



Guideline Silencer Specification

A. GENERAL

1. Silencers shall be of the size, configuration, capacity and acoustic performance as scheduled and shown on the contract drawings. In the event of a conflict between the silencer schedule and specification, the schedule shall take precedence. All silencers shall be factory fabricated and supplied by the same manufacturer.
2. Silencer inlet and outlet connection dimensions must be equal to the duct sizes shown on the drawings. Duct transitions at silencers are not permitted unless shown on the contract drawings.
3. Basis of design manufacturer: VAW Systems
4. Other approved manufacturers: Industrial Acoustics Company, McGill Airflow and Semco, based on a submittal that demonstrates compliance with the contact documents and certified data sheets for the submitted silencers that substantiate submitted performance. Substitute manufacturers are not permitted.
5. If products other than those of the basis of design manufacturer are supplied on the project, the Contractor assumes full responsibility for meeting the construction schedule and noise criteria. If the project noise criteria is not met, the Contractor must provide remedial measures to the satisfaction of the Owner.

B. MATERIALS

1. Unless otherwise noted, materials shall be the same type and grade as the duct system in which the silencers are installed.
2. **Rectangular Silencers:** All rectangular silencers shall be constructed with a 22 gauge steel outer casing and 22 gauge perforated steel.
3. **Circular Silencers:** All circular dissipative and reactive silencers with circular casings shall be constructed with a steel casing gauge as noted below and 22 gauge perforated steel.

Casing Diameter	Casing Gauge
≤ 36"	22
37" to 54"	18
55" to 72"	16
> 72"	14

All circular dissipative and reactive silencers with rectangular casings shall be constructed with a steel casing gauge as noted below and 26 gauge minimum perforated steel.

Casing Dimension	Casing Gauge
≤ 30"	22
31" to 54"	18
> 55"	16

4. **Elbow Silencers:** All elbow silencers shall be constructed with an 18 gauge steel outer casing and 22 gauge perforated steel. All acoustical splitters shall be internally radiused and aerodynamically designed for efficient turning of the air. Half and full splitters are required as necessary to achieve the scheduled insertion loss. All elbow silencers with a turning cross-section dimension greater than 50" shall have at least two half splitters and one full splitter.
5. **Transitional Silencers:** All transitional rectangular silencers shall be constructed with a 22 gauge steel outer casing and 22 gauge perforated steel. Transitioning shall occur internal to the silencer such that the height of the gap or air passage is uniformly changing with the length of the splitters.

6. **Crosstalk Silencers:** All rectangular silencers shall be constructed with a 22 gauge galvanized steel outer casing and 22 gauge galvanized perforated steel.

7. **Acoustic Media / Absorbing Mechanism:**

a. **Natural Media Silencers and Film Lined Natural Media Silencers:**

Media shall be 100% natural cotton fibers treated with an EPA registered, non-toxic borate solution, "flash dried" to actively inhibit the growth of mold, mildew, bacteria and fungi. Media shall not contain any formaldehydes, phenolic resins or Volatile Organic Compounds (VOC's) that can off-gas and/or cause health concerns. Media shall be 100% recyclable. Media shall comply with UL181 and NFPA 90A. Media shall be packed with a minimum of 15% compression during silencer assembly. Media shall not cause or accelerate corrosion of aluminum or steel. Fiberglass, mineral wool and rockwool will not be permitted as a filler or substitute for natural fiber media.

b. **Dissipative and Film Lined silencers:**

Media shall be formaldehyde-free, acoustic quality fiberglass insulation with long, resilient fibers bonded with a thermosetting resin. Fiber glass density and compression shall be as required to insure conformance with laboratory test data. Fiberglass shall be packed with a minimum of 15% compression during silencer assembly. Media shall be resilient such that it will not crumble or break, and conform to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel. Mineral wool or rockwool will not be permitted as a substitute for fiberglass.

c. **Reactive Silencers:**

All reactive silencers shall not contain dissipative media of any kind. Attenuation shall be achieved with controlled impedance membranes and broadly tuned resonators. Membrane and resonator geometry shall be as required to obtain the scheduled insertion loss.

