



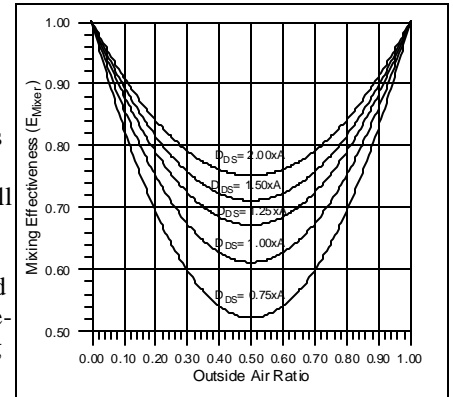
How to Write a Good Air Mixing Specification

Mixing boxes and static mixers vary significantly in the amount of mixing they provide. Therefore, including key items in a specification for this equipment is critical in order to ensure the design conditions desired are actually achieved. However, without a guide this can become a complicated specification. Therefore, this article is a reference guide outlining the critical components that need to be included for a good mixing specification.

1). Define System Requirements

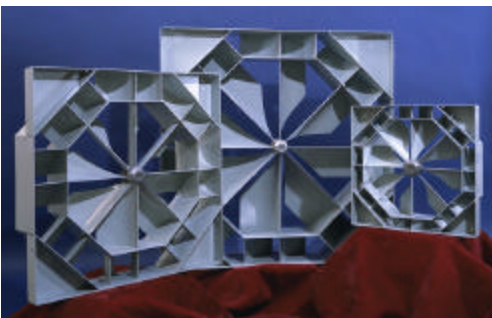
The first step is to define the mixing requirements of the system. The required mixing effectiveness can be determined to eliminate freeze stat trips, minimize sensor error, or enhance outdoor air distribution utilizing system conditions such as outdoor air percentage, return air temperature, and freeze stat trip point. These conditions are critical because they determine the required mixing effectiveness. Blender Products offers two easy-to-use tools that are available for defining the required mixing effectiveness. These are the Mixing Effectiveness Design Guide and the Blender Products selection software. These two tools will allow the mixing requirements to be defined specific to the system being specified.

As a reminder, it is also important to state that the amount of mixing effectiveness required is based on range mixing effectiveness calculation, not statistical. If range mixing effectiveness is not specifically defined in the specification, greater uncertainty will exist regarding the actual amount of mixing the system will provide.



2). Qualify Mixer Performance

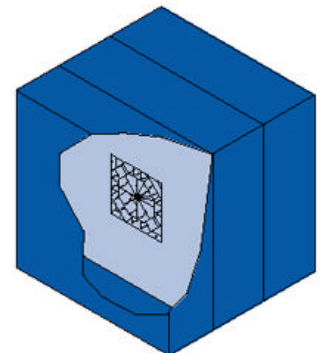
The second step is to qualify the static mixer performance. Two key items to include are the design of the mixer and the test methods for establishing performance. Stating that a mixer design must be geometrically similar for all sizes ensures that the performance can be predicted for the entire product line. If a line of mixers is not geometrically similar then performance data needs to be provided for each different size.



Further, to substantiate mixing performance, the air mixer manufacturer should be required to supply, upon request, a complete description of the testing method and performance data. At a minimum, stating that the mixer should be tested in a section of straight duct at varying outdoor air percentages with no mixing influence upstream. In addition the required distance downstream should be included to ensure all supplier's test data is comparable.

3). Defining Maximum Pressure Drop

The third step is defining a maximum pressure drop. Varying mixer designs have significantly different associated pressure losses. Therefore, care needs to be taken to ensure that the pressure drop stated will actually match performance. Mixers that are geometrically similar and have been tested at different sizes can easily predict the pressure drop for any of their sizes. If a line of mixers is not geometrically similar, then pressure drop data needs to be provided for the particular size.



Also the open area of mixers typically account for around 40 percent of the area of the plenum. Therefore, the pressure drop is not simply influenced by the mixer design but also the contraction of air through the mixer(s). This orifice effect can have a significant impact on pressure loss and therefore, should be included as part of the spec for the mixer. If a mixer's pressure drop is not inclusive of the orifice effect, it will have an unknown and higher pressure drop once installed in a plenum.

4.) Define Mixer Construction

The fourth step is to define mixer construction to ensure the mixer life will meet and/or exceed the life of the air-handling unit. This can be accomplished by specifying the material and method of construction of the mixer as well as requiring the manufacturer to provide detailed installation instructions to ensure the mixer and panels will withstand the forces inside the mixing box. The manufacturer should supply cut sheets and I&O instructions upon request. Including this section in the spec is important since it will make it difficult for a field built option to be substituted.

5.) Chose the Manufacturer

Lastly a list of acceptable manufactures should be stated. This ties all the other steps into one and helps to disqualify products with unknown performance and field built solutions.

Series IV Air Blender Mixer Specification

System Description

Static mixing devices shall be installed where shown on plans to enhance the mixing of outside air with return air to a required mixing effectiveness to eliminate freeze stat trips, minimize sensor error and enhance outdoor air distribution. Furthermore the air mixing device shall provide even airflow across filters, coils and control sensors.

Performance

Mixing (Generic Option): The static mixer shall be capable of 70% range mixing effectiveness at 25% outside air, one mixer diameter downstream of mixer. Range mixing effectiveness is defined as follows: $(E_{mixer} = 1 - (\text{Range} / (\text{Tra} - \text{Toa})))$ Where: Tra= Return air temperature, Toa=Outside air temperature, Range=Tmax-Tmin at one mixer diameter downstream. Static air mixers shall be geometrically scaled to ensure consistent performance across full range of applications. Mixers that are not geometrically scaled are not acceptable.

Mixing (Customized Option): The performance requirements for each system should be as listed in the schedule of equipment shown on the plans. The required mixing effectiveness shall be stated in terms of range mixing effectiveness at the appropriate outside air percentage. Range mixing effectiveness is defined as follows: $(E_{mixer} = 1 - (\text{Range} / (\text{Tra} - \text{Toa})))$ Where: Tra= Return air temperature, Toa=Outside air temperature, Range=Tmax-Tmin at a specified distance downstream from the mixer. Static air mixers shall be geometrically scaled to ensure consistent performance across full range of applications. Mixers that are not geometrically scaled are not acceptable.

Pressure Drop: The pressure drop rating for static air mixers shall include the pressure loss due to the mixer design and the mixer-to-plenum area ratio.

Testing: Detailed documentation of performance testing shall be made available upon request

Construction

Material: Static air mixers material shall be .080" or .125" thk. Aluminum (Optional: Carbon Steel/Galvanized Steel/Aluminized Steel/ Stainless Steel).

Construction: Static air mixers shall be welded and mechanically fastened construction.

Finish: Static air mixers shall have bare finish (Optional: Anodized / Galvanized / Painted).

Installation

Installation shall be in accordance with the manufacturer's written installation instructions and SMACNA plenum construction guidelines. If necessary, provide reinforcement in plenum where the mixing device is installed to eliminate excess vibration or deflection of blank off plenum.

Acceptable Manufacturers and Products

Blender Products, Inc. -Series IV AIR BLENDER® static mixer

Approved equal prior to bidding.