AHRI Standard 1240-2017 (R2023) (I-P)

2017 (R2023) Standard for

Performance Rating of Active Chilled Beams

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ICS Code: 27.200

Note:

This standard supersedes AHRI Standard 1240 (I-P)-2016.
This standard was reaffirmed May 2023.
For SI ratings, see AHRI Standard 1241-2017 (R2023) SI

Scope of Certification Program and Certified Ratings

Please refer to the most current version of the Active Chilled Beams Certification Program Operations Manual (OM) for the scope of the certification program and certified ratings.

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APPENDICES

PERFORMANCE RATING OF ACTIVE CHILLED BEAMS

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to provide, for Active Chilled Beams: definitions; classifications; standard equipment; testing requirements; rating requirements; minimum data requirements for published ratings; marking and nameplate data; and conformance conditions.

Section 2. Scope

2.1 This standard applies to Active Chilled Beams as defined in Section 3, including Multi-service Active Chilled Beams and Room Air Induction Units.

2.2 *Exclusions.*

2.2.1 This standard does not apply to Active Chilled Beams employing volatile-refrigerant coils, condensing coils, or steam coils.

2.2.2 This standard does not apply to Passive Chilled Beams.

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 *Active Chilled Beam*. An air induction and diffusion device which introduces conditioned air for the purposes of temperature and/or humidity control. Primary Air is delivered through a series of Nozzles, which induces and conditions Secondary Air through a unit mounted coil.

3.1.1 *Multi-service Active Chilled Beam*. A chilled beam that incorporates space services other than cooling such as lighting. This type of Active Chilled Beam is usually customized to meet specific project requirements.

3.1.2 *Room Air Induction Unit*. A type of Active Chilled Beam that requires more than 1.5 in H_2O of inlet static pressure to operate.

3.2 *Air-induction Process.* The process by which a jet of Primary Air induces Secondary Air through the coil.

3.2.1 *Primary Air*. Air delivered through the Nozzle(s) of an Active Chilled Beam.

3.2.2 *Secondary Air*. Air induced through the coil of an Active Chilled Beam.

3.2.3 *Supply Air*. The mixture of Primary Air and Secondary Air that is discharged to the space by the Active Chilled Beam.

3.2.4 *Nozzle.* An air flow opening in the Plenum which discharges a jet of Primary Air via the Air-induction Process.

3.2.5 *Plenum.* An air compartment under positive pressure, and consisting of inlet(s) and Nozzle(s) for Primary Air. Also referred to as a *Plenum Chamber*.

3.2.6 *Induction Ratio.* The ratio of the volumetric flow rate of Secondary Air to Primary Air.

3.2.7 *Air Outlet(s) and Inlet(s).* Openings for the delivery or induction of air.

3.2.7.1 *Supply Air Outlet*. An opening for the delivery of Supply Air from the active chilled beam unit.

3.2.7.2 *Induced Air Inlet.* An opening through which Secondary Air is induced into the Active Chilled Beam.

3.2.8 *Standard Air.* Air weighing 0.075 lb/ft^3, which approximates dry air at 70°F and at a barometric pressure of 29.92 inches of mercury.

3.2.9 *Reference Air Temperature.* Average air temperature of the induced air on the inlet side of the cooling coil(s), measured as prescribed in ANSI/ASHRAE Standard 200.

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

3.4 *Passive Chilled Beam.* A cooled element or coil, fixed in, above or under a ceiling that sensibly cools through natural convection using buoyancy driven air flow. The cooling media in the coil is water.

3.5 *Product Line.* A family of units of common basic design, consisting of a set of Models, and a progression of Sizes.

3.5.1 *Coil Size.* A measurement relative to the nominal length and width of the coil.

3.5.2 *Model.* The style or structure of the Active Chilled Beam relative to the configuration of coils, Nozzles, and Air Outlets and Inlets as typified by the discharge pattern common to all Sizes. A given Model may have different nozzle arrangements, Air Outlets and Inlets, coil configurations and Sizes.

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 a particular Model and Coil Size produced by the same manufacturer.

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

3.6.2 *Application Rating.* A rating at other than Standard Rating Conditions; such other Rating Conditions are referred to as Application Rating Conditions.

3.7 *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.

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

3.8 *Sensible Capacity.* Capacity associated with a reduction or an increase in dry-bulb temperature, Btu/h.

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 Power Level (L_w).* 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).

3.11 *Throw*. Horizontal or vertical axis distance an airstream travels after leaving an air outlet before the stream velocity is reduced to a specific terminal value.

Section 4. Classifications

4.1 Active Chilled Beams are classified according to the following Product Lines:

4.1.1 *Single or Multiple Discharge Openings.*

4.1.2 *Method of Secondary Air Intake.*

4.1.2.1 *Direct Type*. Where the Induced Air Inlet is located in the room (Secondary Air is induced from the conditioned space).

