

Suggested Specifications

Price Duct Silencers Division 23 – Heating, Ventilating, and Air Conditioning Section 23 33 19 – Duct Silencers

The following specification is for a defined application. Price would be pleased to assist in developing a specification for your specific need.

PART 1 – GENERAL

1.01 Section Includes

- A. Duct Silencers.

1.02 Related Sections

- A. Section 01 30 00 - Administrative Requirements.
- B. Section 01 40 00 - Quality Requirements
- C. Section 01 7419 - Construction Waste Management and Disposal
- D. Section 01 78 00 - Closeout Submittals.
- E. Section 01 79 00 - Demonstration and Training
- F. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.
- G. Section 23 31 00 - HVAC Ducts and Casings: Connections to silencers.
- H. Section 23 33 00 - Air Duct Accessories: Flexible duct connections.

1.03 Reference Standards

- A. ASHRAE Applications Handbook, Chapter 48 "Noise and Vibration Control"; 2015
- B. ASHRAE 62.1 – Ventilation For Acceptable Indoor Air Quality; 2013
- C. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-dip Process; 2015
- D. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials; 2016
- E. ASTM E477-20 – Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers; 2013
- F. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015
- G. NFPA 90B – Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015
- H. NFPA 255 – Standard Method of Test of Surface Burning Characteristics of Building Materials; 2006
- I. SMACNA 006-2006 – HVAC Duct Construction Standards – Metal and Flexible; 2006
- J. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials; 2008

1.04 Submittals

- A. See Section 01 30 00 – Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Silencer manufacturer to provide submittal drawings detailing all duct silencer data specified in the mechanical drawing schedule.
 - 2. Silencer manufacturer shall submit certified laboratory performance obtained using ASTM E477-20. The laboratory must be NVLAP accredited for the ASTM E477-20 test standard and a copy of the accreditation certificate must be included with submittals. Data from non-NVLAP accredited test facilities is not acceptable.
 - 3. Submitted silencer pressure drops should not exceed those listed in the silencer schedule unless approved by project engineer. Silencer pressure drop measurements shall be made in accordance with ASTM E477-20.
 - 4. Submitted silencer dynamic insertion loss and self-noise data should satisfy values listed in the silencer schedule at the project's air distribution system airflow requirements. ASTM E477-20 tests to obtain this data shall be conducted in the same facility and utilize the same silencer.
 - 5. Silencer dynamic insertion loss shall not be less than that listed in the silencer schedule unless approved by the project engineer.
 - 6. Silencer generated noise shall not be greater than that listed in the silencer schedule unless approved by the project engineer.
 - 7. The silencer manufacturer shall provide, for approval, acoustic calculations for relevant duct systems with silencers to validate that the submitted silencers will satisfy occupied space design guidelines. Use sound power levels of actual equipment scheduled for installation on project. Acoustic Analysis shall include breakout noise calculations as required. In the absence of specified background noise level criteria, the guidelines outlined in the 2015 ASHRAE Applications Handbook Chapter 48, Table 1 shall apply.
 - 8. Silencer manufacturer shall provide test data for silencer(s) as indicated in the silencer schedule if requested by the project engineer that complies with project criteria.

1.05 Quality Assurance

- A. Silencers shall be installed in accordance with NFPA 90A and with NFPA 90B.
- B. Silencer performance must have been substantiated in a duct-to-reverberant room test facility in accordance with ASTM E477-20. The test facility must provide airflow in both directions through the test silencer. The test set-up shall eliminate effects due to flanking, directivity, end reflection, standing waves and reverberation room absorption. The aero-acoustic laboratory must be currently NVLAP accredited for ASTM E477-20. Test facilities and reports shall be open to inspection from project engineer.
- C. Silencer manufacturer must have a minimum ten (10) years of industry experience.

Suggested Specifications

- D. Silencer manufacturer shall provide a copy of their laboratory NVLAP accreditation certificate for the ASTM E477-20 test standard with the submittals. Data from non-NVLAP accredited test facilities is not acceptable.
- E. The silencer manufacturer shall test silencer(s) as indicated in the silencer schedule if required and at owner's expense. Project engineer shall be notified of the test date in advance and tests shall comply with the project criteria.

1.06 Warranty

- A. Provide 12 month manufacturer warranty from date of shipment for duct silencers.
- B. See Section 01 78 00 – Closeout Submittals for additional warranty requirements.

