

# AMCA Publication 311-05 (Rev. 7/09)

Certified Ratings Program -  
Product Rating Manual for  
Fan Sound Performance



**AIR MOVEMENT AND CONTROL  
ASSOCIATION INTERNATIONAL, INC.**

The International Authority on Air System Components

# AMCA Publication 311-05 (Rev. 7/09)

## Certified Ratings Program Product Rating Manual for Fan Sound Performance

---



---

Air Movement and Control Association International, Inc.  
30 W. University Drive  
Arlington Heights, Illinois  
60004

# AMCA Publications

## Authority

This publication was approved by the AMCA International membership on 13 February 2005, and became effective on 1 March 2005. It is not the intent of the committee to require currently licensed product line catalogs to be changed based on the editorial changes made in this revision. New catalogs and catalogs in their normal cycle of product line catalog revision will be required to update.

The May 2007 revision was approved by the AMCA International membership on 6 May 2007, and became effective on 1 June, 2007. This revision introduces a new sone rating called spherical sones, differentiating from the traditional sone rating (now referred to as hemispherical sones), and adds Annex B to provide the method of calculating and presenting spherical sones.

The July 2009 revision was approved by the AMCA membership on 25 July 2009, and became effective on 1 August 2009. This revision introduces Annex C, which adds requirements for certifying sound performance of air curtain units.

## Copyright

© 2009 by Air Movement and Control Association International, Inc.

All rights reserved. Reproduction or translation of any part of this work beyond that permitted by Sections 107 and 108 of the United States Copyright Act without the permission of the copyright owner is unlawful. Requests for permission or further information should be addressed to the Executive Director, Air Movement and Control Association International, Inc. at 30 West University Drive, Arlington Heights, IL 60004-1893 U.S.A.

## Objections

Air Movement and Control Association International, Inc. will consider and decide all written complaints regarding its standards, certification programs, or interpretations thereof. For information on procedures for submitting and handling complaints, write to:

Air Movement and Control Association International  
30 West University Drive  
Arlington Heights, IL 60004-1893 U.S.A.

AMCA International, Incorporated  
c/o Federation of Environmental Trade Associations  
2 Waltham Court, Milley Lane, Hare Hatch  
Reading, Berkshire, United Kingdom  
RG10 9TH

## Disclaimer

AMCA uses its best efforts to produce standards for the benefit of the industry and the public in light of available information and accepted industry practices. However, AMCA does not guarantee, certify or assure the safety or performance of any products, components or systems tested, designed, installed or operated in accordance with AMCA standards or that any tests conducted under its standards will be non-hazardous or free from risk.

# Review Committee

Tim Mathson, Chair	Greenheck Fan Corporation
Dr. John Cermak	Acme Engineering & Manufacturing Corporation
Joseph Langford	American Coolair Corp.
David Ortiz	Soler & Palau, S.A. de C.V.
Jeff Hill	Cleanpak International
Thomas Gustafson	Hartzell Fan, Inc.
Dr. John Murphy	JOGRAM, Inc.
Tan Tin Tin	Kruger Ventilation Industries Pte. Ltd.
Iain Kinghorn	Flaktwoods
Ray Sexton	Matthews & Yates
Joe Pope	Pope Engineering Company
Boyd Kunze	The New York Blower Company
Scott Hausmann	The Trane Co.
Rad Ganesh	Twin City Fan Companies, Ltd.
Kim Osborn	Governair Corporation
Kurt Eichelberger	York, a Johnson Controls Company
Tom Paige	Kinetics Noise Control, Inc.
Bob Valbracht	Loren Cook Company
Ralph Susey	Howden Buffalo, Inc.
Mark Stevens	AMCA International, Inc.
Joseph Brooks	AMCA International, Inc.

## Related AMCA Documents

### **Related Publications**

AMCA Publication 11

*Certified Ratings Program  
Operating Manual*

AMCA Publication 211

*Certified Ratings Program  
Product Rating Manual for Fan Air Performance*

### **Related Standards**

ANSI/AMCA Standard 300

*Reverberant Room Method for Sound Testing of Fans*

ANSI/AMCA Standard 301

*Methods for Calculating Fan Sound Ratings from Laboratory Test Data*

# Contents

<b>1. Purpose</b>	1
<b>2. Product Scope</b>	1
<b>3. General Guidelines for Developing Fan Sound Ratings</b>	1
3.1 Definitions	1
3.2 Rating development	1
3.3 Similarity	1
3.4 Rating methods	1
3.5 Published sound ratings	2
<b>4. Check Test</b>	4
4.1 General	4
4.2 Check test tolerances	4
<b>Annex A. Electronic Catalogs (Normative)</b>	5
A.1 Introduction	5
A.2 Scope	5
A.3 Allowable performance modifications	5
A.4 Required qualifying statements	5
<b>Annex B. Method of Presenting Sound Ratings in Spherical Sones (Normative)</b>	6
B.1 Hemispherical sones and spherical sones	6
B.2 Presentation of values	6
B.3 Calculation of loudness in spherical sones	6
<b>Annex C. Additional Requirements for the Sound Performance Licensing of Air Curtain Units (Normative)</b>	12



# Certified Ratings Program

## Product Rating Manual for Fan Sound Performance

---

### 1. Purpose

The purpose of this manual is to prescribe/establish definitions and specifications to be used in connection with the AMCA Certified Ratings Program for the sound performance of fans.

