

AHRI Standard 270

**2015 Standard for
Sound Performance
Rating of Outdoor
Unitary Equipment**



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AHRI STANDARD 270-2015 WITH ADDENDUM 1, *Sound Performance Rating of Outdoor Unitary Equipment*

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Note: This addendum is not ANSI approved and is currently going through the process to become so.

Addendum 1 (dated March 2016) of AHRI Standard 270-2015, “*Changes to AHRI Standard 270-2015*” is provided as follows. The following changes have been incorporated (deletions are shown by ~~strikethroughs~~, additions are shown by **shading**) into the already published 2015 version of AHRI Standard 270 to avoid confusion.

The changes include:

- 1) The last sentence of Section 4.3.2 was removed.

4.3.2 *Outdoor-side Air Quantity.* All tests shall be made at the outdoor-side air quantity specified by the manufacturer where the fan drive is adjustable, or, where the fan drive is direct-connected, they shall be determined at the outdoor air quantity inherent to the unit when operated with all of the air resistance elements associated with inlet louvers and any duct work and attachments normally supplied as part of the unit. ~~Once established, the outdoor air circuit shall remain unchanged for all tests prescribed herein, except for the reduced ambient conditions operation (Refer to Section 5.5).~~

- 2) Edits to the second paragraph of Section 4.3.3.

For convenience, the standard (cooling) condition temperatures ~~the sound test temperatures~~ for Unitary Air-conditioners, VRF systems and Air-source Unitary Heat Pumps are listed below.

- 3) Edits to Section 5.1.2.

5.2.1 ~~Overall A-weighted Sound Power Level, L_{wA} , dB (100 Hz to 10,000 Hz are required, 50 Hz to 10,000 Hz are optional)~~ Overall A-weighted Sound Power Level, L_{wA} , dB covering the range of 100 Hz to 10,000 Hz (or optionally from 50 Hz to 10,000 Hz)

- 4) Section 5.5 was removed.

~~**5.5** *Reduced Ambient Conditions Operation.* For those units designed to automatically operate with lower noise levels during reduced ambient conditions, Standard Ratings shall also be determined with the unit operating at these lower sound levels per Section 4.3, except that the temperature entering and surrounding the outdoor portion of the unit shall be 26.5°C dry bulb (and 19.5°C wet bulb when condensate is rejected to the air stream).~~

IMPORTANT

SAFETY DISCLAIMER

AHRI does not set safety standards and does not certify or guarantee the safety of any products, components or systems designed, tested, rated, installed or operated in accordance with this standard/guideline. It is strongly recommended that products be designed, constructed, assembled, installed and operated in accordance with nationally recognized safety standards and code requirements appropriate for products covered by this standard/guideline.

AHRI uses its best efforts to develop standards/guidelines employing state-of-the-art and accepted industry practices. AHRI does not certify or guarantee that any tests conducted under its standards/guidelines will be non-hazardous or free from risk.

Note:

This standard supersedes AHRI Standard 270-2008.

Foreword

This standard references the sound intensity test method defined in ANSI/AHRI Standard 230, as an alternate method of test to the reverberation room test method defined in ANSI/AHRI Standard 220 for determination of sound power ratings.

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SOUND PERFORMANCE RATING OF OUTDOOR UNITARY EQUIPMENT

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish for outdoor unitary equipment: definitions; test requirements; rating requirements; minimum data requirements for Published Ratings; marking and nameplate data; and conformance conditions.

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

1.1.2 *Review and Amendment.* This standard is subject to review and amendment as technology advances.

Section 2. Scope

2.1 *Scope.* This standard applies to the outdoor sections of factory-made air-conditioning and heat pump equipment as defined in ANSI/AHRI Standard 210/240, ANSI/AHRI Standard 340/360 (cooling capacity ratings of equal to or less than 40.0 kW), ANSI/AHRI Standard 1230, ANSI/AHRI Standard 1160 (I-P), and ANSI/AHRI Standard 1161 (SI). Products covered include: Air-source Unitary Heat Pumps, Heat Pump Pool Heaters, Unitary Air-conditioners and Variable Refrigerant Flow (VRF) Systems.

