AMCA Publication 303-79 (R2012)

Application of Sound Power Level Ratings for Fans

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

The International Authority on Air System Components

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Authority

This document was approved by the membership of the Air Movement and Control Association in 1979 and was reaffirmed in 2012.

History

The first edition of this publication was issued in February 1965. The second edition, June 1973, included Appendix A: "*Recommended practice for Calculation of Typical dBA Sound Pressure Levels for Ducted Fan Installations*." This third edition incorporates the 1973 Appendix into the text and has an expanded calculations section which includes L_WA rated fans. In addition, absorption coefficients now compromise the annex.

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1. Introduction

To apply Sound Power Level Ratings in the design of an air system, the engineer must understand what these ratings are and he must appreciate their limitations. For the many design engineers who are not yet familiar with the techniques of applying acoustical data, this publication may serve as an introduction to the subject.

Before undertaking any system design calculations using Sound Power Level Ratings, the chapter on "Sound Control Fundamentals" in the ASHRAE *Handbook of Fundamentals* should be reviewed. The reference list included in the chapter will also provide a good starting point for a detailed study of this subject.

2. What are AMCA Sound Power Level Ratings?

AMCA Sound Power Level Ratings are measurements of the sound generated by a fan when operated at various points within its normal operating range. The ratings are obtained from tests conducted by the method described in AMCA Standard 300 *Test Code for Sound Rating* and are published in accordance with AMCA Standard 301 *Methods for Calculating Fan Sound Ratings From Laboratory Test Data.*

Sound Power Ratings for ducted fans are given in decibels (dB) in each of the eight octave bands of the audible frequency spectrum. Non-ducted fans may be rated in decibels (dB) Sound Power in eight octave bands, or alternatively in single number L_WA (sound power, *A*-weighted) given in decibels.

Because different fans are applied in various ways, AMCA Standard 300 includes several different test setups. Depending on which of these has been used, published Sound Power Level Ratings must indicate whether they represent the total sound power of the fan or that radiated from either the inlet or the outlet only. Note that for non-ducted fans, the Sound Power Rating is normally given for the inlet *or* the outlet.

2.1 How accurate are sound ratings?

Sound measurements cannot be made as precisely as those used to establish air movement or heat transfer ratings. Within the present state of the art, differences in sound power levels of 2 dB or less are not considered significant. In comparing products of different manufacturers, it is good practice to disregard differences of less than 4 dB. This is particularly true in the first octave band where differences of 6 dB or less should be disregarded.

2.2 What happens when sound travels through an air system?

Sound Power Level Ratings alone do not provide a measure of the sound intensity at the listener's location. What is "heard" is a sound pressure level which is determined, for any particular location, by many factors, including the size of the room and nature of its walls, ceilings and furnishings, etc. The loudness level at the point of hearing is also related to the distance from the sound source. In a ducted system, the fan may be so remote from the conditioned space that the other components, such as mixing boxes, diffusers, and the ducts themselves may be more significant as sound generators. However, the fan is the logical starting point, and, when proper and accurate consideration is given to the other components of the system, Sound Power Level Ratings in octave bands will allow calculation of the resulting sound pressure levels in the conditioned space.

Whenever sound passes from a small opening into a large plenum or space, a phenomenon known as "end reflection" occurs, which must be taken into account by the system designer. When testing ducted devices for rating, AMCA Standard 300 requires that the sound reflected back into the system by the inlet and the outlet be calculated and added to the values obtained in the laboratory. The system designer must reverse this process by subtracting appropriate values to approximate the "reflection" occurring at grilles and diffusers, etc. Detailed data related to attenuation and reflection are given in the ASHRAE - *Handbook and Product Delivery, Systems Volume.*