### 2. Product scope

Products that can be licensed by AMCA International to bear the AMCA Certified Sound Ratings Seal are centrifugal fans, axial fans, power roof ventilators, air curtains, agricultural fans and other air moving devices within the product scope of AMCA.

The program applies only to complete air moving devices which are already licensed to bear the AMCA Certified Performance Seal for Air Performance.

The program applies to fans within the scope of AMCA International for which performance catalogs are published and made available to the public. It does not apply to special units for which performance ratings are not published. When performance ratings for both licensed and non-licensed products are contained in the same catalog, there must be a clear distinction made between licensed and non-licensed products, as required in Section 11 of AMCA Publication 11.

When one or more licensed products are used as component parts of a larger unit, the AMCA Certified Sound Ratings Seal may not be applied to the complete unit unless the unit itself has been licensed in accordance with this program.

### 3. General Guidelines for Developing Fan Sound Ratings

#### 3.1 Definitions

All technical terms specific to sound are defined in the appropriate test standards referenced herein.

A "spherical sone" is defined as the loudness, in sones, of the sound pressure level at a distance of 1.5 m (5 ft) from the acoustic center of the fan in a spherical free field.

A "hemispherical sone" is defined as the loudness, in sones, of the sound pressure level at a distance of 1.5 m (5 ft) from the acoustic center of the fan in a hemispherical free field.

A hemispherical sone is calculated in accordance with the procedures found in ANSI/AMCA 301. Licensees may label

a hemispherical sone rating as a "fan sone". In this document, the term "hemispherical sone" will be used to clearly differentiate the two terms.

#### 3.2 Rating development

The sound performance rating of a fan or a series of dynamically similar fans are developed from tests conducted in accordance with ANSI/AMCA 300, ANSI/AMCA 320, ANSI/AMCA 330, or other such standards as allowed under AMCA 111.

The performance rating of a fan can be developed for a range of speeds from the test of the fan at one speed utilizing the procedures defined in ANSI/AMCA 301.

The performance rating of one or more larger fan sizes can be developed based on the test of a smaller fan utilizing the procedures defined in ANSI/AMCA 301.

#### 3.3 Similarity

The sound performance of a fan shall not be calculated from a fan larger in size.

The performance rating of one or more larger fan sizes can be developed based on the test of a smaller fan provided that the larger size fans meet the requirements of geometric similarity given in ANSI/AMCA 301, Sections 5.2.1 and 5.2.2. Similarity is discussed in AMCA 211.

Materials used in the rated fans must have acoustic properties similar to those of the test fan, but gauges need not be exactly proportional.

#### 3.4 Rating methods

A sound performance rating may be presented by any one or combination of the three following methods, as applicable. The methods shall be in conformance with ANSI/AMCA 301 or Annex B of AMCA 311.

##### 3.4.1 Octave and one-third octave band sound power levels

Sound power levels in full octave bands (8 values) or one-third octave bands (24 values) are presented in decibels (dB) rounded to the closest integer.

##### 3.4.2 Loudness

Sound performance is presented as a single loudness value in hemispherical sones or spherical sones.

Hemispherical sone values less than twenty shall be rounded to one tenth of a sone. Hemispherical sone values of twenty and greater shall be rounded to the nearest integer.

For fans rated using spherical sone values, the rating shall be at a fan static pressure of 25 Pa (0.1 in. wg). Ratings at other fan static pressures are optional. Spherical sone values greater than one and a half are rounded to the nearest one half sone. Spherical sone values greater than three tenths and less than or equal to one and a half are rounded to one tenth of a sone. Spherical sone values less than three tenths are rated as "< 0.3 Sones."

### 3.4.3 A-Weighted Sound Power Level

Sound performance is presented as a single A-weighted sound power level  $L_{WA}$  in units of decibels rounded to the closest integer.

## 3.5 Published sound ratings

The sound rating is a statement of sound power output of a fan, and shall include the inlet air density at which the rating applies, if other than standard air density. Printed catalogs must be published at standard inlet air density. Electronic catalogs must allow the user to obtain rating data at standard air density.

All sound ratings shall be based on sound power level data obtained in accordance with ANSI/AMCA 300 *Reverberant Room Method for Sound Testing of Fans*, ANSI/AMCA 320 *Laboratory Method for Sound Testing of Fans Using Sound Intensity*, or ANSI/AMCA 330 *Laboratory Method of Testing to Determine the Sound Power in a Duct*, or other such standards as recognized by AMCA 111, and shall be related to air performance ratings obtained in accordance with AMCA 211 *Certified Ratings Program - Air Performance*.

All catalogs shall be checked against data identified in the Application for AMCA International Certified Ratings Seal (AMCA form CRP-8). Cataloged sound power data shall not be lower than 1 dB less than the data developed from the CRP-8 test data. Cataloged hemispherical sone or spherical sone ratings shall not be lower than 1 sone (or 5%, whichever is less) from the value calculated from the sound power level data developed from the CRP-8 test data.

The tolerance between all catalogs for the same product line for certified hemispherical sone or spherical sone ratings shall be  $\pm 5\%$  or  $\pm 1$  sone, whichever is less, and the tolerance for certified fan decibel ratings shall be  $\pm 1$  dB, respectively.

