AHRI Standard 1280

2014 Standard for

Sound Power Rating of Water-cooled Chillers

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2111 Wilson Boulevard, Suite 500
Arlington, VA 22201, USA
www.ahrinet.org
PH 703.524.8800
FX 703.562.1942

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Note:

This is a new standard.

At each of the four Integrated Part Load Value (IPLV) load points, the following ratings are required:

- 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:

- Un-weighted one-third octave band Sound Power Levels, dB (50 Hz to 10,000 Hz)

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SOUND POWER RATING OF WATER-COOLED CHILLERS

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish methods for determining the sound power ratings of commercial and industrial Water-cooled Chillers. It establishes 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 commercial and industrial Water-cooled Chillers used for refrigerating or air-conditioning of spaces, as defined in Section 3 of this standard and covered by ANSI/AHRI Standards 550/590 (I-P) and 551/591 (SI), *Performance Rating of Water Chilling Packages Using the Vapor Compression Cycle.*

2.2 *Exclusions.* This standard does not apply to air-cooled equipment, which falls within the scope of ANSI/AHRI Standard 270, *Sound Rating of Outdoor Unitary Equipment* and ANSI/AHRI Standard 370, *Sound Performance Rating of Large Outdoor Refrigerating and Air-conditioning Equipment.*

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 *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 *Integrated Part-Load Value (IPLV).* A single number part-load efficiency figure of merit calculated per the method described in ANSI/AHRI Standards 550/590 (I-P) and 551/591 (SI) at Standard Rating Conditions.

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.

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 IPLV rating conditions, by which a unit may be chosen to fit its application. These values apply to all units of like

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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 IPLV 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 IPLV 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 IPLV 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*" *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 are desirable as good practice.

3.10 *Sound Intensity*. The average sound power transmitted through a unit area.

3.11 *Sound Intensity Level, L_i*. This is ten times the logarithm to the base ten of the ratio of the Sound Intensity component radiated by the source to a reference Sound Intensity, expressed in decibels (dB). The reference Sound Intensity used in this standard is 1 picowatt per square meter, pW/m^2 (internationally recognized units). The sound intensity component is the value of the intensity vector, normal to a measurement surface, directed out of a volume enclosing the sound source.

3.12 *Sound Power Level, L_W.* This is 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).

3.12.1 *A-weighted Sound Power Level, L_{WA}*. The logarithmic summation of A-weighted, One-third Octave Band levels.

3.13 *Sound Pressure Level, L_P.* This is 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.

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

3.515 *Water-cooled Chiller.* A factory-made and prefabricated assembly (not necessarily shipped as one package) of one or more compressors, condensers and evaporators, with interconnections and accessories, designed for the purpose of cooling water. It is a machine specifically designed to make use of a vapor compression refrigeration cycle to remove heat from water and reject the heat to a cooling medium, usually water. The refrigerant condenser may or may not be an integral part of the package.

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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, hemi-anechoic room, or an indoor or outdoor space that is an essentially free field over a reflecting plane or by tests using Sound Intensity.

4.1.1 Sound tests in a reverberation room shall be conducted in a reverberation room meeting the requirements of and qualified per ANSI/AHRI Standard 220, as adapted for Water-cooled Chillers in Appendix E of this standard. Sound tests shall be conducted in accordance with ANSI/AHRI Standard 220 using a RSS that meets the performance requirements of and is calibrated per ANSI/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 with ISO 3745, as adapted for Water-cooled Chillers in Appendix F of this standard.

4.1.3 Sound tests in indoor or outdoor spaces that qualify as an essentially free field over a reflecting plane shall be conducted in accordance with ISO 3744, as adapted for Water-cooled Chillers in Appendix F of this standard.

4.1.4 Sound tests using Sound Intensity shall be conducted in accordance with AHRI Standard 230, as adapted for Water-cooled Chillers. For Water-cooled Chillers, the sound component of interest as discussed in Section 7 of ANSI/AHRI Standard 230 is the entire chiller. The measurement grid shall enclose the entire chiller.

4.2 *Test Conditions.* Standard sound ratings shall be based on sound tests conducted with the unit operating at the Rating Conditions specified in ANSI/AHRI Standard 550/590 (I-P) and ANSI/AHRI Standard 551/591 (SI). Sound tests shall be conducted as prescribed below:

4.2.1 *Standard Sound Ratings*. Standard sound ratings shall be based on sound tests conducted with the unit operating at voltage, V, phase and frequency, Hz, for each of the four load conditions required for IPLV determination.

4.2.2 *Application Sound Rating.* Application Sound Ratings are for conditions other than the AHRI standard rating conditions.

4.2.3 *Test Condition Tolerances*. During sound rating tests, the equipment operating conditions shall not deviate from the specified operating conditions by more than the tolerances specified in ANSI/AHRI Standard 550/590 (I-P) and ANSI/AHRI Standard 551/591 (SI).

4.3 *Data to be Taken.* Sound Pressure Level or Sound Intensity Level data taken shall be in One-third Octave Bands (50 Hz to 10,000 Hz are required) in accordance with the procedure specified for the type of test being conducted.

4.4 *Unit Installation*. The unit under test shall be located within the reverberation room as specified in ANSI/AHRI Standard 220 or per Appendix F when testing per Sections 4.1.2 or 4.1.3 of this standard or per Appendix H when testing per Section 4.1.4.

Section 5. Rating Requirements

5.1 *Product Ratings.* The Sound Power Rating shall be for the complete unit operating at AHRI Standard IPLV Rating Conditions.

5.1.1 At each of the four IPLV load points, the following ratings are required:

5.1.1.1 Un-weighted octave band Sound Power Levels, dB (63 Hz to 8,000 Hz)

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