

## **1 General**

### **1.1 RELATED SECTIONS**

- .1 Section 26 05 00 - Common Work Results - Electrical.
- .2 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

### **1.2 SYSTEM DESCRIPTION**

- .1 Telecommunications pathway system consists of outlet boxes, conduits, pull boxes, fish wires and J-hooks.

### **1.3 SUBMITTALS**

- .1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

## **2 Products**

### **2.1 MATERIAL**

- .1 Conduits: type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Outlet boxes: 100 mm sq. with single device cover and fittings: in accordance with Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.
- .3 J-hook support clips: Caddy "CableCat Clip" or approved equal.
- .4 Velcro cable ties: Panduit #HLS-15RO or approved equal.

## **3 Execution**

### **3.1 INSTALLATION**

- .1 Install raceway system, including outlet boxes, conduit, miscellaneous and positioning material to constitute complete system.
- .2 Ensure all data/ telephone system conduits are properly grounded. Where required, install ground bushings and a #14 AWG bare bonding conductor to closest grounded raceway or junction box.
- .3 Dress cabling using Velcro cable ties. The use of nylon or plastic ties is not permitted.

END OF SECTION

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## **1 General**

### **1.1 RELATED SECTIONS**

- .1 Not applicable.

### **1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 ANSI S1.4-1983(R2004), American National Standard Specification for Sound Level Meters.
  - .2 ANSI S1.11-1986(R2004)/ASA 65, American National Standard Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters.
  - .3 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
- .2 American Society for Testing and Materials (ASTM):
  - .1 ASTM E1041- 85 Standard Guide for Measurement of Masking Sound in Open Offices.
  - .2 ASTM E1573-09 Standard Test Method for Evaluating Masking Sound in Open Offices, Using A-Weighted and One-Third Octave Band Sound Pressure Levels.
  - .3 ASTM E1130-08 Standard Test Method for Objective Measurement of Speech Privacy in Open Plan Spaces Using Articulation Method.
  - .4 ASTM E 1374-02 Standard Guide for Open Office Acoustics and Applicable ASTM Standards.
- .3 International Electro-technical Vocabulary (IEC):
  - .1 IEC 651, Live Working.

### **1.3 DEFINITIONS**

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEZEE SP1122.

### **1.4 DESCRIPTION OF A DIGITAL CENTRALIZED MASKING/PA SYSTEM**

- .1 An electronic, frequency contoured sound masking system which includes the following:
  - .1 Strategically located speaker assemblies installed suspended from concrete ceilings in areas indicated.
  - .2 Speaker assemblies generating unique, diffuse and unobtrusive sound with spatial and temporal uniformity, and having a spectrum shape designed to mask speech and low level unwanted noise.
  - .3 System Components Must Include: The Vibra-Sonic, Digital Sound Masking System is based on the DSP2210 Digital Signal Processor. It is a self-contained multi-zone digital DSP-GUI controlled processor with Digital Class D Amplifiers, Third Octave 31 Band Equalizers, Power, Public Address Paging and Music Inputs, all onboard.
  - .4 Processor must be housed in a 19"w x 3.5"h (48.3 cm x 8.9 cm) - (2 Rack Units high) rack or wall mount chassis that is black powder coat CRS cold roll steel.
  - .5 Must include adjustable brackets for 19" (48.3 cm) rack or wall mounting.
  - .6 The system shall be (2) independent programmable channels.
  - .7 Each channel must have independent equalization allowing separate sound masking spectrums for each zone.

### **1.5 PERFORMANCE REQUIREMENTS**

- .1 Provide sound masking in accordance with the system description to all areas indicated on drawings and/or schedule. Sound level performance shall comply with the following one-third octave sound pressure levels and tolerances:

1/3 Octave ISO Centre Frequency (Hz)	1/3 Octave Band Sound Pressure Levels (dB)	Tolerances (± dB)
125	44	± 3
160	43	± 3
200	42	+2-3
250	41	+1-2
315	40	± 1
400	39	± 1
500	37.5	± 1
630	36	± 1
800	34.5	± 1
1,000	33	± 1
1,250	31.5	± 1
1,600	30	± 1
2,000	28	± 1
2,500	26	± 1
3,150	24	± 1
4,000	22	± 1
5,000	20	± 1
6,300	17	+1-2
8,000	14	+1-2

Note: The above values are graphically illustrated on detail drawing 27 51 20.01.

- .2 Spatial Average Overall Sound Pressure Levels: Minimum 43 decibels and maximum 45 decibels, A-weighted (dBA).

## 1.6 SUBMITTALS

- .1 Provide requested items in accordance with Section 01 33 00 –Submittals.
- .2 Submit shop drawings indicating proposed quantity and location of all system components and related wiring and accessories.
- .3 Obtain Departmental Representative approval for any changes in quantity or location of sound masking units from Departmental Representative's reviewed shop drawings.
- .4 After completing installation, testing, adjusting and balancing, submit the following:
  - .1 Project record drawings in the form of the above noted shop drawings, revised as necessary to accurately indicate locations of all system components, as installed.
  - .2 Copy of all final sound pressure levels readings taken, including accurate description of reading locations and test methods and equipment used.