4.1.2.2 *Indirect Type*. Where the Induced Air Inlet is located outside the room (Secondary Air is induced from the conditioned space via the return air Plenum).

4.1.3 *Mounting Type.*

4.1.3.1 Exposed mount or surface mount

4.1.3.2 Modular (ceiling or drywall integrated)

4.1.4 *Operating Inlet Static Pressure.*

4.1.4.1 Less than or equal to 1.5 in H_2O of inlet static pressure.

4.1.4.2 More than 1.5 in H_2O of inlet static pressure.

Section 5. Standard Equipment

5.1 *Equipment*. An Active Chilled Beam shall include the following as standard equipment:

5.1.1 Plenum

5.1.2 Nozzle(s)

5.1.3 Cooling, or cooling and heating, coil(s)

5.1.4 Static pressure port(s)

5.1.5 Supply Air Outlet(s)

5.1.6 Induced air opening

Section 6. Test Requirements

6.1 Active Chilled Beams, as described in Section 5, shall be tested for rating in accordance with the provisions set forth in ANSI/ASHRAE Standard 200.

Section 7. Rating Requirements

7.1 *Standard Ratings*. Standard Ratings shall be established at the Standard Rating Conditions specified in Section 7.2 and shall be expressed in terms of Btu per hour (Btu/h) rounded to the nearest 50 Btu/h and in terms of the flow of Primary Air in cubic feet per minute (scfm) rounded off to the nearest 2 scfm.

7.2 *Standard Rating Conditions.* Standard Ratings shall be determined from tests, using the methods of testing set forth in ANSI/ASHRAE Standard 200.

7.3 *Application Rating Conditions.* Application ratings shall permit selection of units for at least a range of conditions commonly encountered, and should be based on corresponding ranges of the parameters listed in Section 8.

7.4 *Tolerances.* To comply with this standard, Published Ratings shall be based on data obtained in accordance with the provisions of Section 8 of this standard, and shall be such that any production Chilled Beams, when tested, will meet these ratings within the following tolerances:

7.4.1 Water flow rate shall be greater than or equal to 95% of the rating.

7.4.2 Water pressure drop shall be no greater than 110% of the rating or 1 ft H_2O above the rating, whichever is greater.

7.4.3 Water coil capacity shall be greater than or equal to 95% of the rating.

7.4.4 Primary Air flow rate shall be less than or equal to 105% of the rating or no more than 3 scfm above the rating, whichever is greater.

7.4.5 Induced air flow rate shall be greater than or equal to 90% of the rating.

7.4.6 Discharge air Throw shall be within 20% or 1 foot of the rating whichever is greater.

7.4.7 Sound Power Levels shall not exceed the published values in each Octave Band by more than the rating tolerance shown in Table 1.

Table 1. Sound Power Level Rating Tolerances

Octave Band	Octave Band Center Frequencies, Hz	Rating Tolerance, dB
2	125	6
3	250	4
4	500	3
5	1000	3
6	2000	3
7	4000	3

Section 8. Minimum Data Requirements for Published Ratings

8.1 *Published Ratings.* Published Ratings shall consist of Standard Ratings. Application Ratings may be published in addition to Standard Ratings. Wherever Application Ratings are published or printed, they shall include or be accompanied by the Standard Rating, clearly designated as such. Application Ratings shall include the information contained in Section 8.3 and shall clearly define the pertinent information as indicated in Section 8.4.

8.2 *Standard Ratings.* Standard Ratings shall consist of at least the following information, obtained at Standard Rating Conditions:

8.2.1 Primary air flow rate, scfm

8.2.2 Primary air temperature, 75°F

8.2.3 Entering water temperature (cooling), 57°F

8.2.4 Minimum primary air pressure drop, reported value, rounded to 0.1 in H_2O. At this condition, also include the following information:

8.2.4.1 Water coil capacity, Btu/h

8.2.4.2 Induced air flow rate, scfm

8.2.4.3 Leaving water temperature, °F

8.2.4.4 Water flow rate (adjusted to achieve mean water temperature differential of 14.5°F relative to Reference Air Temperature), gpm

8.2.4.5 Water pressure drop, feet H_2O

8.2.4.6 Supply air Throw at 100 fpm (with Supply Air at isothermal conditions relative to the test room to be determined using ANSI/ASHRAE Standard 70 and air volume to be at manufacturer supplied value for Primary Air), feet

8.2.4.7 Sound Power Level by Octave Bands 2 to 7 (free discharge combined with casing radiated), dB. Air volume to be at manufacturer's supplied value for Primary Air.

