ANSI/AHRI Standard 250-2022 (SI)

2022 Standard for

Performance and Calibration of Reference Sound Sources

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IMPORTANT

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ICS Code: 17.140.01

Note:

This standard supersedes AHRI Standard 250-2013 with Addendum 1.

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Intent

This standard is intended for the guidance of the industry, including manufacturers, engineers, installers, contractors, and users.

Review and Amendment

This standard is subject to review and amendment as technology advances.

2022 Edition

This edition of ANSI/AHRI Standard 250-2022, *Performance and Calibration of Reference Sound Sources* was prepared by the Testing and Analysis Standards Technical Committee. It was approved by the Sound and Vibration Standards Subcommittee on 6 October 2022. It was approved as an American National Standard (ANS) on 13 June 2023.

Origin and Development of AHRI Standard 250

The standard was first published as ARI Standard 250-1999, *Performance and Calibration of Reference Sound Sources*. Subsequent publications were:

ARI Standard 250-2001, *Performance and Calibration of Reference Sound Sources*

ANSI/AHRI Standard 250-2008, *Performance and Calibration of Reference Sound Sources*

ANSI/AHRI Standard 250-2013, *Performance and Calibration of Reference Sound Sources*

AHRI Standard 250-2013 with Addendum 1, *Performance and Calibration of Reference Sound Sources*

Summary of Changes

ANSI/AHRI Standard 250-2022 (SI) contains the following updates to the previous edition:

- Incorporated the changes from Addendum 1 into the body of the standard.
- Harmonized AHRI Directivity Index Calculation (Section 5.8) and ISO Standard 6926 calculation
- Added rotational speed (± 0.5% RPM) and maintain the voltage (± 1 V) requirements to maintain 0.3 dB per Section 4.5.1

Committee Personnel

AHRI Standard 250-2022 (SI) Ad Hoc Group

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Paul Bauch Johnson Controls, Inc.	Product Manufacturer	Primary	PA, USA
Jim Kline Intertek	Testing Laboratory	Primary	NY, USA
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Testing and Analysis Standards Technical Committee Scope: The Testing and Analysis STC is responsible for development and maintenance of standards and guidelines related to procedures for testing, analysis, calibration of instrumentation, and qualification of test facilities for sound and vibration. This STC will also be responsible for topics not in scope of the other Sound & Vibration STCs.

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Sound and Vibration Standards Subcommittee Scope: Scope of the Sound & Vibration Standards Subcommittee is standards and guidelines related to sound and vibration for any AHRI product sector.

These lists represent the membership at the time the Standards Technical Committee and Standards Subcommittee were balloted on the final text of this edition. Since that time, changes in the membership may have occurred. Membership on these committees shall not in and of itself constitute an endorsement by the committee members or their employers of any document developed by the committee where the member serves.

Sound and Vibration Consensus Body List

Participant	Interest Category Classification	State / Country
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PERFORMANCE AND CALIBRATION OF REFERENCE SOUND SOURCES

Section 1. Purpose

The purpose of this standard is to establish the performance characteristics of a *reference sound source*, define the acoustical calibration procedures, and define the method for transfer of calibration from a *primary reference sound source* to a *secondary reference sound source*.

Section 2. Scope

This standard applies to all *reference sound sources* used in conjunction with AHRI sound rating standards and covers the one-third octave band frequency range from 50 to 10,000 *Hz*. This standard includes calibration over a limited frequency range 100 to 10,000 *Hz.*

Section 3. Definitions

All terms in this document shall follow the standard industry definitions in the ASHRAE Terminology website unless otherwise defined in this section. For acoustic related terms refer to ASA Standard Term Database.

3.1 Expressions of Provision

Terms that provide clear distinctions between requirements, recommendations, permissions, options, and capabilities.

3.1.1 "Can" or "cannot"

Express an option or capability.

3.1.2 "May"

Signifies a permission expressed by the document.

3.1.3 "Must"

Indication of unavoidable situations and does not mean that an external constraint referred to is a requirement of the document.

3.1.4 "Shall" or "shall not"

Indication of mandatory requirements to strictly conform to the standard and where deviation is not permitted.

