## PART 1 - GENERAL

### 1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for communication raceway systems and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Sustainable Design Submittals:
.1 Construction Waste Management:
.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating % of construction wastes recycled or salvaged.

### 1.2 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect communication raceway systems from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

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

.2 Overhead cable tray distribution system.

### 2.2 MATERIAL

.1 Conduits: type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Underground cable ducts: type, in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit fittings.

.3 Junction boxes, cabinets type E T: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.4 Outlet boxes, conduit boxes, and fittings: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.5 Fish wire: polypropylene type.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for communication raceway systems installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

## 3.2 INSTALLATION

.1 Install empty raceway system, including overhead distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable tray, service poles, miscellaneous and positioning material to constitute complete system.

## 3.3 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management: separate waste materials for reuse and recycling.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

## 3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by pathways for communications systems installation.

END OF SECTION

## PART 1 – GENERAL

### 1.1 SECTION INCLUDES

.1 Sound masking systems.

### 1.2 REFERENCES

.1 UL6500 / ULC 60065 – Standard for Audio/Video and Musical Instrument Apparatus for Household, Commercial and Similar General Use.

.2 UL 2043 – Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; 1996.

.3 ASTM E 1374-11 – Standard Guide for Open Office Acoustics and Applicable ASTM Standards.

.4 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.

.5 ASTM E 1130-08 – Standard Test Method for Objective Measurement of Speech Privacy in Open Offices Using Articulation Index.

.6 FCC – EN 55103-1&2 – Audio, Video and Entertainment Lighting Control.

.7 ANSI s12.2-2008 – Criteria for evaluating noise.

### 1.3 DESIGN AND PERFORMANCE REQUIREMENTS

.1 General Performance
.1 The sound masking system shall provide digital controls for the adjustment of sound masking volume and frequency at the sound generator level.
.2 The system shall include PC Control Software capable of making and displaying all sound masking and sound masking timer settings.
.3 The sound masking system shall include all necessary hardware, software, cabinets, and wiring.

.2 Sound Masking Performance – Above Ceiling System
.1 The system shall use digital signal processing (DSP) technology for masking sound generation and adjustment of masking signals.
.2 The masking sound shall be random and provide no noticeable repetitive pattern.
.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 this specification 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.

.1 Two adjacent standard closed offices shall be a single zone; enclosed executive offices shall be a separate zone(s); enclosed boardrooms and meeting rooms shall be a separate zone(s).

.2 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.

.3 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.

.4 Masking Sound Level Control

.1 Centralized Control Only

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

.5 Diagnostic Performance

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

.6 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.

.7 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.

.8 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 ANSI s12.2.
.1 Special attention shall be taken to identify any building noise which exceeds the preferred spectrum identified below.
.2 Provide a report of these measurements to the acoustical engineer in advance of system verification (see Part 3 - Execution).
.2 All zones shall conform to the masking sound levels defined in 1.3.8.5 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 appropriate remedial measures to be taken by vendor to meet specifications. This may include but is not limited to use of additional, speakers, zones or other solutions, any or all of which are 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 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.

.7 Table 1: Preferred Masking Sound Spectrum

| Band Center Frequency | NRC Canada Optimum Spectrum |
|---|---|
| Overall dBA | 45.0 |
| 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 |

## 1.4 SUBMITTALS

.1 Product Data: Manufacturer's specifications and installation instructions.

.2 System Design: Schematics of the system showing quantity and location of components and related cabling and accessories.

.3 Warranty Documents: Warranty documents covering the system components.

## 1.5 QUALITY ASSURANCE

.1 System Design – Performed by an approved manufacturer representative.

.2 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.

.3 System Adjustment – Done by an approved manufacturer representative or trained contractor.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Protect from moisture during shipping, storage and handling.

.2 Deliver in manufacturer’s original unopened and undamaged packages with manufacturer’s labels legible and intact.

.3 Inspect manufacturer’s packages upon receipt.

.4 Handle packages carefully.

