AHRI Standard 431 (SI)

2014 Standard for

Performance Rating of Central Station Air-handling Unit Supply Fans

AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE
we make life better™

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

Documents
Document Sharing Hub

Copyright Air-Conditioning, Heating and Refrigeration Institute
Provided by IHS
No reproduction or networking permitted without license from IHS
Licensee=Southern Company Service/5929653100, User=alexa, joe
Not for Resale, 04/10/2016 02:09:23 MDT
Full document details: AHRI Standard 431-2014 (I-P) - Performance Rating of Central Station Air-handling Unit Supply Fans

IMPORTANT

SAFETY DISCLAIMER

AHRI does not set safety standards and does not certify or guarantee the safety of any products, components or systems designed, tested, rated, installed or operated in accordance with this standard/guideline. It is strongly recommended that products be designed, constructed, assembled, installed and operated in accordance with nationally recognized safety standards and code requirements appropriate for products covered by this standard/guideline.

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 AHRI Standard 430-2009.
See AHRI Standard 430 for I-P ratings.

Scope of Certification Program and Certified Ratings

Please refer to the most current version of the Central Station Air-handling Unit's Supply Fans Certification Program Operations Manual (OM) for the Scope of the Certification Program and Certified Ratings.

Price $10.00 (M) $20.00 (NM)
Printed in U.S.A.

©Copyright 2014, by Air-Conditioning, Heating, and Refrigeration Institute
Registered United States Patent and Trademark Office

Documents Document Sharing Hub

Copyright Air-Conditioning, Heating and Refrigeration Institute
Provided by IHS
No reproduction or networking permitted without license from IHS

Licensee=Southern Company Service/5929653100, User=alexa, joe
Not for Resale, 04/10/2016 02:09:23 MDT

Full document details: AHRI Standard 431-2014 (I-P) - Performance Rating of Central Station Air-handling Unit Supply Fans

TABLE OF CONTENTS

SECTION PAGE

Section 1. Purpose 1

Section 2. Scope 1

Section 3. Definitions 1

Section 4. Classifications 4

Section 5. Test Requirements 4

Section 6. Rating Requirements 11

Section 7. Symbols and Subscripts 12

Section 8. Minimum Data Requirements for Published Ratings 12

Section 9. Marking and Nameplate Data 13

Section 10. Conformance Conditions 13

FIGURES

Figure 1. Unducted Fan Discharge - Horizontal Arrangement 2

Figure 2. Ducted Fan Discharge - Horizontal Arrangement 3

Figure 3. Outlet Test Unit Configuration for Multiple Parallel Housed Fans in CSAHUs with Individual Ducted Discharges 5

Figure 4. Single Outlet Test Unit Configuration for Single or Multiple Parallel Plenum Fans in CSAHUs with Full Face Opening Axial Discharge. 5

Figure 5. Figure 15 Reprinted from “AMCA Publication 210-07, Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating”..... 6

Figure 6. Figure 12 Reprinted from “AMCA Publication 210-07, Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating” 6

Figure 7. Dimensions for Inlet Vane Proportionality 7

Documents
Document Sharing Hub

Copyright Air-Conditioning, Heating and Refrigeration Institute
Provided by IHS
No reproduction or networking permitted without license from IHS

Licensee=Southern Company Service/5929653100, User=alexa, joe
Not for Resale, 04/10/2016 02:09:23 MDT

Full document details: AHRI Standard 431-2014 (I-P) - Performance Rating of Central Station Air-handling Unit Supply Fans

Figure 8. Ducted Fan Discharge CSAHU with Airflow Direction Change 8

Figure 9. Fan and Unit Characteristics - Fan Rated and Unit Tested 10

Figure 10. Fan and Unit Characteristics - Fan Rated and Unit Calculated 11

APPENDICES

Appendix A. References - Normative 14

Appendix B. References - Informative 14

Appendix C. Criteria for Proportionality-Informative 15

FIGURES FOR APPENDICES

Figure C1. Dimensions Used for Proportionality Equations - Housed Fan 17

Figure C2. Dimensions Used for Proportionality Equations - Plenum Fan 17

Figure C3. Dimensions Used for Proportionality Equations - Axial Fan 17

Figure C4. Dimensions Used for Proportionality Equations - Multiple Fans (End Views) 18

Documents
Document Sharing Hub

Copyright Air-Conditioning, Heating and Refrigeration Institute
Provided by IHS
No reproduction or networking permitted without license from IHS
Licensee=Southern Company Service/5929653100, User=alexa, joe
Not for Resale, 04/10/2016 02:09:23 MDT
Full document details: AHRI Standard 431-2014 (I-P) - Performance Rating of Central Station Air-handling Unit Supply Fans

PERFORMANCE RATING OF CENTRAL STATION AIR-HANDLING UNIT SUPPLY FANS

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish for Central Station Air-handling Units: 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 Central Station Air-handling Units, as defined in Section 3.