Section 3. Definitions

All terms in this document will follow the standard industry definitions in the ASHRAE Terminology website (<https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology>) unless otherwise defined in this section.

3.1 *Air-source Unitary Heat Pump.* One or more factory-made assemblies which normally include an indoor conditioning coil(s), compressor(s), and outdoor coil(s), including means to provide a heating function. They shall provide the function of air heating with controlled temperature and may include the functions of air-cooling, air-circulating, air-cleaning, dehumidifying or humidifying. When such equipment is provided in more than one assembly, the separated assemblies shall be designed to be used together, and the requirements of rating outlined in the standard are based upon the use of matched assemblies.

3.2 *Heat Pump Pool Heater.* A factory-made assembly, which contains the air moving device, compressor, refrigerant-to-water heat exchanger and air-to-refrigerant heat exchanger using ambient air as the heat source. They shall provide the function of heating pool water to achieve a controlled temperature, but may include the functions of pool water cooling, air-heating, air cooling, air-circulating, air-cleaning, or dehumidifying. Models may consist of more than one assembly to be used together for the purpose of cooling and heating air. Models with separated assemblies shall be designed to be used together, and the requirements of rating outlined in this standard are based upon the use of matched assemblies.

3.3 *Hertz (Hz).* A unit of frequency equal to one cycle per second.

3.4 *Octave Band.* A band of sound covering a range of frequencies such that the highest is twice the lowest. The Octave Bands used in this standard are those defined in ANSI/ASA Standard S1.11.

3.5 *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. The One-third Octave Bands used in this standard are those defined in ANSI/ASA Standard S1.11.

3.6 *Published Rating.* A statement of the assigned values of those performance characteristics, under stated rating conditions, by which a unit may be chosen to fit its application. These values apply to all units of like nominal size and type

(identification) produced by the same manufacturer. As used herein, the term Published Rating includes the rating of all performance characteristics shown on the unit or published in specifications, advertising or other literature controlled by the manufacturer, at stated rating conditions.

3.6.1 Application Rating. A rating based on tests performed at application Rating Conditions (other than Standard Rating Conditions).

3.6.2 Standard Rating. A rating based on tests performed at Standard Rating Conditions.

3.7 Rating Conditions. Any set of operating conditions under which a single level of performance results, and which cause only that level of performance to occur.

3.7.1 Standard Rating Conditions. Rating Conditions used as the basis of comparison for performance characteristics.

3.8 Reference Sound Source (RSS). A portable, aerodynamic sound source that produces a known stable broadband sound.

3.9 “Shall” or “Should”. “Shall” or “should” shall be interpreted as follows:

3.9.1 Shall. Where “shall” or “shall not” is used for a provision specified, that provision is mandatory if compliance with the standard is claimed.

3.9.2 Should. “Should” is used to indicate provisions which are not mandatory but which are desirable as good practice.

3.10 Sound Power Level, L_w . Ten times the logarithm to the base ten of the ratio of the sound power radiated by the source to a reference sound power, expressed in decibels, dB. The reference sound power used in this standard is 1 picowatt, pW.

3.10.1 A-weighted Sound Power Level, L_{wA} . The logarithmic summation of A-weighted, one-third octave band Sound Power Levels.

3.11 Sound Pressure Level, L_p . Twenty times the logarithm to the base ten of the ratio of a given sound pressure to a reference sound pressure of 20 μ Pa, expressed in decibels, dB.

3.12 Sound Quality Indicator (SQI). The calculated metric determined when following the procedure contained in ANSI/AHRI Standard 1140 for quantifying sound quality whereby measured sound levels are weighted to adjust for psychoacoustic sensitivity to frequency distribution and any discreet tones which may be present and then converted to a single number Sound Quality Indicator.

3.13 Unitary Air-conditioner. One or more factory-made assemblies which normally include an evaporator or cooling coil(s), compressor(s) and condenser(s). Either alone or in combination with a heating plant, the functions are to provide air-circulation, air cleaning, cooling with controlled temperature and dehumidification, and may optionally include the function(s) of heating and/or humidifying. Where such equipment is provided in more than one assembly, the separated assemblies are to be designed to be used together, and the requirements of rating outlined in this standard are based upon the use of these assemblies in operation together.

