech privacy/security protection to be provided by sound masking, including communication, monitoring and alerting requirements as determined by departmental representatives, security, acoustical and communications specialist.
  - viii. Any other details related to supplier's design, installation and material costing requirements
2. Sound masking zone area shall be defined by, the independently addressable and controllable masking devices and associated loudspeakers, and comply with Section 1.4.A.
3. Open Office Areas (common/shared plenum)
  - i. Shall consist of multiple individual zones, each zone shall be limited to a maximum of 3 loud speakers, such that the acoustical performance requirements specified in 1.4.D are maintained in each zone, and between all zones.
4. Private offices and meeting rooms and other fully enclosed rooms having slab to slab partitions, and/or plenum barriers enclosing their plenum space.
  - i. Shall each be an independently controllable zone, or multiple zones, such that the acoustical performance requirements specified in Section 1.4.C and D are maintained.
5. Adjacent partially enclosed rooms having floor to ceiling partitions, and common shared plenum space. (no plenum barriers).
  - i. A maximum of 2 adjacent and partially enclosed rooms may be included within a single zone's coverage area such that the maximum masking devices in 1.4.A and performance requirements specified in 1.4.,C and D are maintained.
6. Conference and large meeting rooms and/or those that make use of audio enhancement/sound reinforcement systems, (microphones/public address systems, audio translation systems, etc.), broadcasting and/or similar special purpose rooms requiring high levels of speech intelligibility, will require special acoustical and audio design considerations in regards to the use sound masking, if used.
  - i. Each speaker shall be considered a zone, and in-room occupant control devices shall be provided which include the minimal features listed in Section 1.4.I
7. Public servicing areas, corridors, lobbies, waiting areas and other public and common areas.
  - i. meet the zonal requirements 1.4.A and acoustical and operational performance requirements in Section 1.4 C and D.
8. Speech Security Zones - *It is assumed, that the level of speech security protection required and zones have been defined by the appropriate security procedures; and appropriate acoustical expertise has been retained to; provide the rooms required design and construction details; determine the sound masking system's operational requirements in conjunction with the supplier; verify speech security performance has been achieved upon commissioning. When sound masking is integral to meeting the speech security protection requirements the following specifications must be met.*
  - i. Within a Speech Security Zones (SSZ), each speaker and its associated devices shall be considered as an independent zone with the central control unit setup for monitoring and logging operational status in real time.
  - ii. The supplier shall setup and enable the central control units communications interface to allow it to facilitate direct and/or remote communications with departmental representatives monitoring system, and/or to provide automated

- alerts of its operational status in real-time. Minimal operation requirements to meet speech security requirements are provided in Sections 1.4.E, F, M, N.
- iii. The supplier must provide departmental representative with detailed technical manuals including the communication protocols and materials required to link multiple control unit (s) within a facility and to access and monitor operational status of secure zones. The supplier may also provide proprietary monitoring software as an optional item.
  - iv. It shall be the departmental representative's responsibility to, determine and facilitate communication, monitoring/alert methodologies, and ensure that communications and security requirements are maintained.
  - v. It shall be the departmental representative's responsibility to provide any computer equipment or other resources required for monitoring security requirements.

**C. Sound Masking Performance**

- 1. The system shall use digital signal processing (DSP) technology for masking sound generation and output adjustment of masking signals.
- 2. The masking sound shall be generated via a truly-random, non-deterministic digital process with no noticeable repeat cycle.
- 3. The system shall be comprised of sound masking zones, fed by one or more independent masking sound generators and shall include independent equalization and volume controls which will ensure that the target volume levels and spectral requirements identified in 1.4.H and are met throughout the facility regardless of architectural condition. For open office spaces, corridors and other space considered open areas, each sound masking zone shall be comprised of a maximum of three (3) speakers.
- 4. Sound masking zones for enclosed spaces shall be configured to meet requirements of sections 1.4.B.3 and 1.4.H, such that enclosed executive offices are on separate addressable zone(s); enclosed boardrooms and meeting rooms are on separate addressable zone(s), (larger enclosed rooms may require multiple zones); small adjacent enclosed room types may be included within a single addressable zone as design and size permit.
- 5. The system shall provide a 1/3 octave equalizer for each masking sound generator. Equalizers shall provide a minimum adjustment range of 100 to 10,000 Hz.

