

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

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 m² (215 ft²) 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 ± 0.3 dB at 25°C.

END OF SECTION