PART 2 – PRODUCTS

2.01 Duct Silencers

- A. Basis of Design: Price Industries
 1. Absorptive Circular Silencer: Model CS
 2. Absorptive Elbow Silencer: Models ERM/ERMX
 3. Absorptive Rectangular Silencer: Models RL/RM/RH/RLX/RMX/RHX
 4. Axial Fan Silencer: Model AFS
 5. Film Lined Circular Silencer: Model CS
 6. Film Lined Elbow Silencer: Models ERMT/ERMTX
 7. Film Lined Rectangular Silencer: Models RLT/RMT/RHT/RLTX/RMTX/RHTX
 8. Packless Circular Silencer: Models PCLS/PCLB/PCMS/PCMB/PCHS/PCHB
 9. Packless Elbow Silencer: Model PERM
 10. Packless Elbow Circular Silencer: Models PECLS/PECLB/PECMS/PECMB/PECHS/PECHB
 11. Packless Rectangular Silencer: Model RSP
- B. Alternate Manufacturers:
 1. Alternate manufacturers must obtain written approval by the project engineer to bid.
 2. As a condition of pre-approval, alternate manufacturers must submit to the project engineer HVAC silencer test reports for a silencer tested in accordance with ASTM E477-20 in a test facility that is NVLAP-accredited for ASTM E477-20.
 3. A copy of the laboratory's current NVLAP accreditation certificate must be included with submitted reports and any changes to the specifications must be submitted and approved in writing by the project engineer prior to the bid due-date.
- C. General:
 1. Silencers shall be of the size, configuration, capacity and acoustic performance as scheduled on the drawings. Silencers shall be fabricated 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 or approved by the project engineer.
- D. 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.
 2. Casing seams and joints shall be lock-formed and sealed or stitch welded and sealed except as noted, to provide leakage-resistant construction.
 3. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.
 4. Perforated steel shall be adequately stiffened to insure flatness and form. Spot welds shall be painted as required.
 5. Fire-Performance Characteristics:
 - a. Silencer assemblies, including acoustic media fill, natural cotton fiber, sealants and acoustical spacers shall have Class 1 flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E84, NFPA 255 or UL 723.
 6. Material gauge thickness:
 - a. Material gauges noted in other sections are minimums and shall increase as required for the system pressure and velocity classification.
 - b. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.
- E. Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel, gauge as listed below
 1. Rectangular Silencers, including STC-rated models: 22 gauge
 2. Rectangular Elbow Silencers: 22 gauge
 3. Circular Silencers:
 - a.) For units up to 20 inches in diameter: 22 gauge
 - b.) For units 21 through 44 inches in diameter: 18 gauge
 - c.) For units over 44 inches in Diameter: 16 gauge
 4. Transitional Silencers: 22 gauge
- F. Rectangular Elbow Silencers:
 1. Acoustical splitter/baffles shall be internally radiused and aerodynamically designed for efficient turning of the air.

Suggested Specifications

- G. Transitional Silencers:
1. Transitioning shall occur internal to the silencer such that the height of the gap or air passage is changing with the length of the splitters/baffles.
- H. Inner perforated metal liner shall be supplied in accordance with ASTM A 653/A 653M, G90 galvanized sheet steel in the following gauge thicknesses according to silencer type or connection size:
1. Rectangular Silencers: 22 gauge
 2. Rectangular Elbow Silencers: 22 gauge
 3. Circular Silencers: 22 gauge
 4. Transitional Silencers: 22 gauge
- I. Principal Sound-Absorbing Mechanism:
1. Packless (No-Media) Silencers:
 - a. Models shall not contain absorptive media. Attenuation shall be achieved with controlled impedance membranes and broadly tuned resonators.
 2. Absorptive (Dissipative) and Film Lined Silencers:
 - a. Standard Acoustic media:
 1. Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to insure conformance with laboratory test data.
 2. Media shall be packed with a minimum of 15% compression during silencer assembly.
 3. Media shall be resilient such that it will not pull apart during normal applications, and shall resist settling, breakdown, and sagging from vibration. Media shall not rot, mildew, or otherwise deteriorate, and shall have sufficient flexibility to readily form around corners and curved surfaces.
 4. Media shall not cause or accelerate corrosion of aluminum or steel.
 - b. Natural cotton and film lined natural cotton:
 1. Media shall be natural cotton fibers treated with an EPA registered, non-toxic borate solution, and "flash dried" to actively inhibit the growth of mold, mildew, bacteria, and fungi.
 2. Media shall not contain formaldehydes, phenolic resins or Volatile Organic Compounds (VOC's) that can off-gas and/or cause health concerns.
 3. Media shall be 100% recyclable and comply with UL181 and NFPA 90A. Insulation shall be packed with a minimum of 15% compression during silencer assembly.
 4. Media shall not cause or accelerate corrosion of aluminum or steel. Glass fiber, fiberglass and mineral wool are not permitted as a substitute for natural cotton.
- J. Media Protection:
 1. Dissipative silencers:
 - a. Where indicated on the silencer schedule, media shall be encapsulated in glass fiber cloth to help prevent shedding, erosion and impregnation of the glass fiber.
 - b. Axial Fan silencers shall have a glass fiber cloth liner.
 2. Film Lined silencers:
 - a. The acoustic media shall be completely wrapped with polymer film to help prevent shedding, erosion and impregnation.
 - b. The wrapped acoustic media shall be separated from the perforated metal by a factory-installed acoustically transparent spacer.
 - c. The spacer shall be flame retardant and erosion resistant.
 - d. Mesh, screen or corrugated perforated liner will not be acceptable as a substitute for the specified spacer.
 - e. Silencer manufacturer shall provide a written test report showing silencer assemblies have Class 1 flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.
 3. HTL Casings:
 - a. Where indicated on the silencer schedule, silencers shall have high transmission loss (HTL) walls externally applied and completely sealed to the silencer casing by the silencer manufacturer.
 - b. If requested by the project engineer, relevant breakout noise calculations shall be provided to ensure compliance with the relevant room noise criteria that are based on the sound power levels of the specified equipment.
- K. Shipping Protection:
 1. Silencers shall be shipped with factory-installed end caps.

Suggested Specifications

PART 3 – EXECUTION

3.01 Installation

- A. Install silencer according to manufacturer's written installation instructions.
- B. Support duct silencers independently from ductwork.
- C. Ensure duct silencers are installed with airflow arrows in direction of airflow.

3.02 Field Quality Control

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

3.03 Cleaning

- A. See Section 01 74 19 – Construction Waste Management and Disposal for additional requirements.

3.04 Closeout Activities

- B. See Section 01 78 00 - Closeout Submittals for closeout submittals.
- C. See Section 01 79 00 - Demonstration and Training for additional requirements.

END OF SECTION 23 33 19