8.2.5 Maximum primary air pressure drop, reported value, rounded to 0.1 in H_2O. At this condition, also include the following information:

8.2.5.1 Water coil capacity, Btu/h

8.2.5.2 Induced air flow rate, scfm

8.2.5.3 Leaving water temperature, °F

8.2.5.4 Water flow rate (adjusted to achieve mean water temperature differential of 14.5°F relative to Reference Air Temperature), gpm

8.2.5.5 Water pressure drop, feet H_2O

8.2.5.6 Supply air Throw at 100 fpm (with Supply Air at isothermal conditions relative to the test room to be determined using ANSI/ASHRAE Standard 70 and air volume to be at manufacturer supplied value for Primary Air), feet

8.2.5.7 Sound Power Level by Octave Bands 2 to 7 (free discharge combined with casing radiated), dB. Air volume to be at manufacturer's supplied value for Primary Air.

8.2.6 Primary Air pressure drop, 0.5 in H_2O. At this condition, also include the following information:

8.2.6.1 Water coil capacity, Btu/h

8.2.6.2 Induced air flow rate, scfm

8.2.6.3 Leaving water temperature, °F

8.2.6.4 Water flow rate (adjusted to achieve mean water temperature differential of 14.5°F relative to Reference Air Temperature), gpm

8.2.6.5 Water pressure drop, feet H_2O

8.2.6.6 Supply air Throw at 100 fpm (with Supply Air at isothermal conditions relative to the test room to be determined using ANSI/ASHRAE Standard 70 and air volume to be at manufacturer supplied value for Primary Air), feet

8.2.6.7 Sound Power Level by Octave Bands 2 to 7 (free discharge combined with casing radiated), dB. Air volume to be at manufacturer's supplied value for Primary Air.

8.3 *Published Application Ratings.* Published Application Ratings shall consist of at least the following information:

8.3.1 Primary air flow rate, scfm (Standard Air)

8.3.2 Primary air temperature, °F

8.3.3 Dew point temperature of room and Primary Air, °F

8.3.4 Primary air pressure drop, in H_2O

8.3.5 Room air temperature (induced to the beam for cooling), °F

8.3.6 Water coil Sensible Capacity, Btu/h

8.3.7 Entering water temperature (cooling), °F

8.3.8 Leaving water temperature, °F

8.3.9 Water flow rate, gpm

8.3.10 Water pressure drop, in H_2O

8.3.11 Supply air Throw at 100 fpm (with Supply Air at isothermal conditions relative to the test room to be determined using ANSI/ASHRAE Standard 70 and air volume to be at manufacturer supplied value for Primary Air), feet

8.3.12 Supply air temperature, °F

8.3.13 Sound Power Level by Octave Bands 2 to 7 (free discharge combined with casing radiated), dB.

8.3.14 Total Sensible Capacity, Btu/h

8.3.15 Sensible water coil energy per unit volume of Primary Air, Btu/scfm

8.3.16 Induced air flow rate, scfm

8.3.17 Some optional published Application Ratings may include:

8.3.17.1 Induction Ratio

8.3.17.2 Supply air Throw at other manufacturer-specified air velocity, fpm, (with Supply Air at isothermal conditions relative to the test room to be determined using ANSI/ASHRAE Standard 70 and air volume to be at manufacturer supplied value for Primary Air), feet

8.4 *Published Rating Data*. Published Ratings shall include drawings indicating essential information, including:

8.4.1 The length, height, and width of the unit

8.4.2 Nozzle type

8.4.3 Size and locations of inlet(s) for Primary Air

8.4.4 Size and location of piping

As a minimum, Published Ratings shall include all Standard Ratings. All claims to ratings within the scope of this standard shall include the statement "Rated in accordance with AHRI Standard 1240 (I-P)". All claims to ratings outside the scope of this standard shall include the statement "Outside the scope of AHRI Standard 1240 (I-P)". Wherever Application Ratings are published or printed, they shall include a statement of the conditions at which the ratings apply.

Section 9. Marking and Nameplate Data

9.1 *Model Identification.* The nameplate on each Active Chilled Beam shall include sufficient model and size identification to correlate with published data, literature and any other advertising issued by the manufacturer.

9.2 *Marking and Nameplate Data.* As a minimum, the nameplate shall display the manufacturer's name and model designation.

Section 10. Conformance Conditions

10.1 *Conformance*. While conformance with this standard is voluntary, conformance shall not be claimed or implied for products or equipment within the standard's *Purpose* (Section 1) and *Scope* (Section 2) unless such product claims meet all the requirements of the standard and all of the testing and rating requirements are measured and reported in complete compliance with the standard. Any product that has not met all the requirements of the standard cannot reference, state, or acknowledge the standard in any written, oral, or electronic communication.

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 Standard 70-2006 (RA 2011), *Method of Testing the Performance of Air Outlets and Air Inlets*, 2011, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329, U.S.A.

A1.2 ANSI/ASHRAE Standard 200-2015 with Addendum a and Addendum b, *Methods of Testing Chilled Beams*, 2015, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329, U.S.A.

A1.3 ASHRAE Terminology, https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology, 2016, 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

B1 Listed here are standards, handbooks, and other publications which may provide useful information and background but are not considered essential. References in this appendix are not considered part of the standard.

None.