3.1.5 "Should" or "should not"

Indication of recommendations rather than requirements. In the negative form, a recommendation is the expression of potential choices or courses of action that is not preferred but not prohibited.

3.2 Standard Specific Definitions

3.2.1 Acoustic Volume

Volume of the hemi-anechoic or anechoic room that extends all the way to the solid surfaces behind the absorptive lining.

3.2.2 Directivity Index (D_i)

An indicator, expressed in decibels (dB), of the non-uniform spatial sound radiation of the *reference sound source* being calibrated.

3.2.3 Hertz (Hz)

A unit of frequency in cycles per second.

3.2.4 Octave Band

A band of sound covering a range of frequencies such that the highest is twice the lowest as defined in ASA S1.11.

3.2.5 One-third Octave Band

A band of sound covering a range of frequencies such that the highest frequency is the cube root of two times the lowest frequency as defined in ASA S1.11.

3.2.6 Reference Sound Source (RSS)

A portable, aerodynamic sound source that produces a known stable broad band sound power output

3.2.7 Primary Reference Sound Source

A laboratory *RSS* whose sound power levels are determined by using the procedures as defined in Section 5.

3.2.8 Secondary Reference Sound Source

A laboratory *RSS* whose sound power levels are determined by using the transfer calibration procedure as defined in Section 6.

Section 4. Performance Requirements

4.1 Type of Sound Source

A portable, aerodynamic sound source that produces a known stable broadband sound power output.

4.2 Reference Sound Source Spectral Characteristics

The spectrum of the *RSS* shall be broadband and the spread of one-third octave band sound power levels of the *RSS* when calibrated over the frequency range of 50 – 10,000 *Hz* shall not exceed 16 dB. When the *reference sound source* is only calibrated over the frequency range of 100 to 10,000 *Hz* the spread of one-third octave band sound power levels of the *RSS* shall not exceed 12 dB. Regardless of the frequency range of calibration, the sound power levels in adjacent one-third octave bands within that range shall not deviate by more than 3 dB to reduce the probability of tones when tested in accordance with this standard.

4.3 Reference Sound Source Size

The largest dimension of the source shall not exceed 0.5 m.

4.4 Vibration Isolation

The *RSS* shall be equipped with elastomeric vibration isolation.

4.5 Temporal Steadiness and Repeatability of the Sound Power Output

The *reference sound source* shall be designed and constructed so that the sound power level in each *one-third octave band* is constant in time within the limits defined in Table 1 for the required measurement period. The values in Table 1 represent the expected repeatability of the measurements.

Table 1. RSS Sound Power Level Output Standard Deviations

Frequency Range, Hz	Sound Power Level Output Standard Deviation, dB
50 - 80	0.8
100 - 160	0.4
200 – 10,000	0.2

4.5.1 Sound Power Level Variation from Electrical Variation

The *RSS* sound power level in any *one-third octave band* shall not vary by more than ± 0.3 dB within the range of the source electrical power. The manufacturer of the *RSS* shall provide the tolerances of electrical input power to assure not more than a ± 0.3 dB deviation.

4.5.2 Sound Power Level Variation from Atmospheric Conditions

The sound power level of the *reference sound source* depends on the atmospheric pressure and temperatures along with the altitude. The manufacturer of the *RSS* shall provide correction values for these variables. Temperature and barometric pressure corrections shall be performed per Clause 8.4 of ISO 6926.

4.6 Directivity Index

The *directivity index* of the *reference sound source* in any *one-third octave band* within the frequency range of interest at any microphone height shall not exceed +6 dB. See Section 5.8 for procedure to determine *directivity index*.

Section 5. Primary Reference Sound Source Calibration Procedure

5.1 General

The *RSS* calibration procedure shall be carried out in accordance with the provisions of Section 5 for sound pressure measurements in a hemi-anechoic room. For low frequencies as defined in Appendix C the sound intensity method as defined in Appendix C can be used to supplement the hemi-anechoic room method. Calibration of the laboratory instrumentation system used for this procedure shall be verified at intervals in a calibration laboratory demonstrating traceability to appropriate standards.