## 1.7 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 – Quality Control.

## 1.8 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of contract.

## 1.9 SYSTEM STARTUP

- .1 Installer shall make measurements to verify that the installed sound masking system meets specified acoustical performance requirements with Departmental Representative.
- .2 Verification will be performed with mechanical systems in full operation in area being tested.

## **1.10 OPERATING INSTRUCTIONS**

- .1 Testing, tuning, and balancing will be performed after normal working hours of facility users, or as otherwise required by Departmental Representative.
- .2 Schedule testing, adjusting, and balancing will be performed after mechanical and electrical work, and sound masking system installation are complete.

## **2 Products**

### **2.1 SPEAKER**

- .1 Cone: 200mm (8"), single, Low Q".
- .2 Frequency Response: 125-8000 Hz +/- 4dB on axis.
- .3 Sensitivity: 94 dB EIA minimum.
- .4 Power Handling: 5 watts EIA minimum.
- .5 Resonant Frequency: 99 Hz maximum.
- .6 Mounting: four screws (studs) to grill cover.

### **2.2 TRANSFORMERS**

- .1 Type: 70.7volt
- .2 Minimum Primary Power Taps: COM, 0.25, 0.5, 1, 2, 4 watts set with exterior switch.
- .3 Mounting: directly to speaker frame.

### **2.3 SPEAKER ENCLOSURES**

- .1 Size: 330mm round 100mm (3.9") deep.
- .2 Construction: 0.6mm (1/42") minimum thickness sheet steel.
- .3 Undercoating: factory applied to eliminate resonance.
- .4 Mounting: Bracket

### **2.4 MICRO PROCESSOR CONTROL**

- .1 The DSP2210 digital processor/amp shall be capable of automatic mixing, set-up and administration of all 2 inputs per zone via GUI from a desktop PC or laptop.
- .2 The DSP is integrated within the self contained unit.
- .3 The system shall be monitored and adjusted with a computer from a centralized control area.
- .4 Processing capacity: 264 MIPS, 528 MFLOPS sustained operation.
- .5 Memory storage is non-volatile RAM (Random Access Memory) for all programs and set up parameters which are stored and recoverable during power outages for up to ten (10) years.
- .6 DSP must be capable of control of volume and equalization of zonal PA and music, if required initially on project or at some future date.

### **2.5 POWER SUPPLY**

- .1 Input voltage: 85 to 264VAC
- .2 Output current: 0 to 1.56A continuous
- .3 Power factor: >.90 at full load
- .4 Overload protection: Shall incorporate current limit to protect from damage.
- .5 Power mains: IEC 3-pin with ground.
- .6 Packaging: Integrated within 1RU metal chassis.

### **2.6 NOISE GENERATION**

- .1 2 channel independent, uncorrelated full random non - repeating noise generation with constant energy per octave bandwidth.
- .2 Minimum spectrum accuracy: 1 dB from 40-10,000 Hz

- .3 Repetition Rate: repeats every 271 hours.
- .4 Mounting: Integrated within Digital Signal Processing

## **2.7 SYSTEM INPUTS**

- .1 PA: 3-pin phoenix connector at over  
2K Ohm Microphone pre-gain: 30-60dB  
Frequency: 80Hz – 18kHz
- .2 Background Music: RCA terminations at over 10K Ohm  
Frequency: 50Hz – 20 kHz
- .3 Audio – 2 Channels

## **2.8 EQUALIZER FILTERS**

- .1 Requirement on each output channel with control over 31 - 1/3 octave bands on each channel.
- .2 Integrated within Digital Signal Processing unit.
- .3 Equalization: 1/3 octave using ISO standard frequencies from 63-12,500 Hz minimum.
- .4 Output: 600 ohms balanced and adjustable.
- .5 Filters: adjustable minimum 20 dB adjustment per band.
- .6 Level Tolerance: +/- 1 dB from 200-4000 Hz.
- .7 Total Harmonic Distortion: less than 0.5% at full rated output.
- .8 Equivalent Input Noise: less than -85 dBA from 20-20,000 Hz unweighted.
- .9 Output: transformer isolated.
- .10 Front panel security cover.
- .11 Mounting: Integrated in self contained unit to be mounted in 1 RU chassis.