**D. Timer Performance**

- 1. The system shall provide a timer function allowing masking volume levels to be automatically adjusted according to a programmed schedule.
- 2. The system shall provide a calendar-based programmable timer function. Timer schedules shall be assigned to an individual or group of primary network devices.
- 3. The system shall provide automatic daylight saving time adjustments.
- 4. The system shall provide an acclimatization process that automatically increases the masking volume over a period of time according to a programmed schedule. The system shall allow for independent acclimatization schedules for each timer zone.
- 5. The system shall allow for a minimum of one timer zone per loudspeaker zone.
- 6. The system shall allow independent timer schedules for each day of the week.
- 7. The system shall allow variable rates of volume adjustment.

**E. Masking Sound Level Control**

- 1. Centralized Control Only
  - a. Masking level controls shall be limited to a control panel located in a locked electrical room local to the area being controlled, accessible only by authorized personnel.

**F. Diagnostic Performance**

- 1. The system shall be capable of identifying electronic components that are not functioning.

**G. Reporting Performance**

1. The PC software shall be capable of reading and displaying the current settings for all masking and timer zones.
2. The system shall be capable of generating detailed reports of all system settings for all masking and timer zones.

H. Security Performance

1. Below-ceiling electronic components shall be contained in a locked metal enclosure or cabinet.
2. Access to the control functions shall be password protected.
3. The system shall allow for all settings to be backed up on an electronic storage medium.

I. Acoustical Performance Requirements

1. Prior to commissioning the system, with mechanical system operating at normal daytime levels and with all furnishings in place, 1/3 octave sound measurement samples shall be taken throughout the facility in accordance with Reference G.
  - a. Special attention should be taken to identify any building noise which exceeds the preferred spectrum identified below.
  - b. Provide a report of these measurements to the acoustical engineer in advance of system verification.
2. All zones shall conform to the masking sound levels defined in 1.4.H.5 and the sound spectrum defined in Table 1 below to within +/- **ONE (1) dBA**.
3. Spectrum uniformity in any zone in any 1/3 octave band shall vary no more than +/- **TWO (2) dB**
4. Within a zone, Variations from the spectrum uniformity of more than +/- **TWO (2) dB** in any 1/3 octave band shall be the basis for additional zones to be provided at the vendor's expense.
5. Masking sound level shall be nominally **42 dBA** in meeting rooms, **43 dBA** in private offices and **47 dBA** in open plan areas. The target spectrum shall be determined for each defined volume by adjusting the NRC Canada Optimum Spectrum as shown in **Table 1: Preferred Masking Sound Spectrum**) by subtracting 3dB in each third-octave for meeting rooms, subtracting 2 dB in each third-octave band for private offices and by adding 2dB in each third-octave for open office areas.
6. After adjustment, the system shall provide spatial uniformity of +/- **ONE (1) dBA** for the combined mechanical and sound masking sound level

**Table 1: RC Optimal Sound Masking Spectrum – Nominal 45 dBA Contour**

<b>1/3 Octave Band Center Frequency (Hz)</b>	<b>1/3 Octave Sound Levels (dB)</b>
100	46.9
125	45.9
160	44.7
200	43.9
250	42.7
315	41.4
400	40.4
500	38.9
630	37.4
800	35.4
1,000	33.7
1,250	31.4
1,600	29.4
2,000	27.4
2,500	24.9
3,150	22.4
4,000	19.4
5,000	16.4

### **1.5. CONSTRAINTS**

- A. The mounting location for SM control equipment and central power supplies in the RH Coats building is limited to the electrical room on each floor.
- B. The backboard space available for mounting equipment in the electrical room is limited 12"(w) x 72"(h).
- C. Two (2) 110V duplex circuits will be provided within each electrical room.
- D. One (1) 35mm EMT conduit sleeve will be provided from the electrical room to the plenum space of the floor for the conveyance of cables for the SM system.

