ANSI/AHRI Standard 350

2015 Standard for

Sound Performance Rating of Non-ducted Indoor Air-conditioning and Heat Pump Equipment

Approved by ANSI on July 15, 2016

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IMPORTANT

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Note:

This standard supersedes AHRI Standard 350-2008.

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.
- Provisions for addressing Concealed versus Exposed Equipment test configurations have been added.

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SOUND PERFORMANCE RATING OF NON-DUCTED INDOOR AIR-CONDITIONING AND HEAT PUMP EQUIPMENT

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish for Non-ducted Indoor Air-conditioning and Heat Pump 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 indoor portions of factory-made Non-ducted Air-conditioning and Heat Pump Equipment as defined in ANSI/AHRI Standards 210/240, 340/360, 310/380, 440 and 1230. Products covered include but are not limited to: fan coils, air-source unitary heat pumps as well as unitary air-conditioners, water-source heat pumps, packaged terminal equipment, 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 *Concealed Equipment.* Non-ducted Indoor Air-conditioning and Heat Pump Equipment that is designed to be located outside of the occupied space such that the casing radiated noise is acoustically isolated from the inlet and discharge sound. Refer to Appendix C for examples of various types of Concealed Equipment configurations.

3.2 *Exposed Equipment.* Non-ducted Indoor Air-conditioning and Heat Pump Equipment that is in the occupied space such that the casing radiated noise is included with the inlet and discharge sound. Refer to Appendix C for examples of various types of Exposed Equipment configurations.

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

3.4 *Non-ducted Indoor Air-conditioning and Heat Pump Equipment.* For the purposes of this standard, non-ducted equipment communicates with the occupied space by free delivery and inlet or through enclosed airways with lengths less than 1 effective duct diameter.

3.5 *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.

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

3.7 *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.

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

3.7.2 *Standard Rating.* A rating based on tests performed at Standard Rating Conditions.

3.8 *Reference Sound Source (RSS).* Portable, aerodynamic sound source that produces a known stable broad band sound power output as defined in ANSI/AHRI Standard 250.

3.9 *Reproducibility*. Deviations in test results are obtained with the same method on identical test items in different laboratories with different operators using different equipment.

3.10 *"Shall" or "Should".* "Shall" or "should" shall be interpreted as follows:

3.10.1 *Shall.* Where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with the standard is claimed.

3.10.2 *Should. "Should"* is used to indicate provisions which are not mandatory but which are desirable as good practice.

3.11 *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.

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

3.12 *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 μPa, expressed in decibels, dB.

3.13 *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 discrete tones which may be present and then converted to a single number Sound Quality Indicator.

Section 4. Test Requirements

4.1 *Test Requirements.* Unit Sound Power Level shall be determined by tests conducted in a reverberation room or using sound intensity.

4.1.1 If the reverberation room method is used, Sound Power Levels for the unit under test shall be determined according to ANSI/AHRI Standard 220. The reverberation 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. A RSS shall be used that meets the performance requirements and is calibrated per ANSI/AHRI Standard 250

4.1.2 If the sound intensity method is used, Sound Power Levels for the unit under 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. A record shall be made of the actual equipment thermal rating conditions under which the equipment was tested. In addition, the equipment volumetric flow rate, m^3/s, and external static pressure, kPa gage, shall be recorded.

4.2 *Setup of Equipment for Testing*. Equipment shall be mounted in a way that is representative of a design application of the product.

4.2.1 Position A (Figure 1) – Mounted away from wall.

4.2.2 Position B (Figure 1) – Mounted against or through the wall with the bottom of equipment on the floor. The equipment shall be mounted at the minimum manufacturer's recommended projection into the room.

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