3.14 Variable Refrigerant Flow (VRF) System. An engineered direct exchange (DX) multi-split system incorporating at least one variable capacity compressor distributing refrigerant through a piping network to multiple indoor fan coil units each capable of individual zone temperature control, through proprietary zone temperature control devices and common communications network. Variable refrigerant flow implies three or more steps of control on common, inter-connecting piping.

Section 4. Test Requirements

4.1 *Test Requirements.* All standard sound power level ratings shall be determined by tests conducted in a reverberation room or using sound intensity.

4.1.1 If the reverberation room method is used the room shall meet the requirements of and be qualified in accordance with ANSI/AHRI Standard 220 except as noted within the body of this standard. Sound Power Levels for the unit under test shall be determined per ANSI/AHRI Standard 220. A Reference Sound Source (RSS) shall be used that meets the performance requirements of and is calibrated per ANSI/AHRI Standard 250.

4.1.2 If the sound intensity method is used the test shall be conducted in accordance with ANSI/AHRI Standard 230.

4.1.3 Measured sound data shall be in One-third Octave Bands (100 Hz to 10,000 Hz are required, 50 Hz to 80 Hz are optional) in accordance with the procedures specified above for the method of test being used.

4.1.4 For packaged rooftop equipment with indoor fans, the volumetric flow rate, m³/s, and total static pressure, kPa gage, for the indoor fan(s) shall be recorded.

4.2 *Unit Installation.* The unit under test shall be located within the reverberation room as specified in ANSI/AHRI Standard 220.

4.2.1 *Unitary Air-conditioners and Air-source Unitary Heat Pumps.* Where applicable, unit supply and return ducting shall be acoustically treated to prevent sound radiating from them (refer to ANSI/AHRI Standards 260 (I-P) and 261 (SI) for guidance in duct construction). In the case of wall-mounted equipment, the mounting wall shall be of heavy masonry or equivalent construction, or an auxiliary mounting platform shall be provided to minimize wall vibration effects. Care must be taken to minimize the noise radiating from the connecting refrigerant piping on split systems.

4.2.2 *Heat Pump Pool Heaters and Water-source VRF Systems.* The installation includes water flow through the unit. The water pipe diameter shall match the nominal diameter of the unit connection. The water pipe shall be acoustically treated so that water flow noise through the pipe does not contribute to the unit sound rating.

4.3 *Unit Operation.* The unit under test shall operate as specified below in Sections 4.4.1 through 4.4.5.

4.3.1 *Electrical Characteristics.* Tests shall be performed at the nameplate rated voltage, phase, and frequency at the unit service connection. For units with dual nameplate voltage ratings, standard sound tests shall be performed at both voltages. The higher of the two ratings obtained shall be the AHRI standard sound rating or both ratings shall be published.

4.3.2 *Outdoor-side Air Quantity.* All tests shall be made at the outdoor-side air quantity specified by the manufacturer where the fan drive is adjustable, or, where the fan drive is direct-connected, they shall be determined at the outdoor air quantity inherent to the unit when operated with all of the air resistance elements associated with inlet louvers and any duct work and attachments normally supplied as part of the unit. ~~Once established, the outdoor air circuit shall remain unchanged for all tests prescribed herein, except for the reduced ambient conditions operation (Refer to Section 5.5).~~

4.3.3 *Unit Operation Requirements.* Standard sound ratings shall be based on sound tests conducted with the unit operating at rated voltage (V), phase, and frequency (Hz) as specified on the unit nameplate and measured at the service connection. The sound measurements shall be made with the equipment operating at the AHRI standard thermal rating conditions. All components required to produce the standard rating capacity under ANSI/AHRI Standard 210/240, ANSI/AHRI Standard 340/360, ANSI/AHRI Standard 1160 (I-P), ANSI/AHRI Standard 1161 (SI) or ANSI/AHRI Standard 1230 shall be operated while data is being taken and the test conditions shall be identical to the standard (cooling) condition temperatures specified in ANSI/AHRI Standard 210/240, ANSI/AHRI Standard 340/360, ANSI/AHRI Standard 1160 (I-P), ANSI/AHRI Standard 1161 (SI) or ANSI/AHRI Standard 1230.

