AHRI Standard 640 (I-P)

2017 Standard for

Performance Rating of Commercial and Industrial Humidifiers

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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 ANSI/AHRI Standard 640-2005.
For SI ratings, see AHRI Standard 641 (SI)-2017.

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TABLE OF CONTENTS

SECTION PAGE

Section 1. Purpose....1

Section 2. Scope....1

Section 3. Definitions....1

Section 4. Test Requirements....3

Section 5. Rating Requirements....4

Section 6. Minimum Data Requirements for Published Ratings....5

Section 7. Marking and Nameplate Data....6

Section 8. Conformance Conditions....6

TABLES

Table 1. Capacity Rating Multiples....4

Table 2. Conditions for Standard Rating Tests for Group 1 (Adiabatic)....4

Table 3. Conditions for Standard Rating Tests for Group 2 (Isothermal)....5

APPENDICES

Appendix A. References - Normative....7

Appendix B. References - Informative....7

Appendix C. Method of Test for Adiabatic Commercial and Industrial Humidifiers - Normative....8

FIGURES FOR APPENDICES

Figure C1. Test Apparatus for Air Distribution Systems....10

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PERFORMANCE RATING OF COMMERCIAL AND INDUSTRIAL HUMIDIFIERS

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish for Commercial and Industrial Humidifiers: definitions; classifications; 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 factory-made Commercial and Industrial Humidifiers, as defined in Section 3.

2.1.1 *Energy Source.* This standard applies to electric, gas, or hot water operated Commercial and Industrial Humidifiers including those that utilize steam from a central steam boiler.

2.1.2 *Installation.* Commercial and Industrial Humidifiers are intended for central air systems or direct in-space applications and may be installed in a mechanical room or outdoors.

2.2 *Exclusions.* This standard does not apply to the following:

2.2.1 Residential Central system humidifiers as defined in the ANSI/AHRI Standard 610.
2.2.2 Residential self-contained humidifiers as defined in ANSI/AHRI Standard 620.
2.2.3 Portable residential humidifiers as defined in ANSI/AHAM HU-1.

Section 3. Definitions

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

3.1 *Commercial and Industrial Humidifier (Humidifier).* A device designed to add moisture to air in a room, space, or ventilation system other than residential applications.

3.1.1 *Adiabatic Humidifiers.* A type of Humidifier intended for duct applications in which water is reduced to minute particles and dispersed to air as a fine mist.

3.1.1.1 *Centrifugal Type Atomizer.* Utilizes a high-speed disk to sling water to its rim where it is thrown onto plates or a comb to produce a fine mist.

3.1.1.2 *Nozzle Type Atomizers*. Utilizes a nozzle, compressed-air, water, or air and water, to reduce water to a fine mist.

3.1.1.2.1 *Compressed Air*. Compressed air is forced through an annular orifice at the nozzle tip creating a vortex at the tip. Water is forced through the center orifice of the nozzle where it is atomized on contact with the compressed air at the nozzle tip.

3.1.1.2.2 *Compressed Air and Water.* Compressed air and water are combined inside the nozzle to produce a fine mist at the nozzle tip.

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3.1.1.2.3 *Pressurized Water.* A volumetric pump is used to force water through the orifice of a nozzle to produce a fine mist at the nozzle tip.

3.1.1.3 *Ultrasonic Atomizer*. A piezoelectric transducer immersed in a reservoir of mineral free water. The transducer converts a high-frequency electronic signal into a high-frequency mechanical oscillation. The mechanical oscillation is directed at the surface of the water, where at very high frequencies it creates a fine mist.

3.1.1.4 *Wetted Media*. Utilize a porous core in the process of evaporation. Water is circulated over the media and air is blown through the opening.

3.1.2 *Isothermal Humidifier* A type of Humidifier in which energy is added to water which convert it to steam.

3.1.2.1 *Direct Injection Steam Humidifiers.* A type of Humidifier intended for duct applications in which steam, water vapor under pressure and at high temperature, is dispersed directly into the air. This includes products such as Steam Cup Type, Steam Separator Type, and Steam Panel Type humidifiers as defined below.

3.1.2.1.1 *Steam Cup Type*. Utilizes a cup and drain mounted beneath the duct. Steam is injected into the sides of a cup allowing most of the moisture of the steam to enter into the air while permitting the condensate to fall into the cup by gravity and into the steam trap.