1.7 WARRANTY AND MAINTENANCE

.1 Provide a written warranty that products installed shall be free from defects in parts or assembly or failure to perform to this specification for a 5-year period from date of first use,at no additional cost to the owner.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

.1 The vendor shall be the sole supplier of all aspects of manufactured equipment, components, parts, software and expertise for the sound masking system.

.2 Must meet supply, installation, operational and performance specifications included in this specification.

PART 3 – EXECUTION

3.1 SYSTEM DESIGN

.1 Submit shop drawings of the layout and equipment.

3.2 EXAMINATION

.1 Ensure that facility build out is at a stage suitable for the system installation.

.2 Ensure that facility is constructed according to plans including wall locations, ceiling types and plenum barriers.

.3 Ensure that the ceiling plenum height is appropriate as per manufacturer’s recommendations and as per plan.

.4 Ensure power requirements have been provided as per plan.

.5 Ensure sufficient space for centrally located components is available as per plan and manufacturer’s specifications.

.6 Ensure any third-party components required to be interfaced with the system have been provided.

3.3 PERMITS

.1 Obtain necessary permits for installation work.

3.4 INSTALLATION

.1 Follow all applicable codes.

.2 Follow manufacturer’s recommendations regarding installation as found in the manufacturer’s installation manual.

.3 Follow the system design for location of and wiring.

.4 Record any necessary changes to the system design on the plan.

.5 Ensure that supplementary materials used meet applicable safety standards.

.6 Provide a copy of the PC software to the building owner, as applicable.

3.5 FIELD QUALITY CONTROL

.1 Ensure that ceiling plenum heights meet the minimum recommended by the manufacturer for the loudspeakers. Relocate speakers on site to suit.

.2 Ensure that loudspeakers are not obstructed.

.3 Ensure cables are securely terminated.

.4 Ensure that loudspeakers are suspended in a level manner.

.5 Ensure that distance between the top of the loudspeaker and the deck meets manufacturer’s minimum specifications.

.6 Ensure cables are properly supported in the ceiling with minimal sag between support points.

3.6 SYSTEM CONFIGURATION AND ADJUSTMENT

.1 Follow manufacturer’s recommendations for system settings as found in the system’s user manual.

3.7 CLEANING

.1 Ensure that empty packaging is removed.

.2 Ensure that any material waste is removed.

.3 Ensure the product is clean and presentable where required.

## 3.8 DEMONSTRATION AND TRAINING

.1 Demonstrate, using a sound level meter, operational system to Departmental Representative by walking the space.

.2 Demonstrate functionality of the system to the Departmental Representative.

.3 Train Departmental Representative to maintain system as required.

## 3.9 TESTING AND REPORTING

.1 Test areas in compliance with ASTM E1573 procedures to confirm requirements in 1.3 have been met.

.2 Provide a report detailing system settings and measurement results.

## 3.10 TESTING AND REPORTING – COMPLIANCE TESTING

.1 Prior to occupancy and with all furnishings in place, verify that the masking system performs to the standards set in this specification. Measurements shall be made in accordance with ASTM E1573.

.2 Separate readings will be required for every zone at a minimum.

.1 With masking off and mechanical system on, verify sound levels in all areas previously identified by vendor in 1.3.8 Acoustical Performance Requirements that exceed target volume and spectrum levels.

.1 Excessive mechanical noise, which exceeds the target limits identified shall be noted and included in the submission to the client.

.2 This does not relieve the responsibility of the vendor to ensure that the target levels are met outside of the immediate area affected by the mechanical noise.

.3 Verify specified sound volume and spectrum of masking system with mechanical system on and compare to specification.

.4 Volume or 1/3 octave spectrum levels which cannot be fine-tuned by the vendor to meet the specified requirements, shall be the basis for additional speakers and/or zones to be provided along with re-verification by the engineer at the vendor’s expense.

.5 Provide a printed report detailing system settings and performance compared to this specification.

END OF SECTION