8. **Media Protection:**

a. **Dissipative Silencers:**

Where indicated on the silencer schedule, media shall be encapsulated in fiberglass cloth to help prevent shedding, erosion and impregnation of the fiberglass. All axial cone silencers shall have a fiberglass cloth liner.

b. **Film Lined Silencers:**

The acoustic media shall be completely wrapped with a polymer film to help prevent shedding, erosion and impregnation of the fiberglass. Where required to obtain the required performance, the wrapped acoustic media shall be separated from the perforated metal by a factory installed 1/2" thick acoustically transparent spacer. The spacer shall be flame retardant and erosion resistant. A mesh, screen or corrugated perforated liner will not be acceptable as a substitute for the specified spacer.

9. **Combustion Ratings:** Silencer materials, including acoustic media, polymer film and acoustical spacer, where required, shall have maximum combustion ratings as noted below when tested in accordance with ASTM E84, NFPA 255 or UL 723.

Silencer Type	Natural Media	Dissipative	Film Lined
Flame Spread Index	5	0	20
Smoke Developed Index	35	5	45

10. **HTL Casings:** Where indicated on the silencer schedule, silencers shall have high transmission loss (HTL) casings externally applied and completely sealed to the silencer casing by the silencer manufacturer to assure quality controlled transmission loss. The HTL walls shall consist of media, airspace, mass and outer protective metal skin, as required, to obtain the specified room noise criteria. Standard acoustical panels will not be accepted as HTL walls. If requested by the Engineer, breakout noise calculations for each air handling and fan system shall be provided with the silencer submittal to insure compliance with the room noise criteria. Breakout noise calculations shall be based on the sound power levels of the purchased equipment.

11. **Access Doors:** Where indicated on the silencer schedule, silencers shall be supplied with an access door(s) to permit fire damper service. Access doors shall be supplied as an integral part of the silencer by the silencer manufacturer. Where HTL walls are also supplied, the access doors shall not reduce the effectiveness of the HTL walls.

C. CONSTRUCTION

1. Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Material gauges noted in "Section B Materials", are minimums. Material gauges shall be increased as required for the system pressure and velocity classification. The silencers shall not fail structurally when subjected to a minimum differential air pressure of 8 inches water gauge.
2. All casing seams and joints shall be lockformed and sealed, stitch welded and sealed or continuously welded for leakage resistant construction. The construction method shall be as specified for the duct system in which the silencers are installed. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.
3. All perforated steel shall be adequately stiffened to insure flatness and form. All spot welds shall be painted.
4. Silencers shall be fabricated under the Quality System Standard ISO 9001 quality management system.

D. PERFORMANCE

1. Acoustic performance shall include dynamic insertion loss and generated noise for forward flow (air and noise in same direction) or reverse flow (air and noise in opposite direction) in accordance with the project's air distribution system requirements. Dynamic insertion loss shall be within -2 dB of the values listed in the silencer schedule. Silencer generated noise shall be within +3 dB of the values listed in the silencer schedule.
2. All silencer ratings shall be determined in a test facility which provides for airflow in both directions through the test silencer in accordance with the ASTM E-477-13 or the ISO 7235 test standard. The test set-up, procedure and facility shall eliminate all effects due to flanking, directivity, end reflection, standing waves and reverberation room absorption.
3. Silencer pressure drops shall not exceed those listed in the silencer schedule by more than 0.03" w.g. Silencer pressure drop measurements shall be made in accordance with the ASTM E-477-13 or the ISO 7235 test standard. Tests shall be conducted and reported on the identical units for which acoustical data is presented.

E. SUBMITTALS

1. The manufacturer shall supply certified test data for each scheduled silencer. The data shall include dynamic insertion loss, generated noise and pressure drop for forward or reverse flow, matching the project's air distribution system requirement. All ratings shall be conducted in the same facility and shall utilize the same silencer.
2. Test facilities and test reports shall be open to inspection upon request from the Engineer. Silencer performance must have been substantiated by laboratory testing according to the ASTM E-477-13 or the ISO 7235 standard, and so certified when submitted for approval. The aero-acoustic laboratory must be NVLAP accredited for the ASTM E-477-13 or the ISO 7235 test standard. A copy of the accreditation certificate must be included with the submittals. Data from non-NVLAP accredited test facilities will not be accepted.
3. The manufacturer shall supply a current copy of the Certificate of Registration for Quality System Standard ISO 9001 quality management system. Products from non-register manufacturers will not be accepted.