5.2 Test Environment

The test environment shall be a hemi-anechoic space that has been qualified in accordance with the procedures of ISO 26101-1:2021 that meets the qualification requirements specified in ISO 26101-1:2021 Annex A, Table A.1. The reflecting plane shall extend at least 1 m beyond the projection of the measurement surface in all directions.

Note: The *acoustic volume* of the test chamber should be at least 280 cubic meters. Any room volume below this value can have problems qualifying in the low frequencies.

5.3 Microphone

A calibrated 12.7 mm (± 0.5 mm) free field microphone mounted with its axis 0° towards the *reference sound source* shall be used. The microphone frequency response shall be corrected to give a flat frequency response within 0.1 dB over the frequency range of interest.

5.4 Microphone Positions

The measurement surface shall be a hemisphere with a radius of 2 m. The center of this hemisphere shall be located on the floor directly below the center of the *RSS* fan wheel.

5.5 Microphone Path

The path to be used is defined as twenty coaxial, horizontal circular traverses on the surface of the 2 m radius hemisphere and around a vertical axis passing through the center of the *RSS* fan wheel. The traverse speed shall not exceed 1 rpm. The twenty coaxial, horizontal circular traverses shall start at a height of 0.025r (r = radius) starting from the floor and increase in 0.05r increments to 0.975r in Figure 1.

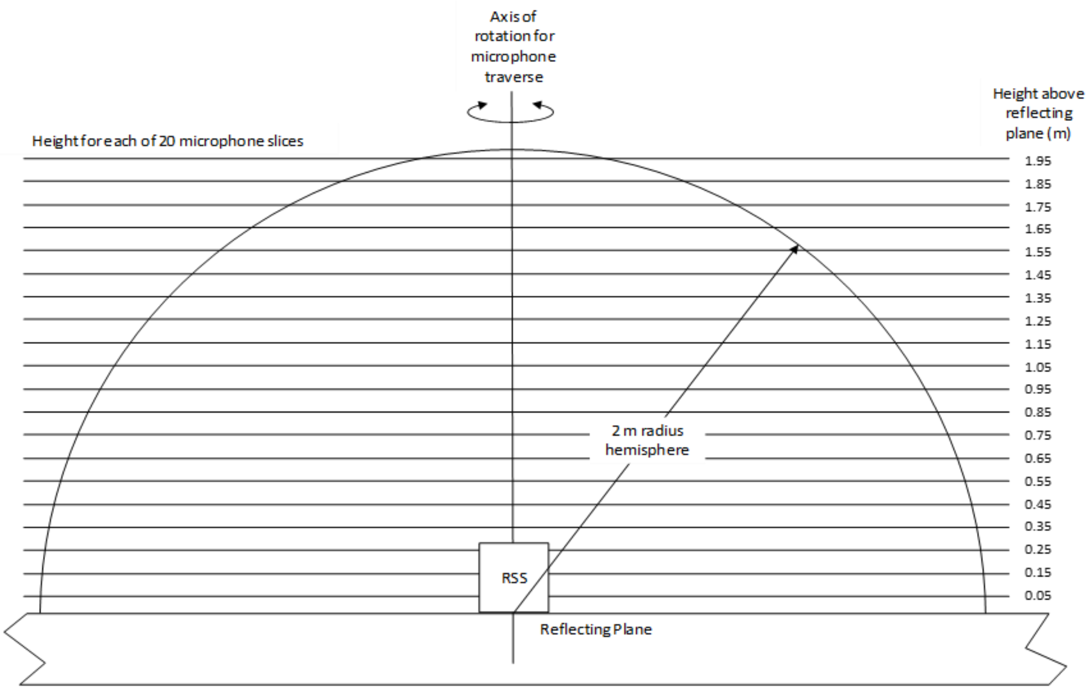

Figure 1. Microphone Path

The circular path can be achieved by uniformly rotating either the microphone or *RSS* through 360°. If the *RSS* is to be rotated, the top surface of the turntable shall be flush with the floor (rotational speed not to exceed 1 rpm).

5.6 Measurements

Measure the one-third octave band sound pressure level in accordance with ASA/ANSI S12.55 with an integration time equal to one complete revolution of the microphones or source. The measurements shall be taken to an accuracy of 0.1 dB over the frequency range of interest. Values to be recorded shall include L_{maxh} and L_{eqh}.