The methods described in this publication shall be used for sound rating purposes at the fan inlet, fan outlet, or for total

sound power for the installation types below:

- A: free inlet, free outlet
- B: free inlet, ducted outlet
- C: ducted inlet, free outlet
- D: ducted inlet, ducted outlet

### 3.5.1 Required statements

Published sound ratings shall be accompanied by the applicable following statement(s):

#### 3.5.1.1 Octave band ratings

For a given rotational speed, a full set of octave band values may be presented for various points of rating. If only one set is presented, the value in each octave band shall be the maximum at any point of rating.

For fans rated in eight octave bands, ratings shall be presented to the nearest integer for one of the following installation types:

- A: free inlet, free outlet
- B: free inlet, ducted outlet
- C: ducted inlet, free outlet
- D: ducted inlet, ducted outlet

Also, the following statement shall be used: "The sound power level ratings shown are in decibels, referred to  $10^{-12}$  watts, calculated per AMCA Standard 301".

In addition, the appropriate statement from Section 3.5.2 shall be used to clarify installation type and end reflection.

#### 3.5.1.2 $L_{WA}$ ratings

For fans rated by a single A-weighted ( $L_{WA}$ ) rating, the rating shall be presented to the nearest integer for one of the following types:

- A: free inlet, free outlet
- B: free inlet, ducted outlet
- C: ducted inlet, free outlet
- D: ducted inlet, ducted outlet

Also, the following statement shall be used: "The A-weighted sound power ratings shown have been calculated per AMCA Standard 301".

In addition, the appropriate statement from Section 3.5.2 shall be used to clarify installation type and end reflection.

### 3.5.2 Octave band and $L_{WA}$ rating qualifying statements

The following are the qualifying statements that shall be used with Sections 3.5.1.1 and 3.5.1.2.

#### 3.5.2.1 Figure 1, fan total sound testing

"Values shown are for (total  $L_W$  or total  $L_{WA}$ ) sound power levels for:

Installation Type A: free inlet, free outlet."

Installation Type B: free inlet, ducted outlet. Ratings include the effects of duct end correction for the outlet duct."

Installation Type C: ducted inlet, free outlet. Ratings include the effect of duct end correction for the inlet duct."

Installation Type D: ducted inlet, ducted outlet. Ratings include the effect of duct end correction for inlet and outlet ducts."

#### 3.5.2.2 Figure 2, fan inlet sound testing

"Values shown are for (inlet  $L_{Wi}$  or inlet  $L_{WiA}$ ) sound power levels for:

Installation Type A: free inlet, free outlet. "

Installation Type B: free inlet, ducted outlet."

Installation Type C: ducted inlet, free outlet. Ratings include the effects of duct end correction."

Installation Type D: ducted inlet, ducted outlet. Ratings include the effect of duct end correction."

#### 3.5.2.3 Figure 3, fan outlet sound testing

"Values shown are for (outlet  $L_{Wo}$  or outlet  $L_{WoA}$ ) sound power levels for:

Installation Type A: free inlet, free outlet."

Installation Type B: free inlet, ducted outlet. Ratings include the effects of duct end correction."

Installation Type C: ducted inlet, free outlet."

Installation Type D: ducted inlet, ducted outlet. Ratings include the effect of duct end correction."

### 3.5.3 Hemispherical sone and spherical sone rating qualifying statements

#### 3.5.3.1 Hemispherical inlet sone rating

For fans rated by a single value (hemispherical sone rating):

"The sound ratings shown are loudness values in hemispherical sones at 1.5 m (5 ft) in a hemispherical free field calculated per AMCA Standard 301. Values shown are for:

Installation Type A: free inlet hemispherical sone levels."

Installation Type B: free inlet hemispherical sone levels."

Installation Type C: ducted inlet hemispherical sone levels. Ratings do not include the effect of duct end correction."

Installation Type D: ducted inlet hemispherical sone levels. Ratings do not include the effect of duct end correction."

For fans rated using spherical sone values:

"The sound ratings shown are loudness values in spherical sones at 1.5 m (5 ft) in a spherical free field calculated per Annex B of AMCA 311. Values shown are for:

Installation Type A: free inlet spherical sone levels."

Installation Type B: free inlet spherical sone levels."

Installation Type C: ducted inlet spherical sone levels. Ratings do not include the effect of duct end correction."

Installation Type D: ducted inlet spherical sone levels. Ratings do not include the effect of duct end correction."

#### 3.5.3.2 Hemispherical outlet sone rating

For fans rated by a single value (hemispherical sone rating):

"The sound ratings shown are loudness values in hemispherical sones at a distance of 1.5 m (5 ft) in a hemispherical free field calculated per AMCA Standard 301. Values shown are for:

Installation Type A: free outlet hemispherical sone levels."

Installation Type B: ducted outlet hemispherical sone levels. Ratings do not include the effect of duct end correction."

Installation Type C: free outlet hemispherical sone levels.”

Installation Type D: ducted outlet hemispherical sone levels. Ratings do not include the effect of duct end correction.”

### 3.5.4 Octave band rating from in-duct tests

For fans rated in eight octave bands from tests in accordance with ANSI/AMCA 330, the following statement shall be used:

“The sound power level ratings are shown in decibels, referred to  $10^{-12}$  watts, in a duct connected to either the inlet or the outlet of the fan, calculated per ANSI/AMCA 301. Values shown are sound power levels for:

total fan sound calculated from inlet and outlet tests.”

the fan inlet.”

the fan outlet.”

