

PART 1 - GENERAL

- 1.1 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 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.

1.2 REFERENCE

- .1 Interim Operating Standard on Premises Telecommunications Infrastructure Installation in Leased, Owned and Occupied Spaces under Shared Services Canada Mandate V2k.
- .2 CSA-T568.B1, CSA-T568.B2 and CSA-T568.B3 Commercial Building Telecommunications Cabling Standard;
- .3 EIA TSB75, EIA TSB67 and EIA TSB95;
- .4 BICSI Telecommunication Distribution Method Manual; and
- .5 Canadian Electrical Code 2015
- .6 NEMA Cable Tray Installation Standards Publication VE 2-2013
- .7 ANSI/TIA-569-C Telecommunications Pathways and Spaces.

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.
 - .2 Overhead cable tray distribution system.

2.2 MATERIAL

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

- .2 Cable trays - other than in telecommunications rooms:
 - .1 Wire basket type to CAN/CSA C22.2 No. 126.
 - .2 Trays: 300mm wide with depth of 100mm unless otherwise noted on plans.
 - .3 175 kg per meter loading capacity.
 - .4 Fittings and accessories: manufactured type (not field fabricated), sweeping radius turns.
 - .5 Barriers where different voltage systems are in the same tray.

- .3 Cable trays - in telecommunications rooms:
 - .1 Ladder type to CAN/CSA C22.2 No. 126.
 - .2 Trays: 300mm wide with depth of 100mm unless otherwise noted on plans.
 - .3 220 kg per meter loading capacity.
 - .4 Fittings and accessories: manufactured type (not field fabricated), sweeping radius turns.
 - .5 Barriers where different voltage systems are in the same tray.
 - .6 Prefabricated 16 gauge tubular steel
 - .7 230mm rung spacing.
 - .8 Black power coat finish.

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

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

- .6 Indoor service poles: in accordance with Section 26 27 23 - Indoor Service Poles.

- .7 Fish wire: polypropylene type.

PART 3 - EXECUTION

3.1 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.

- .2 No section of conduit shall exceed 30 metres or contain more than two 90 degree bends between pull points or pull boxes.

- .3 A pull box shall be placed in conduit runs when the length is over 30 metres, if there are more than two 90 degree bends or if there is a reverse bend in the run.
- .4 The inside radius of a bend in a conduit shall be at least six times the internal diameter when the conduit is less than 50mm in diameter and ten times the internal diameter when the conduit is 50mm and larger in diameter.
- .5 All conduits shall be reamed and bushed.
- .6 All metallic parts shall be bonded together mechanically and connected to the approved building ground in compliance with the Canadian Electrical Code.
- .7 All conduits shall originate from the telecommunications closet, telecom backboard, cable tray, and pull or splice boxes.
- .8 Conduit shall be rigidly fastened and adequately supported to withstand pulling tensions.
- .9 Pull boxes shall be constructed of code gauge steel and shall have a rust resistant finish.
- .10 In all instances pull boxes shall be placed in straight sections of a conduit run and shall NOT be used in lieu of a bend. Corresponding ends of the conduit are to be aligned with each other.
- .11 LB, LL, LR and other conduit type fittings are NOT to be used in lieu of pull boxes and bends.
- .12 Outlet boxes shall be 100mm wide X 100mm high X 65mm deep.
- .13 Install a cover plate (plaster ring) with a double opening on the outlet box, the cover plate shall be flush with the finished wall. Surface mounted outlet boxes shall be equipped with a flat cover plate with a double opening.
- .14 Pull boxes shall be installed in easily accessible locations.
- .15 Pull box locations shall be identified on the as-built drawing.
- .16 Place an indicator decal on ceiling T-Rail or on ceiling tile showing the location of pull boxes.

- .17 All conduit runs are to be labeled clearly at the communications closet indicating the room they terminate in. The backbone system shall be labeled at both ends identifying the closet where it terminates. Pull boxes shall be labeled on the exposed exterior.
- .18 Obtain Departmental Representative's site review of conduits and pathways at completion of rough-in prior to concealing within partitions or above suspended ceilings.
- .19 Bond tray at communications room and provide bonding jumper connection at each tray section using #6 AWG bare copper wire.
- .20 Provide cable tray supports on both sides of all connections and fittings, within 610mm of connection and fitting.
- .21 Remove all sharp edges and projections from inside of cable tray.
- .22 Paint field cuts and connections to prevent galvanic action.
- .23 Maintain minimum 300mm clearance above cable tray.
- .24 Install cable tray as per manufacturer's recommendations.

3.2 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 - GENERAL1.1 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 1374-06(2011) - 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 six (6) 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 Departmental Representative 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 contractor 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 contractor'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.

PART 2 - PRODUCTS

2.1 ACCEPTABLE
MANUFACTURERS

- .1 The contractor 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 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 loudspeakers 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 Departmental Representative as applicable.

3.4 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.

3.5 SYSTEM CONFIGURATION AND ADJUSTMENT

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

3.6 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.

3.7 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.

3.8 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.

3.9 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 contractor 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 contractor 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 contractor to meet the specified requirements, shall be the basis for additional speakers and/or zones to be provided along with re-verification at the contractor's expense.
- .5 Provide a printed report detailing system settings and performance compared to this specification.

END OF SECTION