5.7 Calculations

The one-third octave band sound power levels shall be computed per ASA/ANSI S12.55 using the surface sound pressure levels calculated in accordance with ASA/ANSI S12.55 and they shall be rounded to the nearest 0.1dB.

5.8 Directivity Index Calculation

The maximum measured sound pressure level for each *one-third octave band* at each microphone height shall be used to compute the *directivity index*. The averaging time to determine the maximum level shall be one second.

The *directivity index* shall not be computed for the 0.05 m microphone height. The maximum calculated *directivity index* for each *one-third octave band* shall be published per Section 10 and calculated per Equation 1.

$$D_h = L_{max,h} - L_{eq,} \quad (1)$$

Where:

D_h = *Directivity index* for a given *one-third octave band*

$L_{max\ h}$ = Maximum measured sound pressure level for a given *one-third octave band* at a given microphone height

L_{eq} = Average sound pressure level for a given *one-third octave band* over the surface of the measurement hemisphere

Refer to Appendix D for an example.

5.9 Instrumentation and Equipment

The instrumentation and equipment shall meet the requirements of ASA/ANSI Standard S12.55.

5.10 Use of Windscreens

Windscreens shall not be used.

5.11 Calibration Over a Limited Range

This standard allows the *RSS* to be calibrated over a limited one third octave band frequency range from 100 to 10,000 *Hz*. If the *RSS* is calibrated over a limited range, then the range of calibration shall be reported.

Note: A limited range will not be allowed for certain AHRI standards.

Section 6. Secondary Reference Sound Source Transfer Calibration Procedure

6.1 Transfer Calibration

A method to calibrate secondary reference sound sources based on a primary reference sound source.

6.2 Test Environment

The test environment shall be a reverberation room meeting or exceeding the qualification requirements of AHRI Standard 220 over the frequency range of interest.

6.3 Reverberation Room Volumes

Minimum reverberation room volumes shall be as listed in Table 2.

Table 2 Minimum Reverberation Room Volume for Secondary RSS Transfer Calibration

Lowest One-third Octave Band of Interest, Hz	Minimum Reverberation Room Volume, m^3
50	280
100	200

6.4 Microphone(s) Location

Microphone(s) location shall be as per specified in AHRI Standard 220.

6.5 RSS Locations

The *reference sound sources* shall be placed in a minimum of four locations within the reverberation room for testing. The locations and the orientations shall be the same for each source and these locations shall be positions that were used in qualifying the reverberation room per AHRI Standard 220.

6.6 Measurements

The one-third octave band sound pressure levels shall be measured in accordance with AHRI Standard 220 for the *RSS*. The analyzer integration time shall be the same for all measurements and a minimum of sixty seconds. When using a traversing microphone, the analyzer integration time shall be equal to a whole number of microphone traverses. The analyzer used shall have a measurement resolution of at least 0.1 dB.

6.7 Calculations

One-third octave band sound power levels for the *RSS* shall be calculated by using the average of the measured sound pressure levels (rounded to the nearest 0.1 dB) of the *RSS*. The *RSS* sound power levels, L_{wSEC}, shall be computed and reported to the nearest 0.1 dB, as follows for each *one-third octave band* of interest in Equation 2.

$$L_{wSEC} = (L_{wPRI} - L_{pPRI}) + L_{pSEC} \qquad \mathbf{2}$$

Where:

L_{wPRI} = Sound power level of the *primary RSS*, dB

L_{pPRI} = Averaged sound pressure level of the *primary RSS*, dB

L_{pSEC} = Averaged sound pressure level of the *secondary RSS*, dB

6.8 Instrumentation and Equipment

Instrumentation and equipment shall meet or exceed the requirements of AHRI Standard 220.

6.9 Requirements

A transfer calibration shall be done only from the *primary RSS*. Transfer calibration shall only be done between sources with the same shaft orientation.

6.10 Transfer Calibration Over a Limited Range

This standard allows the *RSS* to be calibrated over a limited range of frequencies. If the *RSS* is calibrated over a limited range, then the range of calibration shall be reported.

Note: A limited range will not be allowed for certain AHRI standards.