### 3.5.5 A-weighted sound pressure levels and dBA ratings

If A-weighted sound pressure levels or dBA levels are displayed, the details of the calculation shall be shown, and the following statement shall be used, “dBA levels are not licensed by AMCA International.”

## 4. Check Test

### 4.1 General

Licensed products are subject to periodic check tests as defined in AMCA 11. When products are check tested the check test sound performance shall be within the tolerance, as defined in Section 4.2, when compared to the catalog data published by the manufacturer.

The fan selected for a sound performance check test shall be the same fan as that used for the air performance check test.

### 4.2 Check test tolerances

#### 4.2.1 Octave band tolerance

The sound power level ratings of the check test unit, while performing within the performance tolerances specified in AMCA 211, shall not exceed the published sound power level ratings by more than 6 dB in the first octave band and 3 dB in any other octave band.

#### 4.2.2 Sone value tolerance

The sone value calculated from the check test unit sound power levels that have been reduced by 6 dB in the first

octave band and 3 dB in all other octave bands, shall not exceed the published sone value.

#### 4.2.3 $L_{WA}$ Value Tolerance

The  $L_{WA}$  value calculated from the check test unit sound power levels that have been reduced by 6 dB in the first octave band and 3 dB in all other octave bands, shall not exceed the published  $L_{WA}$  value.

## Annex A

### Electronic Catalogs (Normative)

---

#### A.1 Introduction

This annex covers the special requirements for licensing electronic catalogs under the AMCA Certified Ratings Program for Sound.

Any computer program, set of instructions, screen display or computer generated printout that provides air performance or sound data for a product line shall be designated an electronic catalog.

#### A.2 Scope

Performance data for all products that can be licensed by AMCA International to bear the AMCA Certified Ratings Seal for Air Performance or the AMCA Certified Ratings Seal for Sound and Air Performance in accordance with the requirements of AMCA 211 and 311 can be published in the form of an electronic catalog.

With the exceptions of the requirements covered in this annex, all other requirements outlined in AMCA 211 and 311 must be met when certifying performance in an electronic catalog.

#### A.3 Allowable performance modifications

##### A.3.1 Density correction

Sound data may continue to be licensed to bear the AMCA Certified Ratings Seal where the density is different than standard air  $1.2 \text{ kg/m}^3$  ( $0.075 \text{ lbm/ft}^3$ ) because of temperature, elevation, humidity, molecular weight or a combination of these factors.

Corrections for densities other than standard air are allowable providing that the density effects are adjusted by using the formula per AMCA 301.

#### A.4 Required qualifying statements

##### A.4.1 Primary statements

Primary statements must appear on the same screen as the selections and on any output printed from there.

###### A.4.1.1

When air performance is certified and corrections, appurtenances and accessories applied to the fan duplicate the test conditions, use the following statement:

“AMCA International Licensed for Air Performance.”

###### A.4.1.2

When fan air and sound performance is certified and corrections, appurtenances and accessories applied to the fan duplicate the test conditions, use the following statement:

“AMCA International Licensed for Sound and Air Performance.”

###### A.4.1.3

When fan air performance is certified but non-certified modifications for the effect of appurtenances and accessories, etc., are applied to the fan ratings, use the following statement:

“AMCA International Licensed for Air Performance Without Appurtenances.”

###### A.4.1.4

When fan air and sound performance is certified, but non-certified modifications for the effect of appurtenances and accessories are applied to the fan ratings, use the following statement:

“AMCA International Licensed for Sound and Air Performance Without Appurtenances.”

###### A.4.1.5

In addition to the above, primary statements must include the appropriate power statement from Subsection A of AMCA 211, for the rating method used. This shall be incorporated by adding the following to the end of the primary statement:

“Power [kW (BHP)] includes (or excludes) drives.”

##### A.4.2 Secondary statements

The secondary statements shall contain all other qualifying statements required by AMCA 211 and 311. They may be on the primary screen, or on an easily accessible secondary screen.

Access instructions to the secondary qualifying statements shall be clearly displayed on the primary screen.

When the product is licensed to bear the AMCA Certified Ratings Seal for fan air and/or sound performance and non-certified modifications have been applied to the ratings, the following additional qualifying statements shall appear on the secondary screen:

“The AMCA International licensed air and/or sound perform-

ance data has been modified for installation, appurtenances or accessories, etc. not included in the certified data. The modified performance is not AMCA International licensed but is provided to aid in selection and applications of the product.”

#### **A.4.3**

Any sound data not licensed by AMCA International shall be clearly identified on the same screen as the data and on any output printed there from, as follows:

“(e.g. Octave Band, Sones,  $L_{WA}$ , etc.) data is not AMCA International licensed.”

## Annex B

### Method of Presenting Sound Ratings in Fan Sones (Normative)

---

#### B.1 Hemispherical sones and spherical sones

One "sone" is, by definition, the loudness of a sound with a frequency of 1000 Hz and a sound pressure of 0.02 microbar (40 dB). The hemispherical sone used to rate commercial fans is based on the sound pressure level at a distance of 1.5 m (5 ft) from the acoustic center of the fan in a hemispherical free field. The spherical sone used to rate residential fans is based on the sound pressure level at a distance 1.5 m (5 ft) from the acoustic center of the fan in a spherical free field.

