
PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and performance criteria for sound attenuation for mechanical systems.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

1.3 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM C 423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - .3 ASTM E 90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - .4 ASTM E 477, Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Building Code (NBC).
- .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

1.4 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Provide separate shop drawings for each piece of attenuation equipment, system shop drawings complete with product data.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.

1.5 PERFORMANCE REQUIREMENTS

- .1 Rating Data:
 - .1 Provide performance rating data, certified by professional engineer or accredited test laboratory and supported by calculations and verified by test results in accordance with referenced standards as follows:
 - .1 Silencer: insertion loss, pressure drop at design conditions, generated noise level.
 - .2 Acoustic plenums: transmission loss and acoustical absorption.
 - .3 Acoustical performance measurements in accordance with ASTM E 477, ASTM E 90 and ASTM C 423, except where specified otherwise.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 ABSORPTION AND INSULATING MEDIA

- .1 Acoustic quality, glass fibre, free of shot and odour; bacteria and fungus resistant; free of corrosion causing or accelerating agents; packed to density to meet performance requirements; and meet NBC fire requirements or requirements of authority having jurisdiction for duct lining.

2.2 SILENCERS

- .1 Factory manufactured of prime coated or galvanized steel, compatible with ductwork specified elsewhere and to ASHRAE and SMACNA standards.
- .2 Outer casing and galvanized steel inner casing with clean cut circular perforations to enclose acoustic media. Inner casing to have half-splitters running full length of silencer where any cross sectional dimension exceeds 450 mm. Protect media from erosion with tedlar or mylar between media and perforated metal.
- .3 Performance: see silencer schedule.

2.3 ACOUSTIC PLENUMS

- .1 Panels: tongue and groove connection type, designed for individual panel removal for equipment access without major dismantling of plenum.
 - .1 Outer sheet: 1.3 mm thick galvanized steel to ASTM A653/A653M, with coating designation G90 (Exposed to outside air).
 - .2 Inner sheet: 0.85 mm thick galvanized steel to ASTM A653/A653M, with coating designation G90 with 2 mm diameter clean cut perforations on 5 mm staggered centres.
 - .3 Fully framed with 1.3 mm thick galvanized steel channels.
 - .4 Horizontal stiffeners: 0.85 mm minimum galvanized steel on 800 mm centres to control media settlement.
 - .5 Access panels: sized for equipment removal; two handles per panel; screw at 100 mm maximum centres; perimeter neoprene sponge gasket; materials same as standard panel.
 - .6 Deflection: not to exceed 1/240 of unsupported panel span at design pressure differential of 500 Pa.
 - .7 Connections: acoustically sealed.
- .2 Doors: access doors with minimum 510 x 1375 mm opening.
 - .1 Construction same as standard panel except interiors to be solid.
 - .2 Two butt-type nylon bushed hinges, two cam-type latches with inside and outside handles.
 - .3 Neoprene gasket seal.
 - .4 Zinc plated hardware.
 - .5 Open against air pressure.
- .3 Windows: inspection windows, 305 x 305 mm, double glazed with 6 mm wire reinforced glass mounted in neoprene "U" channels.
- .4 Assembly: base sections and flashings 1.3 mm minimum galvanized steel.
 - .1 Panel and flashing joints externally sealed with 5 mm diameter bead of non sag, non-hardening sealant. Floor channel to floor connection sealed with 3 x 13 mm monolastomeric tape.

- .2 Factory cut and frame openings where greatest dimension exceeds 300 mm. Smaller panel openings, to be site located and cut 50 mm larger in diameter, sleeved with 0.75 mm minimum galvanized steel.
- .3 Fill space between pipe or conduit and sleeve with acoustic media, covered and mastic sealed in accordance with manufacturer's instructions.
- .4 No sensory leakage at design pressure differential of 500 Pa.
- .5 Assembly RSI not less than 1.2 (m².°C)/W at 10°C.
- .6 Certified acoustical performance:
 - .1 Transmission loss to ASTM E90.
 - .2 Acoustical absorption to ASTM C423.

Octave bands, (Hz)	125	250	500	1000	2000	4000
Transmission loss, dB	21	28	39	50	53	56
Absorption coefficient	0.7	0.9	.99	.99	0.9	0.9

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Noise flanking: where indicated, install in wall sleeve with uniform clearance around to ensure no contact of silencer with wall sleeve. Pack with flexible, non hardening caulking on both sides of sleeves.
- .2 Instrument test ports: install at inlet and outlet to permit measurement of insertion loss and pressure loss.
- .3 Suspension: to manufacturer's instructions.

3.3 FIELD QUALITY CONTROL

- .1 Testing:
 - .1 Experienced and competent sound and vibration testing professional engineer to take sound measurement after start up and testing, adjusting and balancing of systems to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .2 Sound measurements to extend over frequency range of 125 to 4000 Hz and taken:
 - .1 Upstream and downstream of each silencer and plenum
 - .2 In areas adjacent to mechanical equipment rooms, duct and pipe shafts.
 - .3 At 1800 mm above floor adjacent to first air terminal.
 - .4 At following critical locations: air handling units, chillers, pumps, fans, air compressors, refrigeration compressors.

- .3 Provide Department Representative with notice 24 h in advance of commencement of tests.
- .4 Establish adequacy of equipment isolation, acceptability of noise levels in occupied areas, other conditions affecting acoustics and, where appropriate, recommendation for remedial measures and costs.
- .5 Submit complete report of test results including sound curves. Include in Commissioning Manual.
- .2 Manufacturer's Field Services:
 - .1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.
 - .2 Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:
 - .1 After delivery and storage of products.
 - .2 After preparatory work is complete but before installation commences.
 - .3 Twice during the installation, at 25 % and 60 % completion stages.
 - .4 Upon completion of installation.
 - .3 Submit manufacturer's reports to Department Representative within 3 days of manufacturer representative's review.

3.4 ADJUSTING

- .1 Make adjustments and corrections in accordance with written report.
- .2 Provide Department Representative with notice 24 h in advance of visit.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION