AHRI Standard 840
(formerly ARI Standard 840)

1998 Standard for

Unit Ventilators

Air-Conditioning, Heating, and Refrigeration Institute

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IMPORTANT

SAFETY RECOMMENDATIONS

It is strongly recommended that the product be designed, constructed, assembled and installed in accordance with nationally recognized safety requirements appropriate for products covered by this standard.

AHRI, as a manufacturers' trade association, uses its best efforts to develop standards employing state-of-the-art and accepted industry practices. However, AHRI does not certify or guarantee safety of any products, components or systems designed, tested, rated, installed or operated in accordance with these standards or that any tests conducted under its standards will be non-hazardous or free from risk.

Note:

This is a new standard.

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UNIT VENTILATORS

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish, for unit ventilators: definitions; classifications; testing and rating requirements; minimum data requirements for published ratings; performance requirements; operating requirements; 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 all factory-made equipment as defined in the following standards which also meet the requirements of 3.4 and are labeled as a unit ventilator.

a. Room fan-coil air-conditioners, AHRI Standard 440 (formerly ARI Standard 440).
b. Packaged terminal air-conditioners, AHRI Standard 310/380 (formerly ARI Standard 310/380).
c. Unitary air-conditioners and heat pump units, AHRI Standard 210/240 (formerly ARI Standard 210/240).
d. Water-source heat pumps, AHRI Standard 320 (formerly ARI Standard 320).
e. Ground water-source heat pumps, AHRI Standard 325 (formerly ARI Standard 325).
f. Ground source closed-loop heat pumps, AHRI Standard 330 (formerly ARI Standard 330).

2.2 *Exclusions.* This standard does not apply to equipment as defined in the following standards:

a. Room air-conditioners, AHAM Standard RAC-1 or ANSI Standard Z234.1.
b. Central-station air-handling units, AHRI Standard 430 (formerly ARI Standard 430).

Section 3. Definitions

3.1 *Definitions.* All terms in this document will 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.

3.2 *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.

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

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

3.3 *"Shall," "Should," " Recommended" or "It Is Recommended."* "Shall," "should," "recommended" or "it is recommended" shall be interpreted as follows:

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

3.3.2 *Should, Recommended or It Is Recommended.* "Should," "recommended" or "it is recommended" is used to indicate provisions which are not mandatory but which are desirable as good practice.

3.4 *Unit Ventilator.* A factory-made assembly, equipped with outside air ventilation and return air dampers capable of introducing ventilation air of at least 80% of rated Standard Air Flow, while also having the capability to provide any combination of the following functions: humidity control, heating or cooling, and filtering of air. The source of humidity control, heating or cooling supplementary to that from ventilation air, may be remote or an integral part of the unit itself. This equipment is designed for free delivery of air into a room, but may be applied with minimal ductwork having a static resistance not exceeding 0.50 in. H_2O [125 Pa]. This equipment can be either vertical floor standing or horizontally mounted, in or adjacent to the space it serves. This equipment is provided with air capacities of 3000 cfm [1416 m^3/s] or less.

Table 1. Arrangement of Unit Ventilators

Description	Cooling/Heating	AHRI Standard	Arrangement
Self-Contained Unit Ventilator	Vapor Compression/Vapor Compression & (backup heat) (electric) (hydronic) (steam)	310/380	I.D. Fan I.D. Coils O.D. Fan Comp* O.D. Coil
	Vapor Compression/electric Vapor Compression/hydronic Vapor Compression/steam Vapor Compression/none	310/380	I.D. Fan I.D. Coils O.D. Fan Comp* O.D. Coil
Water-Source Self Contained Unit Ventilator	Vapor Compression/Vapor Compression & (backup heat) (electric)	320, 325 and 330	I.D. Fan I.D. Coil(s) Comp Water/ Refrigerant Coil
Fan-Coil Unit Ventilator	Vapor Compression/electric Vapor Compression/hydronic Vapor Compression/steam Vapor Compression/none	210/240	I.D. Fan I.D. Coil(s) O.D. Fan Comp O.D. Coil
	Vapor Compression/Vapor Compression & (backup heat) (electric) (hydronic) (steam)	210/240	
	hydronic/electric hydronic/hydronic hydronic/steam hydronic/none	440	I.D. Fan I.D. Coil(s)

* Compressor may be indoors or outdoors.

3.4.1 *Self-Contained Unit Ventilators.* Any equipment as defined in AHRI Standard 310/380 (formerly ARI Standard 310/380) with ventilation capabilities as defined in 3.4.

3.4.2 *Water-Source Self-Contained Unit Ventilators.* Any equipment as defined in AHRI Standards 320, 325, or 330 (formerly ARI Standards 320, 325, or 330) with ventilation capabilities as defined in 3.4.

3.4.3 *Fan-Coil Unit Ventilators.* Any equipment as defined in AHRI Standards 440 or 210/240 (formerly ARI Standards 440 or 210/240) with ventilation capabilities as defined in 3.4.

Section 4. Classifications

4.1 *Methods of Classification.* Unit ventilators may be classified according to the following (see arrangements in Table 1):

4.1.1 By mounting arrangement

a. Vertical, floor or wall mounted
b. Horizontal, ceiling mounted

4.1.2 By methods of capacity control

a. Damper Control
b. Non-Damper Control

4.1.3 By method of providing heating

a. Hydronic
b. Steam
c. Electric elements
d. Heat pump

4.1.4 By method of providing mechanical cooling

4.1.4.1 Hydronic

4.1.4.2 Direct Expansion

a. Single package
b. Split system

4.1.5 By humidity control

a. Dehumidification
b. Humidification

Section 5. Testing and Rating Requirements

5.1 *Standard Ratings.*

5.1.1 *Standard Performance Ratings.* All applicable cooling capacity, heating capacity, power input, efficiency, standard air flow, fluid flow, and pressure drop ratings shall be verified by tests conducted at the Standard Rating Conditions, in accordance with the applicable standard(s) referenced in 3.4.1, 3.4.2, and 3.4.3.

5.1.2 *Standard Ventilation Rate.* The Standard Ventilation Rate, expressed in percent, shall be determined in accordance with ANSI/ASHRAE Standard 79 by conducting two separate tests at the conditions specified in Table 2. References may also be made to ANSI/ASHRAE Standard 79 for a typical duct connection arrangement.

5.2 *Electrical Conditions.* All Standard Rating tests shall be performed at the nameplate rated voltage and frequency. For units with dual nameplate voltage ratings, standard rating tests shall be performed at both voltages, or at the lower of the two voltages, if only a single standard rating is to be published.

Table 2. Air Flow Testing Conditions		
	Room Air Test	Ventilation Air Test
Inlet Air Temperature	70°F [21.1°C] to 80°F [26.7°C] dry bulb	70°F [21.1°C] to 80°F [26.7°C] dry bulb
Heating or Cooling Means	Not in Operation	Not in Operation
Static Pressure difference between room air inlet and outlet	0.0 in. H_2O [0.0 kPa]	Free Discharge
Static Pressure at ventilation air inlet	--	-0.05 in. H_2O [-0.012 kPa]
Fan Speed Setting	Same as for Standard Cooling Rating Condition	Same as for Standard Cooling Rating Condition
Inside /Outside Damper Position	Adjusted for full Room Air (no ventilation air)	Adjusted for full Ventilation Air (no room air)
Face/Bypass Damper Position (if equipped)	Adjusted for Full Face, 0% Bypass	Adjusted for Full Face, 0% Bypass
ANSI/ASHRAE Standard 41.2 Test Arrangements	See Figure 14 of ANSI/ASHRAE Standard 41.2	See Figure 13 of ANSI/ASHRAE Standard 41.2

5.3 *Equipment.* Filters, any air-mixers, air-inlets, grilles, deflecting vanes, and any other regularly-furnished equipment shall be in place during all following tests.

5.4 *Testing Requirements*. All ratings shall be verified by tests conducted in accordance with ANSI/ASHRAE Standard 79.

5.4.1 *Room Air Test*. The Room Air Test shall be conducted with the ventilation air inlet opening sealed so that no air flow enters the unit except from the room side. The flow rate shall be the value measured from flow meter 1 as depicted in Figure 1.

5.4.2 *Ventilation Air Test*. The Ventilation Air Test shall be conducted with air flow measuring apparatus connected to the ventilation air opening. The flow rate shall be the value measured from flow meter 2 as depicted in Figure 1. Flow meter 1 and any associated duct work shall be removed for this test. Units shall be tested without any outside air intakes, louvers, wall boxes, etc. in place. The unit shall be tested with an external static of -0.05 in. of H_2O [-0.012 kPa] measured at the ventilation air inlet to simulate the pressure drop of a typical device.

5.4.3 The Standard Ventilation Rate shall be the ratio of air flow measured in accordance with 5.4.2 over the air flow measured in accordance with 5.4.1 expressed as a percent.

5.5 *Application Ratings.* Ratings at conditions other than the Standard Rating Conditions may be published as application ratings, and shall be based on data determined by the methods of testing prescribed in the applicable Standards references in 3.4.1, 3.4.2 and 3.4.3.

Wherever application ratings are published or printed, they shall include, or be accompanied by, the Standard Rating, clearly designated as such, including a statement of the conditions at which the ratings apply.

5.6 *Tolerances.* To comply with this standard, published or reported cooling capacity, heating capacity, power input, efficiency, standard air flow, fluid flow and pressure drop shall be based on data obtained in accordance with the provisions of this section, and shall be such that any production unit selected at random and tested in accordance with the standard shall achieve 100% of rated or published value, less the allowable tolerance specified in the applicable standard(s) referenced in 3.4.1, 3.4.2, and 3.4.3.

The tested Standard Ventilation Rate shall be no less than 95% of the rated value and no less than 80% of the airflow measured in 5.4.3.

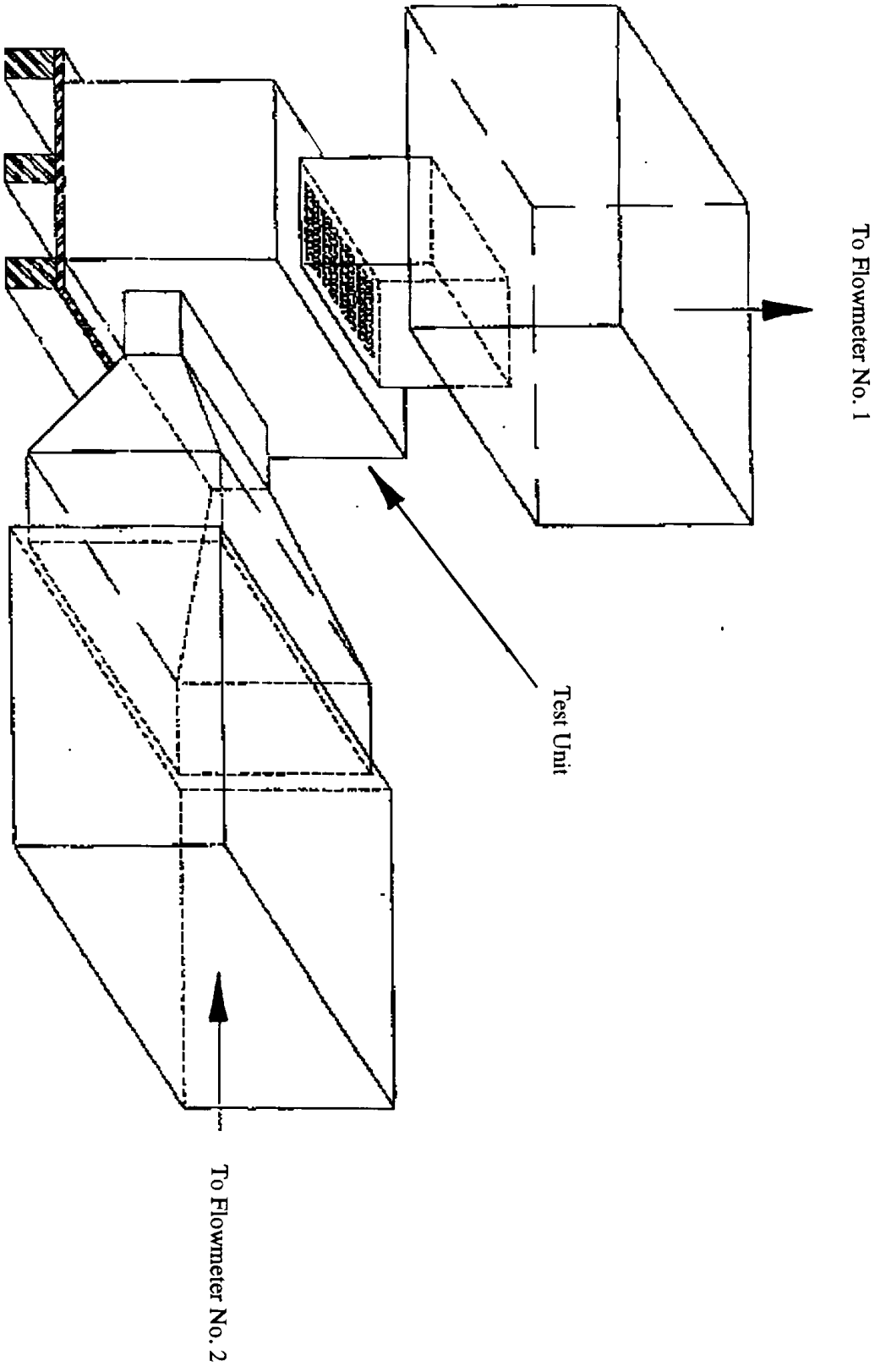

Figure 1. Standard Ventilation Rate Test Set-Up

Section 6. Minimum Data Requirements for Published Ratings

6.1 *Published Ratings*. Wherever application ratings are published or printed, they shall include or be accomplished by the Standard Rating clearly designated as such, including a statement of the conditions at which the ratings apply.

6.2 *Content of Published Ratings*. Published ratings shall consist of the Standard Ventilation Rate, expressed in percent, and any other information as required by all applicable standard(s) referenced in Sections 3.4.1, 3.4.2 and 3.4.3.

Section 7. Operating Requirements

7.1 *Performance Requirements.* To comply with this standard, unit ventilators shall be designed and produced so as to perform in accordance with the provisions of this section, in such a manner that any production unit will meet the requirements detailed herein.

7.1.1 *Self-Contained Unit Ventilators*. All performance tests for self-contained unit ventilators shall be tested in accordance with the provisions of AHRI Standard 310/380 (formerly ARI Standard 310/380).

7.1.2 *Water-Source Self-Contained Unit Ventilators*. All performance tests for water-source self-contained unit ventilators shall be tested in accordance with the provisions of AHRI Standards 320, 325 and 330 (formerly ARI Standards 320, 325 and 330).

7.1.3 *Fan-Coil Unit Ventilators*. All performance tests for fan-coil unit ventilators shall be tested in accordance with the provisions of AHRI Standards 440 and 210/240 (formerly ARI Standards 440 and 210/240).

Section 8. Marking and Nameplate Data

8.1 *Marking and Nameplate Data*. The unit nameplate shall display, as a minimum:

a. The name of the manufacturer and/or the supplier responsible for the performance ratings.
b. The model number of the equipment.

8.2 Recommended nameplate voltages for 60 Hertz systems shall include one or more of the equipment nameplate voltage ratings shown in Table 1 of AHRI Standard 110 (formerly ARI Standard 110). Recommended nameplate voltages for 50 Hertz systems shall include one or more of the utilization voltages shown in Table 1 of IEC Standard Publication 38.

Section 9. Voluntary Conformance

9.1 *Conformance.* While conformance with this standard is voluntary, conformance shall not be claimed or implied for products or equipment within its *Purpose* (Section 1) or *Scope* (Section 2) unless such claims meet all of the requirements of the standard.

APPENDIX A. REFERENCES – NORMATIVE

A1 Listed here are all standards, handbooks and other publications essential to the formation and implementation of the standards. All references in this appendix are considered as part of the standard.

A1.1 ANSI/ASHRAE 41.2-1987, *Standard Methods for Laboratory Airflow Measurement*, 1987, American National Standards Institute/American Society of Heating, Refrigeration, and Air-Conditioning Engineers, Inc., 11 West 42nd Street, New York, NY 10036 U.S.A./1791 Tullie Circle, N.E., Atlanta, Georgia, 30329, U.S.A.

A1.2 ANSI/ASHRAE 79-1984, *Methods for Rating Room Fan-Coil Air Conditioners*, 1984, American National Standards Institute/American Society of Heating, Refrigeration, and Air-Conditioning Engineers, Inc., 11 West 42nd Street, New York, NY 10036 U.S.A./1791 Tullie Circle, N.E., Atlanta, Georgia, 30329, U.S.A.

A1.3 AHRI Standard 110-97 (formerly ARI Standard 110-97), *Air Conditioning and Refrigerating Equipment Nameplate Voltages*, 1997, Air-Conditioning, Heating & Refrigeration Institute, 2111 Wilson Blvd., Suite 500, Arlington, VA 22201, U.S.A.

A1.4 AHRI Standard 210/240-94 (formerly ARI Standard 210/240-94), *Unitary Air-Conditioning and Air-Source Heat Pump Equipment*, 1994, Air-Conditioning, Heating & Refrigeration Institute, 2111 Wilson Blvd., Suite 500, Arlington, VA 22201, U.S.A.

A1.5 AHRI Standard 310/380-93 (formerly ARI Standard 310/380-93)/CSA-C744-93 *Packaged Terminal Air-Conditioners and Heat Pumps*, 1993, Air-Conditioning, Heating & Refrigeration Institute/Canadian Standards Association, 2111 Wilson Blvd., Suite 500, Arlington, VA 22201, U.S.A./178 Rexdale Boulevard, Etobicoke, Ontario, M9W 1R3, Canada

A1.6 ANSI/AHRI Standard 320-93 (formerly ANSI/ARI Standard 320-93), *Water-Source Heat Pumps*, 1993, American National Standards Institute/Air-Conditioning, Heating & Refrigeration Institute, 11 West 42nd Street, New York, NY 10036 U.S.A./2111 Wilson Blvd., Suite 500, Arlington, VA 22201, U.S.A.

A1.7 ANSI/AHRI Standard 325-93 (formerly ANSI/ARI Standard 325-93), *Ground Water-Source Heat Pumps*, 1993, American National Standards Institute/Air-Conditioning, Heating & Refrigeration Institute, 11 West 42nd Street, New York, NY 10036 U.S.A./2111 Wilson Blvd., Suite 500, Arlington, VA 22201, U.S.A.

A1.8 AHRI Standard 330-93 (formerly ARI Standard 330-93), *Ground Source Closed-Loop Heat Pumps*, 1993, Air-Conditioning, Heating & Refrigeration Institute, 2111 Wilson Blvd., Suite 500, Arlington, VA 22201, U.S.A.

A1.9 AHRI Standard 440-97 (formerly ARI Standard 440-97), *Room Fan-Coils and Unit Ventilators*, 1997, Air-Conditioning, Heating & Refrigeration Institute, 2111 Wilson Blvd., Suite 500, Arlington, VA 22201, U.S.A.

A1.10 *ASHRAE Terminology of Heating, Ventilation, Air Conditioning and Refrigeration*, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle N.E., Atlanta, GA 30329, U.S.A.

APPENDIX B. REFERENCES – INFORMATIVE

None.