AHRI Standard 575 (SI/I-P)

2017 (R2022) Standard for

Method of Measuring Machinery Sound Within an Equipment Space

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Foreword

This document establishes a uniform method of measuring and recording the sound levels produced by air-conditioning and refrigerating machinery installed in mechanical equipment spaces. However, it should be emphasized that this standard was developed for use where the test conditions usually cannot be controlled, e.g., ambient temperature; equipment loading; physical attributes of the space; background sound sources, etc. Since the results obtained may vary substantially, a tolerance on these results cannot be specified.

Uniform practices in making sound level measurements are necessary for effective communication between the owner, the architect, the acoustician, the consulting engineer, the contractor and the equipment manufacturer.

If ratings or specifications for sound power levels of water-cooled chillers are needed, AHRI Standard 1280 defines the proper procedure to obtain this information.

Specifications for sound levels produced by machinery may be written, both for the purpose of supplying information in order to evaluate compliance with noise exposure limits and for the purpose of providing information for adequate building design to meet the acoustical design goals of adjacent occupied spaces. In view of the geometrical and acoustical properties of large equipment, both purposes can be served by sound data expressed in terms of Sound Pressure Level measured close to the equipment.

This standard is based upon the procedures established in ANSI Standard S1.13.

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METHOD OF MEASURING MACHINERY SOUND WITHIN AN EQUIPMENT SPACE

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish for machinery installed in a mechanical equipment space: definitions; instruments; sound measurement and calculation procedures; machinery sound specifications and data presentation; system operating conditions; and conformance conditions. It is not the intent of this standard to be used for the sound rating of equipment.

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 water chilling systems, pumps and similar operating machines and parts thereof, which for reasons of size or operating characteristics are more practically evaluated in situ. Furthermore, this standard provides an indication of occupational exposure.

2.2 *Exclusions*. Measurements for sound power ratings for water-cooled chillers shall be conducted according to AHRI Standard 1280.

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 *A-weighted Sound Pressure Level.* The measured value obtained with a sound level meter using its A-weighting network.

3.2 *Key Measurement Points*. Locations on the measurement parallelepiped at the center of each vertical plane.

3.3 *Octave Band.* A band of sound covering a range of frequencies such that the highest is twice the lowest.

3.4 *Operating Conditions.* Those conditions specified for a particular installation. In general, they are those parameters listed in the job specification sheets for the particular equipment. Examples of parameters to be recorded are found on data forms in Appendix C.

3.5 *Representative A-weighted Sound Pressure Level (A_R).* An average A-weighted Sound Pressure Level from a measurement made with a majority of measurement points not affected by nearby reflective surfaces.

3.6 *Representative High Limit A-weighted Sound Pressure Levels (A_H).* An average A-weighted Sound Pressure Level from a measurement made with a majority of measurement points affected by reflections from nearby surfaces. The value represents an upper bound to the representative A-weighted value.

3.7 *Representative High Limit Octave Band Sound Pressure Level (OB_H).* An average Octave Band Sound Pressure Level calculated from a measurement made with more than two Key Measurement Points affected by reflections from nearby surfaces.

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3.8 *Representative Octave Band Sound Pressure Levels (OB_R).* An average Octave Band Sound Pressure Level calculated from a measurement made with two or less Key Measurement Points affected by reflections from nearby surfaces.

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 Pressure.* The difference between the pressure produced by an acoustic wave and the ambient air pressure. This quantity is a function of the source, its surroundings and distance to the receiver. It is measured by a microphone and perceived by the human ear.

3.11 *Sound Pressure Level.* Ratio of the Sound Pressure to a reference of 20 micropascals, expressed in decibels. The reference of 20 micropascals is the threshold of human hearing.

3.11.1 *Octave Band Sound Pressure Level.* A Sound Pressure Level measured when using an octave band filter as defined in ANSI/ASA Standard S1.11 Part 1.

3.12 *Uncertain Measurement Point.* A location where sound energy of other sources causes the observed value to be above its true value.

3.13 *Valid Measurement Point.* A location where other equipment or adjacent surfaces do not significantly affect the value observed.

Section 4. Instruments

4.1 *Sound Pressure Measurement Hardware.* A meter meeting the requirements of the Type 1 meter described in ANSI Standard S1.4 or an equivalent spectrum analyzer, data acquisition system and microphone(s) combination shall be used.

4.2 *Calibration.* During each series of measurements, an acoustical calibrator with an accuracy of ±0.5 dB shall be applied to the microphone for checking the calibration of the entire measuring system at one or more frequencies over the frequency range of interest. The calibrator shall be checked at the manufacturer's recommended intervals or at least once every year to verify that its output has not changed. In addition, an electrical calibration of the instrumentation system over the entire frequency range of interest shall be performed periodically as recommended by the manufacturer, but at intervals of not more than two years.

Section 5. Sound Measurements and Calculation Procedures

5.1 *Measurements.*

5.1.1 *Measurement Points.* The measurement points shall be determined relative to a reference parallelepiped, which is the smallest imaginary rectangular parallelepiped that will enclose the machine, shown in Figure 1. Minor projections from the machine are disregarded in determining the size of the reference parallelepiped.

The measurement points shall be positioned on the surface of a measurement parallelepiped whose planes are one meter out from the vertical sides of the reference parallelepiped. Key Measurement Points are located at the center of each vertical plane of the measurement parallelepiped. The remaining measurement points are at one meter intervals on the measurement planes starting from the Key Measurement Points. All measurement points are at a height of 1.5 m from the floor. If the shortest distance between two measurement

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