2.1.1 This standard applies to supply fan ratings for Plenum Fans in a cabinet with a Full Face Opening Axial Discharge, Housed Centrifugal Fans, and Axial Fans.

2.2 *Exclusions.*

2.2.1 This standard does not apply to forced-circulation, free-delivery air-coolers for refrigeration, which are covered in ANSI/AHRI Standard 420.

2.2.2 This standard does not apply to unit heaters intended for free delivery of heated air or to room fan-coils as defined in ANSI/AHRI Standard 440.

2.2.3 This standard does not apply to units that have direct expansion coils incorporated by the manufacturer in a matched split system air-conditioner, or as otherwise defined in the product scope definition of the AHRI Unitary Small Equipment and Unitary Large Equipment Sections and covered in AHRI Standard 210/240 or in AHRI Standard 340/360.

2.2.4 This standard does not apply to unit ventilators as defined in ANSI/AHRI Standard 840.

2.2.5 This standard does not apply to variable refrigerant flow equipment as defined in ANSI/AHRI Standard 1230.

2.2.6 This standard does not apply to DX Dedicated Outdoor Air System Units as defined in ANSI/AHRI Standard 920.

2.2.7 This standard does not apply to Computer and Data Processing Room Air Conditioners as defined in ANSI/AHRI Standard 1360.

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 *Actual Cubic Meters Per Second (Actual m^3/s), m^3/s.* The unit of airflow uncorrected for air density. All airflow in this standard is considered to be actual airflow rate.

Documents
Document Sharing Hub
Copyright Air-Conditioning, Heating and Refrigeration Institute
Provided by IHS
No reproduction or networking permitted without license from IHS
Licensee=Southern Company Service/5929653100, User=alexa, joe
Not for Resale, 04/10/2016 02:09:23 MDT
Full document details: AHRI Standard 431-2014 (I-P) - Performance Rating of Central Station Air-handling Unit Supply Fans

3.2 *Central Station Air-handling Unit (CSAHU).* A factory-made encased assembly consisting of a supply fan or fans in parallel which may also include other necessary equipment to perform one or more of the functions of circulating, cleaning, heating, cooling, humidifying, dehumidifying and mixing of air. It shall not contain a source of mechanical cooling. This assembly is capable of use with duct work having a total static resistance of at least 125 Pa.

3.2.1 *Ducted Fan Discharge Central Station Air-handling Unit.* A unit that has a ducted fan outlet. (See Figure 2. Note that Figure 2 applies to Housed Centrifugal Fans and Axial Fans and that a Housed Centrifugal Fan is shown.)

3.2.2 *Unducted Fan Discharge Central Station Air-handling Unit.* A unit containing a fan that does not have a ducted fan outlet. (See Figure 1. Note that Figure 1 applies to all fan types in the standard but a Housed Centrifugal Fan is shown)

3.3 *Full Face Opening Axial Discharge.* Where the discharge opening of the CSAHU is the same cross-sectional dimensions as the interior of the CSAHU's casing and the direction of the airflow is parallel with the shaft of the fan or fans.

3.4 *Supply Fan.* The fan that provides enough pressure to overcome the supply air restriction and may provide some or all of the pressure to overcome the return air restriction to provide air into the conditioned space.

3.4.1 *Horizontal Shaft.* A fan shaft that is parallel to the ground.

3.4.2 *Vertical Shaft.* A fan shaft that is perpendicular to the ground.

3.4.3 *Direct Drive.* Driver and driven fans with positive direct connections for rotations at the same speed.

3.4.4 *Belt Drive.* Driver and driven fans with positive belted connections for rotations at any speed.

3.4.5 *Plenum Fan*. A fan assembly consisting of a single inlet impeller mounted perpendicular to airflow that pressurizes a plenum chamber in an air-distribution system.

3.4.6 *Axial Fan*. A housed fan that moves air in the general direction of the axis about which it rotates. This includes tubeaxial fans, centaxial fans, and vaneaxial fans. Fan rotor or wheel within a tubular-type casing that includes supports for either Belt Drive or Direct Drive.

3.4.7 *Housed Centrifugal Fan*. Fan in which the air enters the impeller axially and leaves it substantially in a radial direction. Fan rotor or wheel within a scroll-type casing (shroud) that includes supports for either Belt Drive or Direct Drive.

3.4.8 *Fan Housing.* The stationary element which guides the air before and after the fan's impeller.

3.5 *Unit Appurtenances.* Equipment added to Central Station Air-handling Units for purposes of control, isolation, safety, static pressure regain, energy/heat recovery, wear, etc. Such appurtenances include coils, filters, dampers, air-mixers, spray assemblies, energy recovery devices, acoustical silencers, eliminators, etc.