#### B.2 Presentation of values

As a minimum, the spherical sone value shall be presented for the fan operating at a fan static pressure of 25 Pa (0.1 in. wg). Spherical sone values may be optionally presented for other operating points.

#### B.3 Calculation of loudness in spherical sones

All spherical sone values shall be calculated by the following method (based on ANSI S3.4-1980 (R1992) *Procedure for the Computation of Loudness of Noise*). Spherical sones may be calculated from either full or one-third octave band sound power levels.

For each octave or one-third octave band, convert the measured sound power levels from the inlet (outlet) in decibels (re  $1 \times 10^{-12}$  W) to sound pressure level at a distance 1.5 m (5 ft) from the acoustic center of the fan in a spherical free field using the following formula:

For ANSI/AMCA 300 or 320:

$$L_P = L_{Wmo} \text{ (or } L_{Wmi}) - 14.65$$

For octave band calculations:

Find the loudness index for each octave band sound pressure level in Table B.1. Add these loudness indices; multiply this sum by 0.3. Add to this 0.7 times the highest  $s$  value to obtain the total loudness ( $S$ ) in spherical sones.

$$S = 0.3 (s_1 + s_2 + s_3 + \dots + s_8) + 0.7 s_m$$

Where:

$S$  = total spherical sones

$s$  = octave band loudness index number

$s_m$  = highest octave band loudness index number.

For one-third octave band calculations:

Find the loudness index for each one-third octave band sound pressure level in Table B.2. Add these loudness indices; multiply this sum by 0.15. Add to this 0.85 times the highest  $s$  value to obtain the total loudness ( $S$ ) in spherical sones.

$$S = 0.15 (s_1 + s_2 + s_3 + \dots + s_{24}) + 0.85 s_m$$

Where:

$S$  = total spherical sones

$s$  = one-third octave band loudness index number

$s_m$  = highest one-third octave band loudness index number

**Table B.1 - Loudness Index Values as a Function of Band Pressure Level**

Band Pressure Level (db)	FULL OCTAVE BAND CENTER FREQUENCIES IN HERTZ							
	63	125	250	500	1000	2000	4000	8000
6								-0.02
7								0.02
8								0.06
9							-0.02	0.10
10							0.02	0.14
11							0.06	0.18
12						-0.02	0.10	0.22
13						0.02	0.14	0.26
14						0.06	0.18	0.30
15					-0.02	0.10	0.22	0.35
16					0.02	0.14	0.26	0.40
17					0.06	0.18	0.30	0.45
18					0.10	0.22	0.35	0.50
19					0.14	0.26	0.40	0.55
20				-0.03	0.18	0.30	0.45	0.61
21				0.02	0.22	0.35	0.50	0.67
22				0.07	0.26	0.40	0.55	0.73
23				0.12	0.30	0.45	0.61	0.80
24				0.16	0.35	0.50	0.67	0.87
25				0.21	0.40	0.55	0.73	0.94
26			-0.03	0.26	0.45	0.61	0.80	1.02
27			0.02	0.31	0.50	0.67	0.87	1.10
28			0.07	0.37	0.55	0.73	0.94	1.18
29			0.12	0.43	0.61	0.80	1.02	1.27
30			0.16	0.49	0.67	0.87	1.10	1.35
31			0.21	0.55	0.73	0.94	1.18	1.44
32		-0.03	0.26	0.61	0.80	1.02	1.27	1.54
33		0.02	0.31	0.67	0.87	1.10	1.35	1.64
34		0.07	0.37	0.73	0.94	1.18	1.44	1.75
35		0.12	0.43	0.80	1.02	1.27	1.54	1.87
36		0.16	0.49	0.87	1.10	1.35	1.64	1.99
37		0.21	0.55	0.94	1.18	1.44	1.75	2.11
38	-0.03	0.26	0.62	1.02	1.27	1.54	1.87	2.24
39	0.02	0.31	0.63	1.10	1.35	1.64	1.99	2.38
40	0.07	0.37	0.77	1.18	1.44	1.75	2.11	2.53
41	0.12	0.43	0.86	1.27	1.54	1.87	2.24	2.68
42	0.16	0.49	0.94	1.35	1.64	1.99	2.38	2.84
43	0.21	0.55	1.04	1.44	1.75	2.11	2.53	3.00
44	0.26	0.62	1.13	1.54	1.87	2.24	2.68	3.20
45	0.31	0.69	1.23	1.64	1.99	2.38	2.84	3.40
46	0.37	0.77	1.33	1.75	2.11	2.53	3.00	3.60
47	0.43	0.86	1.44	1.87	2.24	2.68	3.20	3.80
48	0.49	0.94	1.56	1.99	2.38	2.84	3.40	4.10
49	0.55	1.04	1.68	2.11	2.53	3.00	3.60	4.30
50	0.62	1.13	1.82	2.24	2.68	3.20	3.80	4.60
51	0.69	1.23	1.97	2.38	2.84	3.40	4.10	4.90
52	0.77	1.33	2.11	2.53	3.00	3.60	4.30	5.20
53	0.86	1.44	2.24	2.68	3.20	3.80	4.60	5.50
54	0.94	1.56	2.38	2.84	3.40	4.10	4.90	5.80
55	1.04	1.68	2.53	3.00	3.60	4.30	5.20	6.20
56	1.13	1.82	2.68	3.20	3.80	4.60	5.50	6.60
57	1.23	1.97	2.84	3.40	4.10	4.90	5.80	7.00
58	1.33	2.11	3.00	3.60	4.30	5.20	6.20	7.40
59	1.44	2.27	3.20	3.80	4.60	5.50	6.60	7.80
60	1.56	2.44	3.40	4.10	4.90	5.80	7.00	8.30
61	1.68	2.62	3.60	4.30	5.20	6.20	7.40	8.80
62	1.82	2.81	3.80	4.60	5.50	6.60	7.80	9.30
63	1.97	3.00	4.10	4.90	5.80	7.00	8.30	9.90
64	2.11	3.24	4.30	5.20	6.20	7.40	8.80	10.5
65	2.27	3.48	4.60	5.50	6.60	7.80	9.30	11.1
66	2.44	3.72	4.90	5.80	7.00	8.30	9.90	11.8
67	2.62	4.04	5.20	6.20	7.40	8.80	10.5	12.6
68	2.81	4.30	5.50	6.60	7.80	9.30	11.1	13.5
69	3.00	4.66	5.80	7.00	8.30	9.90	11.8	14.4
70	3.24	5.02	6.20	7.40	8.80	10.5	12.6	15.3
71	3.48	5.38	6.60	7.80	9.30	11.1	13.5	16.4