### **1.6. OPTIONAL FEATURES**

- A. The masking system may include an optional automatic spectrum and level calibration process. Any additional cost for this feature shall be identified separately.
- B. The masking system may include an option to allow paging through the system's speakers. Any additional cost for this feature shall be identified separately.

### **1.7. SUBMITTALS**

- A. Product Data: Manufacturer's specifications and installation instructions.
- B. Written system summary including:
  - 1. Total number of loudspeakers;
  - 2. Total number of masking zones as per 1.4;
  - 3. Average number of loudspeakers per zone;
  - 4. Maximum number of loudspeakers per zone;
  - 5. Minimum number of loudspeakers per zone; and
  - 6. Additional power and conduit beyond that noted in Section 1.5.
- C. System Design: Schematics of the system showing quantity and location of components and related cabling and accessories.
- D. Warranty Documents: Warranty documents covering the system components.
- E. Include optional hourly rate for regular business hours (08:00 to 17:00) and after hours and weekends.
- F. Specification Compliance Statement: A signed compliance statement from an executive officer of the manufacturer stating that the system as proposed to the customer will meet the design and performance requirements outlined in Section 1.4 herein.

### **1.8. QUALITY ASSURANCE**

- A. System Design – Performed by an approved manufacturer representative.
- B. Installer Qualifications – Approved by manufacturer representative and are trained with the specified products or have demonstrated experience with the installation of similar products to those specified.
- C. System Adjustment – Done by an approved manufacturer representative or trained contractor.

### **1.9. DELIVERY, STORAGE AND HANDLING**

- A. Protect from moisture during shipping, storage and handling.
- B. Deliver in manufacturer's original unopened and undamaged packages with manufacturer's labels legible and intact.
- C. Inspect manufacturer's packages upon receipt.
- D. Handle packages carefully.

### **1.10. WARRANTY AND MAINTENANCE**

- A. Provide a written warranty that the system components installed shall be free from defects in parts or assembly for a 1-year period from date of first use (the date of system initialization).



## **2. PART TWO – PRODUCTS**

### **2.1. ACCEPTABLE MANUFACTURERS**

- A. The vendor shall be the sole supplier of all aspects of manufactured equipment, components, parts, software and expertise for the sound masking system.
- B. Must meet supply, installation, operational and performance specifications included in this specification.

## **3. PART THREE – EXECUTION**

### **3.1. SYSTEM DESIGN**

- A. Design system according to manufacturer's specifications.
- B. Design system to conform to Soundmasking layout plan drawings prepared by The Attain Group Inc. All layouts are conceptual only and do not change the performance requirements outlined in Section 1.4 above.
- C. Provide a shop drawing of the zone design and manufacturer's literature for the masking system components.

### **3.2. EXAMINATION**

- A. Ensure that facility build out is at a stage suitable for the system installation.
- B. Ensure that facility is constructed according to plans including wall locations, ceiling types and plenum barriers.
- C. Ensure that the ceiling plenum height is appropriate as per manufacturer's recommendations and as per plan.
- D. Ensure power requirements have been provided as per plan.
- E. Ensure sufficient space for centrally located components is available per manufacturer's specifications including the constraints as noted in Section 1.5.
- F. Ensure any third-party components required to be interfaced with the system have been provided.

### **3.3. PERMITS**

- A. Obtain necessary permits for installation work.

### **3.4. INSTALLATION**

- A. Follow all applicable codes for the area;
- B. Follow manufacturer's recommendations regarding installation as found in the manufacturer's installation manual;
- C. Follow the system design for location of loudspeakers and wiring;
- D. Record any necessary changes to the system design on the plan;
- E. Ensure that supplementary materials used meet applicable safety standards;
- F. If the masking system requires PC or Mac software, a copy of the software shall be provided.