Section 7. Test Requirements

7.1 Operating RPM and Voltage

To maintain the 0.3 dB requirements in Section 4.5.1, it is allowed to monitor the operating speed or line voltage, or both. Whichever is chosen shall be held to ± 0.5% RPM or ± 1 V during testing.

7.2 Environmental

The temperature shall be between 10°C and 30°C and during testing it shall not vary more than ± 3°C. The relative humidity shall be between 30% and 80% and during testing it shall not vary more than ± 5%.

7.3 Background Levels

Background ambient sound levels shall be at least 12 dB below the measured data for each *one-third octave band*. Measure the background sound levels before and after the test.

Section 8. Frequency of Calibration

8.1 Primary RSS Recalibration

A *primary RSS* shall be calibrated per Section 5 at intervals; not exceeding three years. If the change in observed sound pressure in the test room from the *RSS* exceeds the tolerance shown in Table 3, it shall be taken out of service until it has been recalibrated.

8.2 Secondary RSS Recalibration

Secondary RSSs shall be recalibrated per Section 6 at intervals; not exceeding three years. During day-to-day testing if the change in observed sound pressure in the test room from the *RSS* exceeds the tolerance shown in Table 3, it shall be either taken out of service until it has been recalibrated or determined that the differences are due to changes in the test environment.

Table 3. RSS Tolerance Levels

One-third Octave Band Frequency Range, Hz	Tolerance Level, dB
50 - 160	1.5
200 – 10,000	1.0

Section 9. Data and Information to be Reported

The following data and information shall be reported:

- Temperature, °C
- Relative humidity, %
- Barometric pressure, kPa
- Line voltage, V
- Line Frequency, *Hz*
- Rotational speed, rpm
- Location and orientation in the room
- Time and date
- Model, serial number and manufacturer of *RSS(s)*
- Test methods used
- Test personnel identification
- Model and serial number of all instruments used in testing and their calibration
- Laboratory identification where testing was done for each *RSS*
- Type of space (such as, hemi-anechoic) used for testing
- Physical dimensions of test space, (length, width, height), m
- Altitude of test site above sea level, m
- Type of microphone traverse and speed, m/s
- Description of test setup such as rotating the *RSS* or microphone.
- Information as described in Appendix C, if applicable.
- Measured one-third octave band sound pressure levels, and if applicable, sound intensity levels for the frequency range of interest, dB
- Calculated one-third octave band sound power levels for the frequency range of interest, dB
- Octave band and overall "A" and linear sound power levels calculated from the calculated one-third octave band sound power levels for the frequency range of interest, dB
- *Directivity index* for each *one-third octave band* within the frequency range of 100 *Hz* to 10,000 *Hz*
- Any adjustment(s) made to the data for environmental conditions

- Method(s) for correcting the sound power output of the *RSS* for extreme environmental conditions or altitudes, or both, and the uncertainties at these conditions
- Specified test procedure used for calibration of *RSS*

Section 10. Conformance Conditions

While conformance with this standard is voluntary, conformance shall not be claimed or implied for products or equipment within the standard's Purpose (Section 1) and Scope (Section 2) unless such product claims meet all of the requirements of the standard and all of the testing and rating requirements are measured and reported in complete compliance with the standard. Any product that has not met all the requirements of the standard cannot reference, state, or acknowledge the standard in any written, oral, or electronic communication.

APPENDIX A. REFERENCES - NORMATIVE

Listed here are all standards, handbooks and other publications essential to the formation and implementation of the standard. All references in this appendix are considered as part of the standard.

A.1. AHRI Standard 220-2022, *Reverberation Room Qualification and Testing Procedures for Determining Sound Power of HVAC Equipment*, 2022, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, USA.

A.2. ASA/ANSI S1.11-2014/Part 1/IEC 61260-1:2014 (R2019), *Electroacoustics - Octave-band and Fractional-octave band Filters - Part 1: Specifications (a nationally adopted international standard)*, 2014 (Reaffirmed 2019), Acoustical Society of America, 1305 Walt Whitman Road, Suite 300, Melville, NY 11747, USA.

