SECTION 15825
DUCT SOUND ATTENUATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

B. Related Sections include the following:
   1. Section 15050 “Basic Mechanical Materials and Methods”.
   2. Section 15074 “Vibration and Seismic Controls for HVAC Piping and Equipment”.
   3. Section 15725 “Modular Indoor Air Handling Units”.
   4. Section 15734 “Computer Room Air Conditioning Units”.
   5. Section 15736 “Rooftop Replacement Air Units”.
   6. Section 15750 “Rooftop Evaporative Cooling Units”.
   7. Section 15815 “Metal Ducts”.
   8. Section 15820 “Duct Accessories”.
   9. Section 15890 “Air Duct Cleaning”.
   10. Section 15950 “Testing, Adjusting and Balancing”.
   11. Section 15995 “Commissioning of Mechanical Systems”.
   12. Other Division 15 Specifications as applicable.

1.2 SUMMARY

A. Section includes pre-manufactured duct sound attenuators.

1.3 REFERENCES

A. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. ASHRAE Handbook - Systems Volume, Chapter “Sound and Vibration Control”

C. ASTM E477 - Method of Testing Duct Liner Materials and Prefabricated Silencers for Acoustical and Airflow Performance

D. SMACNA - HVAC Duct Construction Standards - Metal and Flexible


F. ASTM A653 Standard Specification for Steel Sheet, Zinc Coated or Zinc-Iron Alloy Coated by the Hot-Dip Process

G. ASTM C634 Terminology Relating to Environmental Acoustics

H. ANSI S1.6 Preferred Frequencies, Frequency Levels and Band Numbers for Acoustical Measurements
SECTION 15825
DUCT SOUND ATTENUATORS

I. ANSI/ASHRAE 41.2 Standard Methods for Laboratory Airflow Measurement

J. ASTM A446 Standard Test Method for Tensile Strength Properties of Metal Connector Plates

1.4 SUBMITTALS

A. Section 01330 Submittal Procedures

B. Shop Drawings: Indicate assembly, materials, thickness, dimensional data, pressure losses, acoustical performance, layout, and connection details.

C. Product Data: Provide catalog information indicating, materials, dimensional data, pressure losses, and acoustical performance.

D. Test Reports: Indicate dynamic insertion loss, noise generation values of attenuators, and static pressure drop for the specified air velocity. NVLAP accreditation certificate from independent lab were tested.

1.5 QUALITY CONTROL

A. Sound attenuators shall be prefabricated standard products of a single manufacturer.

1.6 QUALIFICATIONS

A. Sound attenuators shall be prefabricated by a manufacturer with a minimum 5 years experience in sound attenuator product manufacturing.

PART 2- PRODUCTS

2.1 DUCT SOUND ATTENUATORS

A. Attenuators shall be supplied by one of the following approved manufacturers:
   1. Vibro-Acoustics
   2. Industrial Acoustics Company
   3. Dynasonics

B. Attenuators shall be provided as indicated on the drawings and schedules. Attenuators shall be rectangular or circular, as required, and shall be straight.

C. Outer casing of rectangular attenuators shall be fabricated from not less than 22-gauge galvanized steel conforming to the structural quality of ASTM A-446 and galvanized in accordance with ASTM A-653, Class G-90 in accordance with ASHRAE Guide or SMACNA recommended construction for high velocity ductwork at up to 8-inches of water. Seams shall be longitudinal, lock-formed and mastic-filled.

D. Where indicated on the silencer schedule, attenuators shall have high transmission loss (HTL) walls externally applied and completely sealed to the silencer outer casing by the silencer manufacturer at the factory. HTL walls shall consist of media, airspace, mass...
and outer protective metal skin, as required to obtain the specified breakout transmission
loss. Standard acoustical panels will not be accepted as HTL walls.

E. Interior casings for rectangular attenuators shall be fabricated from not less than 26-
gauge galvanized perforated steel conforming to the structural quality of ASTM A-446
and galvanized in accordance with ASTM A-653, Class G-90.

F. Where specified on the drawings and schedule, sound attenuator shall have a stainless
steel outer casing, and inner casing of perforated stainless steel.