Band  
Pressure  
Level

FULL OCTAVE BAND CENTER FREQUENCIES IN HERTZ

(db)	63	125	250	500	1000	2000	4000	8000
72	3.72	5.74	7.00	8.30	9.90	11.8	14.4	17.5
73	4.04	6.20	7.40	8.80	10.5	12.6	15.3	18.7
74	4.30	6.60	7.80	9.30	11.1	13.5	16.4	20.0
75	4.66	7.00	8.30	9.90	11.8	14.4	17.5	21.4
76	5.02	7.40	8.80	10.5	12.6	15.3	18.7	23.0
77	5.38	7.80	9.30	11.1	13.5	16.4	20.0	24.7
78	5.74	8.30	9.90	11.8	14.4	17.5	21.4	26.5
79	6.20	8.80	10.5	12.6	15.3	18.7	23.0	28.5
80	6.68	9.30	11.1	13.5	16.4	20.0	24.7	30.5
81	7.16	9.90	11.8	14.4	17.5	21.4	26.5	33.0
82	7.64	10.5	12.6	15.3	18.7	23.0	28.5	35.3
83	8.20	11.1	13.5	16.4	20.0	24.7	30.5	38.0
84	8.80	11.8	14.4	17.5	21.4	26.5	33.0	41.0
85	9.42	12.6	15.3	18.7	23.0	28.5	35.3	44.0
86	10.1	13.5	16.4	20.0	24.7	30.5	38.0	48.0
87	10.9	14.4	17.5	21.4	26.5	33.0	41.0	52.0
88	11.7	15.3	18.7	23.0	28.5	35.3	44.0	56.0
89	12.6	16.4	20.0	24.7	30.5	38.0	48.0	61.0
90	13.7	17.5	21.4	26.5	33.0	41.0	52.0	66.0
91	14.8	18.7	23.0	28.5	35.3	44.0	56.0	71.0
92	16.0	20.0	24.7	30.5	38.0	48.0	61.0	77.0
93	17.3	21.4	26.5	33.0	41.0	52.0	66.0	83.0
94	18.7	23.0	28.5	35.3	44.0	56.0	71.0	90.0
95	20.0	24.7	30.5	38.0	48.0	61.0	77.0	97.0
96	21.4	26.5	33.0	41.0	52.0	66.0	83.0	105
97	23.0	28.5	35.3	44.0	56.0	71.0	90.0	113
98	24.7	30.5	38.0	48.0	61.0	77.0	97.0	121
99	26.5	33.0	41.0	52.0	66.0	83.0	105	130
100	28.5	35.3	44.0	56.0	71.0	90.0	110	139
101	30.5	38.0	48.0	61.0	77.0	97.0	121	149
102	33.0	41.0	52.0	66.0	83.0	105	130	160
103	35.3	44.0	56.0	71.0	90.0	113	139	171
104	38.0	48.0	61.0	77.0	97.0	121	149	184
105	41.0	52.0	66.0	83.0	105	130	160	197
106	44.0	56.0	71.0	90.0	113	139	171	211
107	48.0	61.0	77.0	97.0	121	149	184	226
108	52.0	66.0	83.0	105	130	160	197	242
109	56.0	71.0	90.0	113	139	171	211	260
110	61.0	77.0	97.0	121	149	184	226	278
111	66.0	84.0	105	130	160	197	242	298
112	71.0	90.0	113	139	171	211	260	
113	77.0	97.0	121	149	184	226	278	
114	83.0	105	130	160	197	242	298	
115	90.0	113	139	171	211	260		
116	97.0	121	149	184	226	278		
117	105	130	160	197	242	298		
118	113	139	171	211	260			
119	121	149	184	226	278			
120	130	160	197	242	298			
121	139	171	211	260				
122	149	184	226	278				
123	160	197	242	298				
124	171	211	260					
125	184	226	278					
126	197	242	298					
127	211	260						
128	226	278						
129	242	298						
130	260							
131	278							
132	298							
133								
134								



