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Specification For Clean Build Silencer Systems

BACKGROUND

The Electronics Industry has matured to the point that any product impacting the newer, state of the art manufacturing facilities can no longer be cleaned up, after the fact, to meet current cleanliness specifications. Even the new standard clean build protocols cannot guarantee that the the FAB will be clean enough to guarantee the product yields necessary for the owner to justify the very high costs of building the facility. For this reason most engineering houses as well as the owners with in-house contamination control experts require each component interacting with the cleanroom to be built and shipped clean.

The purpose of this specification is to provide guidelines for the implementation of clean build protocols for silencer systems that will be built for two levels of cleanliness. The majority of the specification will be for FED STD 209E defined class 100 to class 1000 (how many particles per cubic foot at .5 microns in size). The more stringent requirements will be for class 10 down to class 1 or cleaner (how many particles per cubic foot at particle sizes down to .1 micron).

GENERAL

Furnish and install Commercial Acoustics Sound Attenuators of the models and sizes shown on plans and/or listed in schedule. Attenuators shall be the product of Commercial Acoustics Division of Metal Form Manufacturing. Any change in this specification must be submitted to and approved by the architect/engineer, in writing, at least 10 days prior to bid due-date.

MATERIALS AND CONSTRUCTION

Unless otherwise specified, attenuator shall be constructed entirely of Chem-Treat Dry G90 galvanized steel in accordance with applicable ASHRAE Guide recommendations for high pressure rectangular ductwork. Seams shall be lock-formed and filled.

Alternative: All housings, stiffening members and battens shall be built using formed and stiffened Aluminum or Stainless Steel (Low carbon stainless e.g. 304L or 316L is preferred to prevent or limit rusting at weldments). Note: In some cases the zinc used in Galvanized Steel may be considered a heavy metal contaminant.

Outer casing shall be a minimum of 22 gauge metal. Internal baffles shall be 24 gauge minimum perforated and degreased metal. The fill material shall be inorganic long fiber fiberglass. The material shall be of sufficient density and packed under at least 5% compression to eliminate voids due to vibration and settling to obtain catalog ratings. MINERAL WOOD OR GYPSUM IS NOT ACCEPTABLE.

Attenuators shall not leak or fail structurally when subjected to a different air pressure of 8 i.w.g. inside to outside of casing.

The combustion rating for the silencer fill shall not be greater than the following UL fire hazard classification:

Flame Spread.....15

Fuel Contributed.....0

Smoke Developed.....0

Tested in accordance with UL Test Procedure 723.

The fill material must be protected from shedding or participating into the system by using a Polyester Liner (Mylar with stand-off) (Fiberglass Scrim) (Tyvek). Note: Some contamination control experts have reported that mylar and tedlar bags have shown signs of shedding or out gassing. This may be a problem for class 10 or cleaner facilities.

Caulking or sealing products shall be Dow Corning #737 clear silicone. (Note: color pigments in silicone caulks are suspected of particle generation).

SILENCER COMPONENT CLEANING PROTOCOLS

Clean, lint free cloths shall be used with a mix of 90% deionized (DI) water and 10% isopropyl alcohol (IPA) to degrease and/or wipe down all components during all protocol stages with the exception of degreasing the coil unit during roll out. During this procedure, any degreasing solvent, enviromentally acceptable can be used.

Specification For Clean Build Silencer Systems *con't.*

Manufacturer shall ensure that every component incorporated into a silencer system being installed into or in support of a cleanroom system be as free of contaminants as physically possible. For example:

All coils of metals being used to manufacture baffles and housings shall be degreased on both sides when rolled out for shearing. (It is impossible to degrease the components after assembly.) After degreasing and forming or shearing, the sections shall be stored in a clean, dry area to prevent contamination or corrosion. All Equipment and Tables used in the manufacture and assembly shall be cleaned using the same solution as described above.

All components being used shall be wiped down before and after cutting or shaping and stored in a clean, dry area to prevent contamination that would not be cleanable once the material is installed in the silencer shell.

CLEAN MANUFACTURING PROTOCOL/PROCEDURE

A manufacturing line structured for the purpose of contamination control shall be constructed and used for all component and final assembly. *(OPTIONAL: This line shall be, at a minimum, class 10,000 or cleaner. It shall not be exposed to normal factory atmosphere or the outside and shall be arranged so that the clean components defined above shall be accessible without exposed transport through contaminated areas of the plant. The following steps, within the class 10,000 environment, shall be used to assemble the components being used to make silencer systems(s):)*

Components being used to manufacture the silencer system shall be cleaned prior to final assembly and welding or crimping.

For class 10 or cleaner cleanrooms, after welding, the components shall be cleaned of all weldment spatter and wiped down. (If galvanized metal is acceptable, cold galvanizing of weldments is acceptable). If high carbon stainless steel is used, some touch up, with an epoxy or silicone caulk, of the exposed steel surfaces around the weldments will be required to prevent rusting.)

The silencer unit or system shall be assembled and sealed using crimping, welding or caulking so that no exposed fiberglass or gapping is evident.

The assembled silencer unit or system shall be cleaned in a staging area and shall be bagged in a 4 mil poly bag or wrapped in a layer of heavy shrink wrap material in the case of units or systems too large for bags (Optional: Double or Triple bags or wrap). Larger components shall be stiffened using some form of skidding to provide ease of handling during transport and delivery to the cleanroom staging area. (Note: The purpose of three layers of wrap is to: a) prevent transport contamination and b) allow for one layer to be removed in the clean staging area of the cleanroom without exposing the silencer system to contamination. The client may wish to stage or install the system without exposing the ends during the early phases of clean construction.)

ACOUSTIC PERFORMANCE

Attenuator ratings shall be determined using the duct-to-reverberant room test method which provides for airflow in both directions through the test attenuator in accordance with ATSM specification E-477-84, or latest version thereof. The test set-up and procedure shall be such that all effects due to end reflection, directivity, flanking transmission, standing waves and test chamber sound absorption are eliminated. Acoustic ratings shall include Dynamic Insertion Loss (DIL) and Self-generated (SN) power levels both for Forward Flow (air and noise traveling in same direction, +), and Reverse Flow (air and noise traveling in opposite directions, -). Data shall be presented for tests conducted using silencers no smaller than 24W x 24H. Tests shall be performed on silencers with linings in place. Computer generated data will not be acceptable.

AERODYNAMIC PERFORMANCE

Static pressure loss of attenuators shall not exceed those listed in the silencer schedule. Airflow measurements shall be made in accordance with ASTM specification E-477-84, or latest version thereof, and applicable portions of ASME, AMCA, ADC airflow test codes. Tests shall be reported on the identical units for which acoustic data is presented.

CERTIFICATION

The manufacturer shall supply certified test data on dynamic insertion loss, Self-generated Sound Power levels, and Aerodynamic Performance for Reverse and Forward Flow test conditions to the architect/engineer, in writing, at least 10 days prior to bid due date. Test data shall be for a standard product. All ratings tests shall be conducted by a nationally recognized acoustic testing laboratory, in their facility, utilizing the same attenuator, and shall be open to inspection upon request from the architect engineer. The testing laboratory shall be totally independent from the manufacturer. Data obtained in the manufacturers test lab will not be acceptable unless substantiated by test reports conducted by a nationally recognized acoustic testing laboratory.