For convenience, the standard (cooling) condition temperatures ~~the sound test temperatures~~ for Unitary Air-conditioners, VRF systems and Air-source Unitary Heat Pumps are listed below.

Air temperatures entering indoor side:

26.7°C ± 1.0°C (dry-bulb)
19.4°C ± 1.0°C (wet-bulb)

Air temperature entering outdoor side:

35.0°C dry-bulb (and 24.0°C wet-bulb when condensate is rejected to the air stream).

Water temperature entering the heat exchanger of a water-source VRF system:

30.0°C ± 1.0°C

For convenience, the sound test temperatures for Heat Pump Pool Heaters are listed below.

Air and water temperatures Heat Pump Pool Heaters:

Inlet Water Temperature:	26.7°C ± 1.0°C
Ambient Air Temperature (dry-bulb):	26.7°C ± 1.0°C
Ambient Air Temperature (wet-bulb):	24.0°C ± 1.0°C

4.3.3.1 For Heat Pump Pool Heaters: In an optional second step, the compression equipment and/or pump shall be turned off and sound readings taken with only the fan(s) operating. During this step, the temperature of the ambient air entering the unit shall be within 1.1°C of the temperature measured during compressor operation.

4.3.3.2 For water-source VRFs: In order to accurately capture the contribution of extraneous sources, compression equipment shall be turned off and sound ratings will be measured with the pump operating.

4.3.4 *Indoor-side Loading.* The indoor side loading shall be maintained as follows:

4.3.4.1 *Single-package Units.* Tests shall be conducted at the air quantity used for standard rating tests as specified in ANSI/AHRI Standard 210/240 or ANSI/AHRI Standard 340/360.

4.3.4.2 *Split-system Units.* The indoor refrigeration load shall be maintained at the values required to duplicate those found under standard rating tests as specified in ANSI/AHRI Standard 210/240, ANSI/AHRI Standard 340/360 or ANSI/AHRI Standard 1230.

4.3.5 *Test Condition Tolerances.* During sound rating tests, the equipment operating conditions shall not deviate from the specified operating conditions by more than the following tolerances:

Air Temperature:	± 1.0°C
Water Temperature:	± 1.0°C

Note: Water temperature tolerances apply to Heat Pump Pool Heaters.

When the indoor-side loading is simulated by a method not requiring air, the following tolerances apply:

Suction gas temperature at compressor:	± 3.0°C
Evaporator pressure:	± 15 kPa

Note: Suction gas temperature at the compressor is applicable only when the suction gas superheat is at least 5.5°C in the equivalent Standard Rating test specified in the AHRI standard for the equipment being tested.

4.4 *Air Velocity at Measurement Positions.* Sound measurements shall not be made when the air velocity over the microphone exceeds 5.6 m/s. A foam windscreen shall be installed on the microphone which shall not affect the microphone response by more than ± 1 dB for frequencies of 20 to 4,000 Hz or ± 1.5 dB for frequencies above 4,000 Hz.

4.5 *Test Method Measurement Reproducibility.* Sound Power Levels obtained from either reverberant room or sound intensity methods made in conformance with this standard are expected to result in measurement standard deviations which are

equal to or less than those in Table 1. For the reverberation room method this table represents the uncertainty that would result from using ANSI/AHRI Standard 220 and a Reference Sound Source calibrated per ANSI/AHRI Standard 250. For the sound intensity method the uncertainties in this table include uncertainty in the sound intensity measurement due to the test environment, background noise levels and selection of measurement points as defined in ANSI/AHRI Standard 230. The standard deviations in Table 1 do not account for variations of sound power caused by changes in operating conditions.

Table 1. Reproducibility in the Determination of Non-ducted Equipment Sound Power Levels		
Octave Band Center Frequency, Hz	One-third Octave Band Center Frequency, Hz	Maximum Standard Deviation of Reproducibility, dB
63	50 to 80	4.0
125	100 to 160	3.0
250	200 to 315	2.0
500 to 4,000	400 to 5,000	1.5
8,000	6,300 to 10,000	3.0
A-weighted 50-10,000, Hz		0.5 ¹
Note: 1) Applicable to a source which emits noise with a relatively “flat” spectrum in the frequency range 50 Hz to 10,000 Hz.		