G. The direction of airflow through each attenuator shall be clearly marked on the outer
casing.

H. Sound attenuators shall be delivered with blocked ends where to be connected on site
and shall be undamaged on completion of installation.

I. Attachment of inner partitions to outer casing shall be by means of an interlocking track
assembly. Tracks shall be galvanized steel and shall be welded to outer casing. Interior
partitions of tubular attenuators shall be by means of galvanized steel radial brackets
welded to the partition and outer casing.

J. Sound attenuator interior baffles shall be filled with inorganic mineral or glass fiber sound
absorptive material with a thermosetting resin. Material density and compression shall be
as required to insure conformance with laboratory test data. Material shall be packed
under not less than 15 percent compression. Fill material shall be bacteria and fungus
resistant, inert, vermin and moisture-proof, non-corrosive and non-hygroscopic. Fill
material shall have a flame spread not greater than 25 when tested in accordance with
ASTM E-84.

K. Attenuator specified as no-fill on the mechanical schedule shall be a resonant chamber
type without any fill.

L. Where specified on the mechanical drawings fill material in attenuator shall be completely
encased in a Tedlar or Mylar film membrane of 2 mil maximum thickness to prevent
contact of the fiber material with the air-stream. The encased fill material shall be
separated from the perforated inner partition by a factory installed 0.5 inch thick
acoustically transparent spacer. The spacer shall have a flame spread not greater than
25 when tested in accordance with ASTM E-84. A mesh, screen or corrugated
perforated liner will not be acceptable as a substitute for the spacer.

M. All attenuators shall have a composite fire and smoke rating not to exceed a flame
spread of 25 and smoke developed of 50 when tested in accordance with ASTM E84.

N. Air leakage from attenuators shall not exceed SMACNA standards.

O. Attenuators shall be acoustically tested in accordance with ASTM E477-99 at an
independent NVLAP (NIST National Voluntary Laboratory Accreditation Program)
accredited laboratory. Tests shall be run with and without air flowing through the sound
attenuator at not less than three different flow rates. Test methods shall eliminate effects
due to duct end reflection, vibration, flanking transmission and standing waves in the reverberant room.

P. Airflow and pressure loss measurements shall be made in accordance with ASTM E477-99 at an independent NVLAP accredited laboratory.

Q. Attenuators shall not have a dynamic insertion loss in dB less those specified in the duct sound attenuator schedule (on the mechanical drawings) at the air face velocity specified.

R. Attenuators shall not produce self-noise power levels in dB (ref. $10^{12}$ watts) that exceed those specified in the duct sound attenuator schedule (on the mechanical drawings) at the air face velocity specified.

S. Attenuators shall not have an air pressure drop in inches water column exceeding those specified in the duct sound attenuator schedule (on the mechanical drawings) at the air face velocity specified. Tests shall be conducted and reported on the identical units for which acoustical data was presented.

1. For the sound attenuators indicated on the silencer schedule, the manufacturer shall provide a Computational Fluid Dynamics (CFD) analysis of the attenuator with the attached ductwork, a minimum of 5 equivalent duct diameters up and downstream of the attenuator, as shown on the contract drawings, to determine silencer pressure drop including system effects. The manufacturer shall report and validate the solution domain of the CFD analysis by mesh independence, such that two models of different mesh refinement levels produce equivalent results and by solution convergence. The manufacturer shall report the selection of CFD parameters including mesh type, mesh size, boundary conditions, acceptable error residuals (convergence criteria) and turbulence model. Each CFD analysis shall also include additional post-processed information including the number of iterations, convergence status and resulting y+ values.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The sound attenuator manufacturer’s basic installation instruction shall not be compromised. The sound attenuator supplier or his qualified representative shall be responsible for providing such supervision as may be required to assure correct and complete installation of the sound attenuators.

B. Sound attenuators shall be supported independent of ductwork.

C. Where multiple sound attenuator units are grouped together in parallel within the duct system they shall be sealed airtight with EC-800 sealant as manufactured by 3M Company or approved equal.

D. When an elbow precedes a sound attenuator by less than 3 duct widths (as measured in the elbow plane) splitters should be parallel to the plane of the elbow turn.

END OF SECTION