Documents
Document Sharing Hub
Copyright Air-Conditioning, Heating and Refrigeration Institute
Provided by IHS
No reproduction or networking permitted without license from IHS
Licensee=Southern Company Service/5929653100, User=alexa, joe
Not for Resale, 04/10/2016 02:09:23 MDT
Full document details: AHRI Standard 431-2014 (I-P) - Performance Rating of Central Station Air-handling Unit Supply Fans

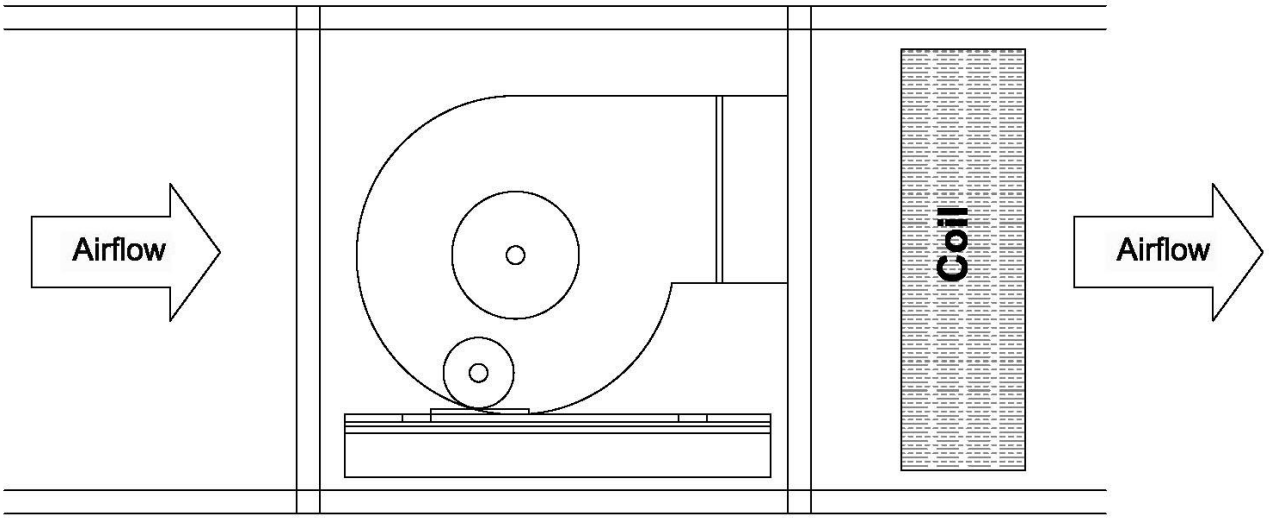


Figure 1. Unducted Fan Discharge – Horizontal Arrangement

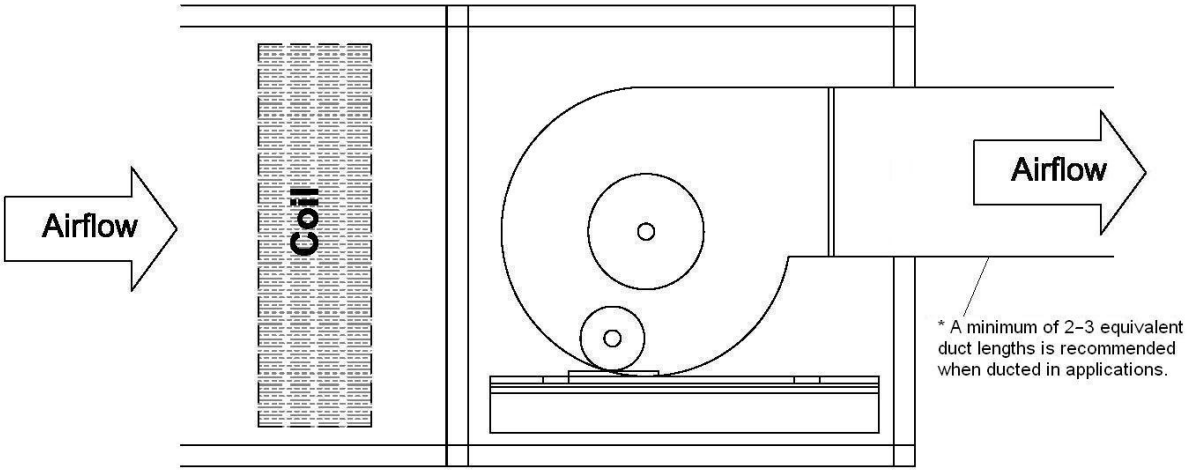


Figure 2. Ducted Fan Discharge – Horizontal Arrangement

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 capacity 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.

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

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

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

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

3.9 *Standard Air.* Air weighing 1.2 kg/m^3 which approximates dry air at 21°C and at a barometric pressure of 101.3 kPa.

Documents
Document Sharing Hub
Copyright Air-Conditioning, Heating and Refrigeration Institute
Provided by IHS
No reproduction or networking permitted without license from IHS
Licensee=Southern Company Service/5929653100, User=alexa, joe
Not for Resale, 04/10/2016 02:09:23 MDT
Full document details: AHRI Standard 431-2014 (I-P) - Performance Rating of Central Station Air-handling Unit Supply Fans