Section 5. Rating Requirements

5.1 Introduction. The outdoor sound rating shall be for the complete unit operating and optionally for the unit operating with “fan(s) only.” The ratings shall comprise:

- 5.1.1 Un-weighted Octave Band Sound Power Levels, L_w , dB (125 Hz to 8,000 Hz are required, 63 Hz is optional)
- 5.1.2 ~~Overall A-weighted Sound Power Level, L_{wA} , dB (100 Hz to 10,000 Hz are required, 50 Hz to 10,000 Hz are optional)~~ Overall A-weighted Sound Power Level, L_{wA} , dB covering the range of 100 Hz to 10,000 Hz (or optionally from 50 Hz to 10,000 Hz)
- 5.1.3 Sound Quality Indicator (SQI) per ANSI/AHRI Standard 1140 (optional)
- 5.1.4 Un-weighted one-third Octave Band Sound Power Levels, dB (optional)

5.2 Determination of Outdoor Sound Power Level Ratings. The unit under test shall be installed as specified by Section 4.2 of this standard.

5.2.1 One-third Octave Band Sound Power Level Calculations. For the reverberation room method these unit levels shall be determined per ANSI/AHRI Standard 220 Section 6.5. For the sound intensity method the unit levels shall be determined per ANSI/AHRI Standard 230 Section 7.2 for discrete points and Section 7.3 for scanning.

5.2.2 Octave Band Sound Power Level Calculations. For the reverberation room method the octave band sound power level shall be determined per ANSI/AHRI Standard 220 Section 6.6. For the sound intensity method the octave band sound power level shall be determined per ANSI/AHRI Standard 230 Section 7.4.

5.2.3 A-weighted Sound Power Level Calculations. For the reverberation room method the A-weighted Sound Power Level shall be determined per ANSI/AHRI Standard 220 Section 6.7. For the sound intensity method the A-weighted Sound Power Level shall be determined per ANSI/AHRI Standard 230 Section 7.5.

The A-weighted Sound Power Level and octave band Sound Power Levels shall be rounded to the nearest decibel.

5.3 *Sound Quality Indicator Calculation (Optional).* An optional sound quality indicator can be used to describe the perceived character of the sound. If this option is desired, the Sound Quality Indicator of the outdoor unit shall be determined using in ANSI/AHRI Standard 1140. The SQI can be used for both full unit operation and fan(s) only operation.

5.4 *Rating Tolerances.* Any outdoor unitary equipment tested in accordance with this standard shall have Octave Band Sound Power Levels (L_w) and an overall A-weighted Sound Power Level (L_{wA}), not higher than their Published Ratings. This tolerance also applies to optional Sound Quality Indicator (SQI) or optional one-third octave band Sound Power Levels.

~~**5.5** *Reduced Ambient Conditions Operation.* For those units designed to automatically operate with lower noise levels during reduced ambient conditions, Standard Ratings shall also be determined with the unit operating at these lower sound levels per Section 4.3, except that the temperature entering and surrounding the outdoor portion of the unit shall be 26.5°C dry-bulb (and 19.5°C wet bulb when condensate is rejected to the air stream).~~

5.5 *Application Sound Ratings.* Application sound ratings for conditions other than the AHRI standard thermal rating condition shall be based on sound tests conducted with the equipment operating at those conditions.

Section 6. Minimum Data Requirements for Published Ratings

6.1 *Published Ratings.* Published sound power ratings shall be for the unit with all components running that are necessary to produce the AHRI standard thermal rating. Variable speed equipment shall be operated at constant speed for the duration of the test. For equipment with variable capacity compressors, the compressors shall be operated at rated and constant capacity for the duration of the test.

The sound power ratings shall include Sections 6.1.1 and 6.1.2 as listed below. Sections 6.1.3 and 6.1.4 are optional. Additionally, sound power data may be published for the unit operating with only the fan(s) running.

6.1.1 The un-weighted octave band Sound Power Levels to the nearest decibel from 125 Hz to 8,000 Hz (63 Hz is optional).

6.1.2 The overall A-weighted Sound Power Level to the nearest decibel covering the range of 100 Hz to 10,000 Hz (or optionally from 50 Hz to 10,000 Hz).

