ANSI/AHRI Standard 370

2011 Standard for

Sound Performance Rating of Large Air-Cooled Outdoor Refrigerating and Air-Conditioning Equipment

Approved American National Standard ANSI

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Note:

This standard supersedes AHRI Standard 370-2001 and differs in the following ways.

a. The single number overall A-weighted tone corrected sound power level rating has been replaced by ratings comprised of Sound Power Levels expressed in decibels.

   Required Ratings:
   - Un-weighted octave band Sound Power Levels, dB (63 Hz to 8,000 Hz);
   - Overall A-Weighted Sound Power Level, dB (A-weighted 50 Hz to 10,000 Hz).

   Optional Information:
   - Sound Quality Indicator (SQI) per AHRI Standard 1140;
   - Un-weighted one-third octave band Sound Power Levels, dB (50 Hz to 10,000 Hz).

b. This standard references AHRI Standard 220 for reverberation room qualification and testing replacing ISO 3741.

The AHRI Technical Committee on Sound is currently evaluating the use of sound intensity measurement methods to determine Sound Power Levels for possible inclusion as an alternate method into this standard in future revisions.

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SOUND PERFORMANCE RATING OF LARGE AIR-COOLED OUTDOOR REFRIGERATING AND AIR-CONDITIONING EQUIPMENT

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish methods for determining the sound ratings of the outdoor portions of factory-made commercial and industrial Large Air-Cooled Outdoor Refrigerating and Air-Conditioning Equipment. It establishes definitions; test requirements; rating requirements; minimum data requirements for Published Ratings; 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 air-cooled outdoor portions of factory-made commercial and industrial Large Air-Cooled Outdoor Refrigerating and Air-Conditioning Equipment greater than 40kW cooling capacity. This equipment is defined in Section 3 of this standard and covered by AHRI Standard 340/360, *Performance Rating of Commercial and Industrial Unitary Air-Conditioning* and *Heat Pump Equipment,* ANSI/AHRI Standard 365/366, *Commercial and Industrial Unitary Air-Conditioning Condensing Units,* ANSI/AHRI Standard 520, *Performance Rating of Positive Displacement Condensing Units,* ANSI/AHRI Standard 460, Performance Rating of Remote Mechanical-Draft Air-Cooled Refrigerant Condensers, AHRI Standard 490, *Remote Mechanical-Draft Evaporatively-Cooled Refrigerant Condensers,* and AHRI standard 550/590, *Performance Rating of Water Chilling Packages Using the Vapor Compression Cycle*.

2.2 *Exclusions.* This standard does not apply to the outdoor portions of unitary air-conditioning or heat pump equipment which fall within the scope of AHRI Standard 270, *Sound Rating of Outdoor Unitary Equipment* (cooling capacity ratings of less than 40 kW).

Section 3. Definitions

All terms in this document shall follow the standard industry definitions established in the current edition of *ASHRAE Terminology of Heating, Ventilation, Air-Conditioning and Refrigeration*, unless otherwise defined in this section.

3.1 *Comparison Method.* A method of determining Sound Power Level of the equipment under test in a reverberation room by comparing the average Sound Pressure Level of that equipment to the average Sound Pressure Level of a Reference Sound Source of known sound power level output. The difference in Sound Power Level is equal to the difference in Sound Pressure Level when conditions in the room are the same for both sets of measurements.

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

3.3 *Large Air-Cooled Outdoor Refrigerating and Air-Conditioning Equipment.* Equipment that consists of one or more assemblies, including an outdoor coil and outdoor fan, and which may include a compressor.

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 Standard S1.11.

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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 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 broad band sound power output.

3.9 *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 *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 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 Pa, expressed in decibels, dB.

3.13 *Sound Quality Indicator (SQI)*. The calculated metric determined when following the procedure contained in 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.

3.14 *Unit Under Test (UUT)*. HVAC equipment for which the sound power is to be determined.

Section 4. Test Requirements

4.1 *Test Requirements*. All standard sound power level ratings shall be determined by tests conducted in a qualified reverberation room, anechoic room, or an indoor or outdoor space that is an essentially free field over a reflecting plane.

4.1.1 Sound tests in a reverberation room shall be conducted in a reverberation room meeting the requirements of and is qualified per AHRI Standard 220. Sound tests shall be conducted in accordance with AHRI Standard 220 using a RSS that meets the performance requirements of and is calibrated per AHRI Standard 250.

4.1.2 Sound tests in a hemi-anechoic room which affords a free field condition above the measurement space or above a reflecting plane shall be conducted in accordance ISO 3745, as adapted for Large Air-Cooled Outdoor Refrigerating and Air-Conditioning Equipment in Appendix D of this standard.

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