A.3. ASA/ANSI S12.55-2012, ISO 3745:2012 (R2019), *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Precision methods for anechoic rooms and hemi-anechoic rooms (a nationally adopted international standard)*, 2012 (Reaffirmed 2019), Acoustical Society of America, 1305 Walt Whitman Road, Suite 300, Melville, NY 11747, USA.

A.4. ASA Standard Term Database. Acoustical Society of America. Accessed March 25, 2022. http://asastandards.org/asa-standard-term-database/.

A.5. ASHRAE Terminology. ASHRAE. Accessed December 16, 2021. https://www.ashrae.org/technical-resources/free-resources/ashrae-terminology.

A.6. ISO 6926:2016, Acoustics – *Requirements for the performance and calibration of reference sound sources used for the determination of sound power levels*, 2016, International Organization for Standardization, Case Postale 56, CH-1211, Geneva 21 Switzerland.

A.7. ISO 9614-1: 1993, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 1: Measurement at discrete points*, 1993, International Organization for Standardization, Case Postale 56, CH-1211, Geneva 21 Switzerland.

A.8. ISO 26101-1:2021, *Acoustics - Test Methods For The Qualification Of Free-Field Environments – Part 1: Qualification of free-field environments*, 2021, International Organization for Standardization, Case Postale 56, CH-1211, Geneva 21 Switzerland.

APPENDIX B. REFERENCES – INFORMATIVE

Listed here are standards, handbooks and other publications which may provide useful information and background but are not considered essential. References in this appendix are not considered part of the standard.

None.

APPENDIX C. ALTERNATIVE PRIMARY RSS CALIBRATION PROCEDURE – NORMATIVE

C.1. *General*

Calibration of the *RSS* in conformance with the provisions of Section 5 of this standard requires that the test environment shall be a hemi-anechoic space meeting the qualification requirements of ISO 26101-1:2021 over the entire frequency range of interest. Laboratories that would otherwise be able to perform the required calibration but are not qualified for measurements in the 63 *Hz octave band* (or 50, 63, and 80 *Hz* One-Third Octave Frequency Bands) can use the alternative procedure of this Appendix.

C.2. *Procedure*

The *RSS* calibration procedures found in Section 5 shall be carried out over the 50 to 10,000 *Hz* one-third octave band frequency range using sound pressure level measurements. These requirements are then duplicated in the 50 through 315 *Hz one-third octave bands* using sound intensity level measurements. Sound intensity level measurements shall be made in accordance with ISO 9614-1 using a spacer indicated by the probe manufacturer. The measurement positions and the measurement path of the intensity probe shall be per Clauses 5.4 and 5.5, and as shown in Figure 1 of this standard. For all measurements, the sound intensity level shall be measured in the outward radial direction. The sound power levels determined from the sound pressure level and sound intensity level measurements shall be compared. If these sound power levels differ by no more than the tolerance of Table 4, then the sound power levels determined from the sound intensity measurements shall be deemed valid and shall be the calibrated levels reported for the 50, 63 and 80 *Hz one-third octave bands*.

Table 4. Tolerance for Sound Power Level Difference

Octave Band, Hz	One-third Octave Band, Hz	Tolerance, dB
63	50 – 80	± 4.0
125-250	100 – 315	± 1.0

C.3. *Calculations*

The reported primary *RSS* sound power levels and *directivity index* shall be those determined by sound pressure measurements made in accordance with Section 5 for the 100 to 10,000 *Hz one-third octave bands* and 125 to 8000 *Hz octave bands*. For the 50 to 80 *Hz one-third octave bands* and 63 *Hz octave band*, the reported sound power level shall be determined from the sound intensity level measurements. The calibration report shall be marked to indicate the levels that were determined from sound intensity level measurements.

Note: Directivity index is not required to be determined for the 50 to 80 *Hz one-third octave bands* and 63 *Hz octave band*.