### **3.5. FIELD QUALITY CONTROL**

- A. All equipment shall be commercial grade only;
- B. All cabling to follow building lines where possible;
- C. All cabling and equipment to be labeled using machine generated labels (Black lettering on white background). Use wrap-type labels for all cables.
- D. All cabling must be supported within the ceiling plenum space using approved mounting methods at ALL times;
- E. Verify all existing site conditions to avoid interferences (e.g. from lighting, HVAC equipment and ducts etc.);
- F. Ensure that ceiling plenum heights meet the minimum recommended by the manufacturer for the loudspeakers

- G. Ensure that loudspeakers are not obstructed as much as possible
- H. Ensure cables are securely terminated
- I. Ensure that loudspeakers are suspended in a level manner using approved anchors. Only new anchors (approved by the site constructor or facilities manager) may be used.
- J. Ensure that distance between the top of the loudspeaker and the deck meets manufacturer's minimum specifications
- K. Ensure cables are properly supported in the ceiling with minimal sag between support points.

### **3.6. SYSTEM CONFIGURATION AND ADJUSTMENT**

- A. Follow manufacturer's recommendations for system settings as found in the system's user manual.

### **3.7. CLEANING**

- A. Ensure that empty packaging is removed and recycle all material where possible.
- B. Ensure that any material waste is removed.
- C. Ensure the product is clean and presentable where required.

### **3.8. DEMONSTRATION AND TRAINING**

- A. Demonstrate, using a sound level meter, operational system to customer by walking the space.
- B. Demonstrate functionality of the system to the customer or customer's representative
- C. Provide any training to customer's representative that may be required under the terms of the contract to maintain and/or operate the system or any optional devices (e.g., in room controls).
- D. Special training may be provided for sound masking systems monitoring software, when operation requires monitoring for speech security requirements.

### **3.9. TESTING AND REPORTING**

- A. The supplier shall provide the departmental representative a report including at a minimal;
  - 1. An as-installed floor plan indicating speaker layout and wiring routing between control unit and speakers. The floor plan should also indicate commissioning measurement locations for each zone.
  - 2. A listing of any identification labeling used on components (speakers, hubs, control devices, wiring) and as referenced in the sound masking software to allow physically locating devices within the plenum/floor plan.
  - 3. An indication of tolerance compliance dBA and spectrum in each zone. Results may be provided in table format and/or plotted graphically.
  - 4. An indication of locations, if applicable, where acoustical performance was not achieved. These should be clearly indicated on a plan, with rationale provided if not previously identified by departmental representative as having an existing issue.
  - 5. The supplier shall include a letter of conformance upon final setup, certifying that the acoustical performance requirements have been achieved in all zones, with any exceptions listed.
  - 6. Sound masking systems used to provide specific levels of speech security to specific closed rooms will require addition accurate details of sound levels, hardware locations and labeling in order to quickly address any alerts received. The speech security protection achieved shall not be considered the suppliers responsibility to determine achieved As previously stated these requirements require special design considerations and in the sound masking system's supply contract and terms of references
- B. The departmental representative reserves the right, at their own expense, to conduct third party testing and verification of acoustical performance. The measurements of acoustical performance shall be made in accordance with appropriate sections of current ASTM E1573, Standard Test Method for Evaluating Masking Sound in Open Office Using A-Weighted and One-Third Octave Band Sound Pressure Levels, with HVAC systems functioning under a "normal" mode of operation, as when would be during normally occupied time periods.

1. If it is determined by departmental representative that acoustical performance has not been achieved, not as a result of existing background sound levels, building conditions or departmental representative negligence, they shall be corrected at the supplier's expense. This may be achieved through software control and/or modification to sound masking system layout, and/or additional /replacement of components, hardware or as may be required and determined by supplier, within compliance of this specification, and applicable codes and/or regulations.

-----End of Section -----