6.1.3 Optionally, the Sound Quality Indicator (SQI) may be published. The SQI shall be rounded to the nearest 0.1.

6.1.4 Optionally, the un-weighted one-third octave band Sound Power Levels to the nearest 0.1 decibel may be published.

6.2 *Standard Sound Rating.* When AHRI standard thermal rating conditions have been established for the equipment, a standard sound rating shall be published for the unit operating at those conditions, optionally accompanied by the same data for the unit operating with “fan(s) only.”

All claims to sound ratings within the scope of this standard shall include the statement “Rated in accordance with AHRI Standard 270”. All claims to ratings outside the scope of this standard shall include the statement “Outside the scope of AHRI Standard 270”. Wherever application sound ratings are published or printed, they shall include a statement of the thermal rating conditions, compressor speed, fan speed, and compressor loading conditions at which the ratings apply and be accompanied by the standard sound rating.

Section 7. Marking and Nameplate Data

7.1 *Marking and Nameplate Data.* As a minimum, the nameplate shall display the manufacturer's name, model designation, and electrical characteristics.

Nameplate voltages for 60 Hertz systems shall include one or more of the equipment nameplate voltage ratings shown in Table 1 of ANSI/AHRI Standard 110. Nameplate voltages for 50 Hertz systems shall include one or more of the utilization voltages shown in Table 1 of IEC Standard 60038.

Section 8. Conformance Conditions

8.1 *Conformance.* 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 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

A1 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 this standard.

A1.1 ANSI/AHRI Standard 110-2012, *Air-Conditioning and Refrigerating Equipment Nameplate Voltages*, 2012, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.2 ANSI/AHRI Standard 210/240-2008 with Addenda 1 and 2, *Performance Rating of Unitary Air-Conditioning and Air Source Heat Pump Equipment*, 2008, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.3 ANSI/AHRI Standard 220-2014, *Reverberation Room Qualification and Testing Procedures for Determining Sound Power of HVAC Equipment*, 2014, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.4 ANSI/AHRI Standard 230-2013, *Sound Intensity Testing Procedures for Determining Sound Power of HVAC Equipment*, 2013, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.5 ANSI/AHRI Standard 250-2008 with Addendum 1, *Performance and Calibration of Reference Sound Sources Equipment*, Air-Conditioning, Heating, and Refrigeration Institute, 2008, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.6 ANSI/AHRI Standard 260 (I-P)-2012, *Sound Rating of Ducted Air Moving and Conditioning Equipment*, 2012, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.7 ANSI/AHRI Standard 261 (SI)-2012, *Sound Rating of Ducted Air Moving and Conditioning Equipment*, 2012, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.8 ANSI/AHRI Standard 340/360-2015, *Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment*, 2015, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.9 ANSI/AHRI Standard 1140-2012, *Sound Quality Evaluation Procedures for Air-conditioning and Refrigeration Equipment*, 2012, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.10 ANSI/AHRI Standard 1160 (I-P)-2014 with Addendum 1, *Performance Rating of Heat Pump Pool Heaters*, 2014, Air-Conditioning, Heating and Refrigeration Institute, 2111 Wilson Blvd, Suite 500, Arlington, VA 22201, U.S.A.

A1.11 ANSI/AHRI Standard 1161 (SI)-2014 with Addendum 1, *Performance Rating of Heat Pump Pool Heaters*, 2014, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.12 ANSI/AHRI Standard 1230-2010 with Addendum 2, *Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-conditioning and Heat Pump Equipment*, 2010, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.13 ANSI/ASA Standard S1.11-2004 (R2009), *Specification for Octave-Band and Fractional Octave-Band Analog and Digital Filters*, 2009, American National Standards Institute, 25 West 43rd Street, 4th Fl., New York, NY 10036, U.S.A.

A1.14 ASHRAE *Terminology*, <https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology>, 2014, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329, U.S.A.

A1.15 IEC Standard 60038, *IEC Standard Voltages*, 2002, International Electrotechnical Commission, 3, rue de Varembe, P.O. Box 131, 1211 Geneva 20, Switzerland.

APPENDIX B. REFERENCES – INFORMATIVE

B1 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.