Band  
Pressure  
Level

1/3 OCTAVE BAND CENTER FREQUENCIES IN HERTZ

(db)	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	
72	2.81	3.24	3.72	4.30	5.02	5.74	6.20	6.60	7.00	7.40	7.80	8.30	8.80	9.30	9.90	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0
73	3.00	3.48	4.04	4.66	5.38	6.20	6.60	7.00	7.40	7.80	8.30	8.80	9.30	9.90	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0
74	3.24	3.72	4.30	5.02	5.74	6.60	7.00	7.40	7.80	8.30	8.80	9.30	9.90	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0
75	3.48	4.04	4.66	5.38	6.20	7.00	7.40	7.80	8.30	8.80	9.30	9.90	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0
76	3.72	4.30	5.02	5.74	6.68	7.40	7.80	8.30	8.80	9.30	9.90	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0
77	4.04	4.66	5.38	6.20	7.16	7.80	8.30	8.80	9.30	9.90	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0
78	4.30	5.02	5.74	6.68	7.64	8.30	8.80	9.30	9.90	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0
79	4.66	5.38	6.20	7.16	8.20	8.80	9.30	9.90	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
80	5.02	5.74	6.68	7.64	8.80	9.30	9.90	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
81	5.38	6.20	7.16	8.20	9.30	9.90	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
82	5.74	6.68	7.64	8.80	9.90	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
83	6.20	7.16	8.20	9.42	10.5	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
84	6.68	7.64	8.80	10.1	11.1	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
85	7.16	8.20	9.42	10.9	11.8	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
86	7.64	8.80	10.1	11.7	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
87	8.20	9.42	10.9	12.6	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
88	8.80	10.1	11.7	13.5	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
89	9.42	10.9	12.6	14.4	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
90	10.1	11.7	13.5	15.3	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
91	10.9	12.6	14.4	16.4	17.5	18.7	19.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
92	11.7	13.7	16.0	17.5	18.7	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
93	12.6	14.8	17.3	18.7	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
94	13.7	16.0	18.7	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
95	14.8	17.3	20.0	21.4	23.0	24.7	26.5	28.5	30.5	33.0	35.3	38.0	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121
96	16.0	18.7	21.4	23.0	24.7	26.5	28.5	30.5	33.0	35.3	38.0	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130
97	17.3	20.3	23.0	24.7	26.5	28.5	30.5	33.0	35.3	38.0	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140
98	18.7	22.0	24.7	26.5	28.5	30.5	33.0	35.3	38.0	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150
99	20.3	24.0	26.5	28.5	30.5	33.0	35.3	38.0	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160
100	22.0	26.1	28.5	30.5	33.0	35.3	38.0	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160	170
101	24.0	28.5	30.5	33.0	35.3	38.0	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160	170	180
102	26.1	30.5	33.0	35.3	38.0	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160	170	180	190
103	28.5	33.0	35.3	38.0	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160	170	180	190	200
104	31.0	35.3	38.0	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160	170	180	190	200	210
105	33.9	38.0	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160	170	180	190	200	210	220
106	36.9	41.0	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160	170	180	190	200	210	220	230
107	40.2	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160	170	180	190	200	210	220	230	240
108	44.0	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160	170	180	190	200	210	220	230	240	250
109	48.0	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160	170	180	190	200	210	220	230	240	250	260
110	52.0	56.0	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270
111	56.0	61.0	66.0	71.0	77.0	84.0	90.0	97.0	105	113	121	130	139	149	160	171	184	197	211	226	242	260	278	298	320	340	360
112	61.0	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	139	149	160	171	184	197	211	226	242	260	278	298	320	340	360	380
113	66.0	71.0	77.0	83.0	90.0	97.0	105	113	121	130	139	149	160	171	184	197	211	226	242	260	278	298	320	340	360	380	400
114	71.0	77.0	83.0	90.0	97.0	105	113	121	130	139	149	160	171	184	197	211	226	242	260	278	298	320	340	360	380	400	420
115	77.0	83.0	90.0	97.0	105	113	121	130	139	149	160	171	184	197	211	226	242	260	278	298	320	340	360	380	400	420	440
116	83.0	90.0	97.0	105	113	121	130	139	149	160	171	184	197	211	226	242	260	278	298	320	340	360	380	400	420	440	460
117	90.0	97.0	105	113	121	130	139	149	160	171	184	197	211	226	242	260	278	298	320	340	360	380	400	420	440	460	480
118	97.0	105	113	121	130	139	149	160	171	184	197	211	226	242	260	278	298	320	340	360	380	400	420	440	460	480	500
119	105	113	121	130	139	149	160	171	184	197	211	226	242	260	278	298	320	340	360	380	400	420	440	460	480	500	520
120	113	121	130	139	149	160	171	184	197	211	226																