3.1.2.1.2 *Steam Separator Type*. Utilizes an enclosed distribution pipe, a separating chamber, an integral control valve, and a drain to distribute steam into the air. Steam is injected directly into the enclosed distribution pipe providing reheat to the outgoing steam passing through the distributor pipe before being released into the air. The steam then enters the separating chamber which allows dry steam to pass through the control valve and into the distributor pipe while allowing condensate to fall by gravity into the drain. The moisture of the steam is reheated while in the distributor pipe before being dispersed into the air.

3.1.2.1.3 *Steam Panel Type.* Unit consists of a header with multiple distributor pipes, and a drain. The control valve regulates the amount of steam that is injected into the header, which allows dry steam to pass into the distributor pipe(s) while allowing condensate to escape through the drain. The moisture of the steam in the distributor pipe(s) is dispersed into the air.

3.1.2.2 *Packaged Self Contained Electric.* A type of Humidifier which converts tank water to steam using electricity. The steam is dispersed into a duct system through dispersion manifolds. If the Humidifier is a free standing unit, the steam is dispersed directly into the air space through a fan unit.

3.1.2.2.1 *Electrode Type.* Utilizes an electric current passing through the water to create heat energy to produce steam.

3.1.2.2.2 *Resistance Type.* Utilizes one or more electrical elements to heat the water directly to produce steam.

3.1.2.3 *Packaged Self Contained Gas Type.* Utilizes a gaseous fuel (e.g. natural gas, propane) as the fuel source for boiling water and generating to steam at atmospheric pressure. The steam is dispersed into a duct system through dispersion manifolds. If the Humidifier is a free standing unit, the steam is dispersed directly into the air space through a fan unit.

3.1.2.4 *Packaged Self Contained Heated Tank Humidifiers*. A type of Humidifier which converts tank water to steam using an energy source other than electricity or gas. The steam is dispersed into a duct system through a distributor tube dispersion manifolds. If the Humidifier is a free standing unit, the steam can also be dispersed directly into the air space through a fan unit.

3.1.2.4.1 *Steam-to-Steam Type*. Utilizes steam from a central boiler passing through a heat exchanger submersed in water to produce steam.

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3.1.2.4.2 *Liquid-to-Steam Type*. Utilizes a high temperature liquid from an auxiliary source passing through a heat exchanger submersed in water to produce steam.

3.2 *Humidification Capacity.* The capacity associated with a Humidifier's ability to add moisture to air expressed in lb/h of continuous operation.

3.3 *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. 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.

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

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

3.4 *Rating Conditions.* Any set of operating conditions under which a single level of performance results and which causes only that level of performance to occur.

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

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

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

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

3.6 *Supplementary Heat.* Heat used to enhance evaporation when used in the recirculating system or to heat water for direct evaporation.

3.7 *Relative Humidity (RH).* The ratio of the mole fraction of water vapor to the mole fraction of water vapor saturated at the same temperature and barometric pressure.

Section 4. Test Requirements

4.1 *Test Requirements.* For Adiabatic Humidifiers, all Standard Ratings shall be verified by tests conducted in accordance with Appendix C and at the Rating Conditions in Section 5. For Isothermal Humidifiers, all Standard Ratings shall be verified by tests conducted in accordance with ANSI/ASHRAE Standard 164.3 and at the Rating Conditions in Section 5.

4.1.1 *Equipment.* Humidifiers shall be installed and tested using all components as recommended by the manufacturer.

4.1.2 *Electrical Conditions.* Nameplate voltages for 50 Hz and 60 Hz systems are shown in AHRI Standard 110. Tests shall be performed at the nameplate rated voltage and frequency unless otherwise specified in this standard.

For all dual nameplate voltage equipment covered by this standard, tests shall be performed at both voltages or at the lower voltage if only a single rating is to be published.

4.1.3 *Number of Tests (Isothermal)* If a single product is rated in accordance with AHRI Standard 640 (I-P), that model shall be tested. If a product line is rated in accordance with AHRI Standard 640 (I-P), a representative sample of at least three different units, that include the highest and lowest capacity of the product line shall be tested with ratings of untested products being interpolated.

4.1.4 *Number of Tests (Adiabatic)* If a single product is rated in accordance with AHRI Standard 640 (I-P), that model

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