## **2.9 AMPLIFIERS**

- .1 2 Channel, CLASS D solid state, EIA rated
- .2 Audio power handling: continuous for speaker load plus minimum 3 dB margin (single or multi-channel).
- .3 Frequency response +/- 0.3 dB 20Hz – 20kHz at 100 Ohm.
- .4 Total Harmonic Distortion: less than 1% at 1kHz at rated output.
- .5 Transformer Output: 70.7volt line and audio line level.
- .6 Automatic and manual gain control adjustable to 34 dB.
- .7 Output Regulation within 2dB, from no load to full load.
- .8 Power Supply: self-contained and CSA approved.
- .9 Mounting: Integrated in self contained unit to be mounted in 1RU chassis.
- .10 Input impedance: 50K Ohm.
- .11 Output impedance: 0.08 Ohm.
- .12 Carrier Frequency: 400kHz.
- .13 Constant voltage at 25W
- .14 +/- 15VDC and 100kHz square sine wave.
- .15 Peak current: 1.2 Amps.

## **2.10 MATERIALS**

- .1 All electronic components shall be ROHS and UL recognized.
- .2 All plastics shall meet UL94VO flammability rating.
- .3 Cold roll steel - 18 AWG - .047" nominal.
- .4 White powder coat paint.
- .5 Corrosion resistant.
- .6 White silk screen on rear.
- .7 Molex front cover.

## **2.11 SCHEDULER: PROGRAMMABLE TIMER**

- .1 Adjusts masking volume levels according to a calendar-based, programmed schedule with automatic adjustment of Daylight Savings Time.
- .2 Assigns schedules to each specified zone.
- .3 Offers a programmed acclimatization process with independent schedules for each timer zone.
- .4 Allows for independent timer schedules for each day of the week.

## **2.12 ACCEPTABLE MATERIALS**

- .1 Subject to compliance with requirements, products that may be incorporated into the Work include:
  - .1 SoundMaskIt Digital Centralized Sound Masking Systems as designed by Vibra-Sonic Control and Materials Handling Inc.  
Vancouver - (604) 294-9495 fax - (604) 294-8033  
Calgary - (403) 217-3555 fax - (403) 237-5064

# **3 Execution**

## **3.1 INSTALLATION**

- .1 Install system components suspended from ceiling in accordance with manufacturer's instructions and in a manner that will permit specified acoustical performance requirements will be met.
- .2 Suspend sound masking units with mounting brackets/chain securely anchored to underside of structure. Ensure that there is no strain on any electrical wiring. Avoid mounting that could result in generation of vibration noise or distortion.
- .3 Mount closed enclosure to radiate sound upward (unless otherwise specified).
- .4 Install centralized Digital Signal Processors securely on to the wall using supplied mounting hardware. Locate equipment cabinet at location directed by the consultant.
- .5 Ground audio system to building power supply ground.

## **3.2 NAMEPLATES AND LABELS**

- .1 Ensure manufacturer's nameplates, CSA labels and identifications nameplates are visible and legible after equipment is installed.

## **3.3 INSTALLATION, CABLE**

- .1 Avoid damage to cables. Provide adequate cable strain relief.
- .2 Run cables parallel and perpendicular to building lines. Attach wiring to top of structural elements in a non-obstructive fashion. Secure every 2 meters and at changes in direction.
- .3 Connect each speaker wire pair to one terminal pair on screw terminal blocks at centralized cabinet equipment.

## **3.4 LOCATION OF OUTLETS**

- .1 Indicated within Installation Information.

## **3.5 MOUNTING HEIGHTS**

- .1 Indicated within Installation Information.

## **3.6 TESTING, ADJUSTING AND BALANCING**

- .1 Calibrate the microphone and related test equipment prior to testing.
  - .2 Test, adjust, and balance system with mechanical system and other noise generating equipment shut down in areas receiving sound masking.
  - .3 Test, adjust, and balance system until sound spectrum and levels meet specified
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performance requirements. Adjust settings of installed units, relocate installed units, or add additional units, if and as required.

- .4 Upon completion of tests, perform walk-through verification of areas that will be covered by sound masking. Adjust and re-test areas having abnormal characteristics or levels.

### **3.7 TESTS AND TEST METHODS**

- .1 Test to determine each zone's octave band sound pressure levels. Take a series of readings for unit coverage area.
- .2 Test to determine spatial average overall sound pressure levels. Take minimum of one reading for each enclosed room covered by sound masking and minimum of one reading per 20 m<sup>2</sup> (215 ft<sup>2</sup>) of floor area in all open spaces covered by sound masking.
- .3 Position of Measuring Microphone: 1220 mm (48") above floor and minimum 1000 mm (40") away from any sound reflecting surface, in locations representative of each area that are sound masked.

### **3.8 MEASURE SOUND PRESSURE LEVELS USING ONE OF FOLLOWING METHODS**

- .1 An Equivalent Continuous Sound Level (LEQ) mode for minimum interval of 15 seconds.
- .2 IEC 651 'slow' time constant, average reading of the highest and lowest level during 15 second intervals.

### **3.9 TEST EQUIPMENT**

- .1 Sound Level Meter: to ANSI S1.4-1983, Type 1 or better.
- .2 Octave Band Filter: to ANSI S1.11, Class II or better.
- .3 Accuracy of Acoustic Calibrator: within  $\pm 0.3$  dB at 25°C.

END OF SECTION