## **Annex C**

# **Additional Requirements for the Sound Performance Licensing of Air Curtain Units (Normative)**

---

### **C.1 Introduction**

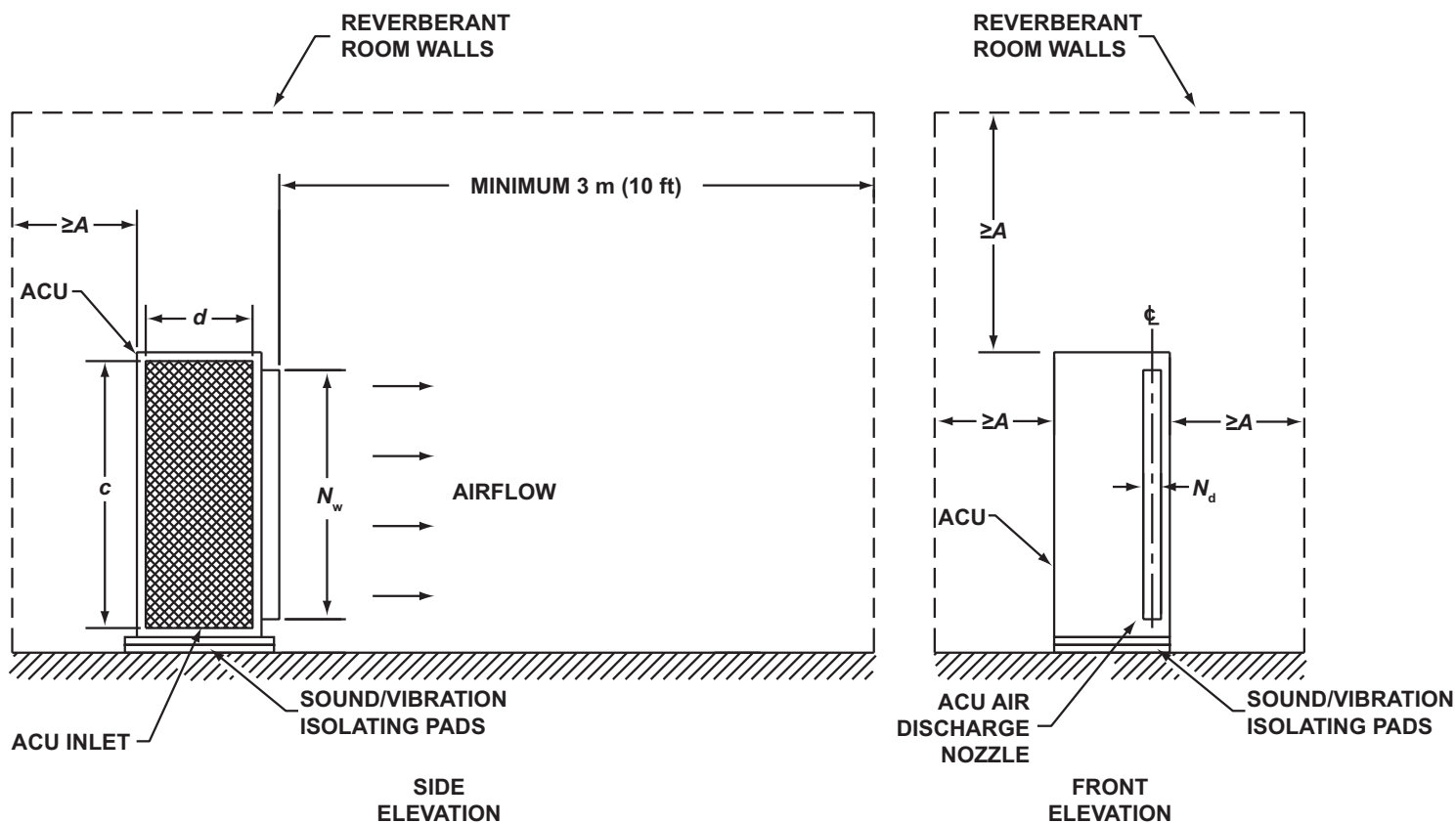
Sound performance ratings for Air Curtain Units are needed. The AMCA International Certified Ratings Program for Fan Sound Performance includes Air Curtain Units. However, the specific test setup for Air Curtain Unit (ACU) sound testing is not specified. In order to allow the buyer or specifier of ACUs to fairly compare sound rating information, a standardized test setup is required. In general, the Figure 1 test setup found in ANSI/AMCA 300-05 will be used. This annex will describe the specific setup requirements for an ACU. The requirements of ANSI/AMCA 300-05 shall continue to be met.

### **C.2 Definitions**

All definitions in ANSI/AMCA 220-05 apply herein.

### **C.3 ACU Test Setup**

The setup of the ACU will be in accordance with Figure C.1.



**Formulae:**

$A = 2$  Equivalent ACU Inlet Diameters

$$A = 4 \left( \frac{cd^*}{\pi} \right)^{0.5}$$

\* For ACU's without a rectangular inlet, substitute the actual value of the inlet area for  $cd$  in equation.

\* For ACU's with multiple inlets, substitute the sum of all inlet areas for  $cd$  in equation.

**Note:**

The reverberant room and placement of the ACU must meet all requirements of ANSI/AMCA 300.

**Figure C.1 - Air Curtain Unit Setup for Sound Certification**



## **AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.**

30 West University Drive  
Arlington Heights, IL 60004-1893 U.S.A.

Tel: (847) 394-0150 • Fax: (847) 253-0088  
E-Mail : [info@amca.org](mailto:info@amca.org) • Web: [www.amca.org](http://www.amca.org)

The Air Movement and control Association International, Inc. is a not-for-profit international association of the world's manufacturers of related air system equipment primarily, but limited to: fans, louvers, dampers, air curtains, airflow measurement stations, acoustic attenuators, and other air system components for the industrial, commercial and residential markets.