APPENDIX D. EXAMPLE FOR THE DETERMINATION OF THE DIRECTIVITY INDEX AND RESULTANT RSS CALIBRATION - INFORMATIVE

As described in Section 5.8, the *directivity index* is calculated using Equation 1. The *directivity index* for each height is the difference between the measured sound pressure levels at each height and the average sound pressure levels. Table 5 shows how the average sound pressure levels are determined for the 100 *Hz*, 125 *Hz*, and 160 *Hz one-third octave bands*. Table 6 shows the measured sound pressure levels at each microphone height. In Table 7, the *directivity indices* are calculated by subtracting the sound pressure level at each height from Table 6 from the average sound pressure level calculated in Table 5. The maximum *directivity index* for each frequency is shown at the bottom of Table 7. Table 8 presents the sound pressure level, conversion factor between sound pressure and sound power, the sound power level, and the *directivity index*.

Table 5. Example for the Determination of the Directivity Index and Resultant RSS Calibration

RSS Average Sound Pressure Levels in One-third Octave Bands, $L_{eq\ h}$			
Microphone Height, m	**100 Hz**	**125 Hz**	**160 Hz**
1.95	63.1	62.8	62.1
1.85	63.4	63.0	62.0
1.75	63.4	62.8	61.9
1.65	63.4	62.7	61.8
1.55	63.2	62.7	61.9
1.45	63.2	62.5	61.6
1.35	61.7	61.1	61.1
1.25	62.5	62.0	61.6
1.15	62.3	61.7	61.5
1.05	61.9	61.4	61.4
0.95	61.6	61.6	61.4
0.85	61.1	60.6	60.9
0.75	60.9	60.5	60.6
0.65	60.3	59.9	60.5
0.55	59.7	59.9	60.3
0.45	59.0	59.3	59.9
0.35	58.6	58.7	59.4
0.25	57.9	58.5	59.2
0.15	57.4	57.9	58.4
0.05	56.7	57.1	57.9
Surface L_{eq} (Avg)	61.5	61.2	60.9

Table 6. RSS Maximum Sound Pressure Levels in One-third Octave Bands, L_{pi}

Microphone Height, m	100 Hz	125 Hz	160 Hz
1.95	65.5	65.1	65.1
1.85	66.3	66.1	64.0
1.75	65.4	65.7	64.0
1.65	65.6	65.3	63.9
1.55	65.8	64.7	64.0
1.45	65.6	64.6	63.8
1.35	65.0	64.7	64.2
1.25	64.9	64.3	63.4
1.15	65.0	64.3	63.6
1.05	64.4	64.4	63.9
0.95	64.2	63.5	63.3
0.85	63.5	63.5	63.8
0.75	63.1	63.3	63.7
0.65	63.1	62.8	63.5
0.55	63.0	63.0	63.7
0.45	62.3	62.3	63.0
0.35	61.9	62.3	61.9
0.25	61.4	61.0	62.6
0.15	60.8	60.6	61.1
0.05	59.1	59.5	60.2

Table 7. RSS One-third Octave Bands Directivity Index, dB

Microphone Height, m	100 Hz	125 Hz	160 Hz
1.95	4.0	3.9	4.2
1.85	4.8	4.9	3.1
1.75	3.9	4.5	3.1
1.65	4.1	4.1	3.0
1.55	4.3	3.5	3.1
1.45	4.1	3.4	2.9
1.35	3.5	3.5	3.3
1.25	3.4	3.1	2.5
1.15	3.5	3.1	2.7
1.05	2.9	3.2	3.0
0.95	2.7	2.3	2.4
0.85	2.0	2.3	2.9
0.75	1.6	2.1	2.8
0.65	1.6	1.6	2.6
0.55	1.5	1.8	2.8
0.45	0.8	1.1	2.1
0.35	0.4	1.1	1.0
0.25	-0.1	-0.2	1.7
0.15	-0.7	-0.6	0.2
0.05	n/a*	n/a*	n/a*
Maximum *directivity index*, D_i	4.8	4.9	4.2
*Note: Not applicable, see Section 5.8			

Table 8. Resultant RSS Calibration Information[1]

Frequency, Hz	RSS Sound Pressure, L_p	Conversion from Lp to L_w	RSS Sound Power, L_w	Directivity Index, D_i
100	61.5	14.0	75.5	4.8
125	61.2	14.0	75.2	4.9
160	60.9	14.0	74.9	4.2

Note:
1) L_p to L_w conversion factor calculation = $10 \cdot \text{Log}(2 \cdot P_i \cdot r^2)$ where r is in meters