

**AHRI Standard 821 (SI)**

**2017 Standard for  
Performance Rating of Ice  
Storage Bins**

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## **IMPORTANT**

### ***SAFETY DISCLAIMER***

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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 821 (SI)-2012.

For I-P ratings, see AHRI Standard 820 (I-P)-2017.

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# PERFORMANCE RATING OF ICE STORAGE BINS

## Section 1. Purpose

**1.1 Purpose.** The purpose of this standard is to establish for Ice Storage Bins: definitions; 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 Ice Storage Bins as defined in Section 3.

## Section 3. Definitions

*Definitions.* All terms in this document shall 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 Baffle.** Surface, usually in the form of a plate or wall, used for separating spaces or deflecting ice.

**3.2 Density of Ice.** The mass per unit volume of ice used for the Ice Storage Bin, kg/m<sup>3</sup>.

**3.3 Ice Storage Bin.** A factory-made assembly (not necessarily shipped in one package) which consists of a non-refrigerated compartment for storage of ice.

**3.4 Measured Internal Volume.** The internal volume includes the space occupied by the Baffles of the Ice Storage Bin, m<sup>3</sup>.

**3.5 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.

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

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

**3.6 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.

**3.6.1 Application Rating Conditions.** Ratings based on tests performed at conditions other than those specified in Section 5.2.1.

**3.6.2 Standard Rating Conditions.** Rating conditions used as the basis of comparison of performance characteristics.

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

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

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

**3.8** *Spacing Factor.* The ratio of ice volume to Measured Internal Volume, %.

**3.9** *Theoretical Storage Capacity.* The theoretical maximum mass of ice that the Ice Storage Bin can hold, kg.

**3.10** *Theoretical Storage Effectiveness.* A theoretical expression of the fraction of ice that under specific rating conditions would be expected to remain in the Ice Storage Bin 24 hours after it is produced, %.

#### **Section 4. Test Requirements**

**4.1** *Method of Testing.* Ice Storage Bins shall be tested for rating in accordance with Appendix C.

**4.1.1** *Equipment.* Ice Storage Bins shall be tested using all components as recommended by the manufacturer. Where units are offered with legs, the unit shall be tested with the legs on.

#### **Section 5. Rating Requirements**

**5.1** *Published Ratings.* Published Ratings shall include Standard Ratings, and may also include Application Ratings.

**5.1.1** *Values of Published Rating.* Published Rating shall include the Measured Internal Volume and the Theoretical Storage Effectiveness and may include Theoretical Storage Capacity as an optional rating.

**5.1.1.1** *Measured Internal Volume.* The Measured Internal Volume shall be expressed in multiples of the nearest 0.1 m<sup>3</sup>.

**5.1.1.2** *Theoretical Storage Effectiveness.* The Theoretical Storage Effectiveness shall be expressed in multiples of the nearest 1%. This requirement does not apply to dispensing machines utilizing cold plate drink dispensers.

**5.1.1.3** *Theoretical Storage Capacity (optional).* The method for calculating and publishing Theoretical Storage Capacity is published in Appendix D. When publishing the Theoretical Storage Capacity, the Spacing Factor, Density of Ice and the Measured Internal Volume shall be published as well. The Theoretical Storage Capacity shall be expressed in multiples of the nearest 5 kg.

**5.2** *Standard Ratings.* Standard Ratings shall be established at the Standard Rating Conditions specified in Section 5.2.1. Standard Ratings shall be verified by tests as required in Section 4.

**5.2.1** *Standard Rating Conditions.* The conditions of test for Theoretical Storage Effectiveness are as follows:

Ambient temperature: 32.0 °C

Initial ice temperature: 0.0 °C

**5.3** *Application Rating Conditions.* Ratings at conditions other than those specified in Section 5.2.1 may be published as Application Ratings and shall be based on data determined by the methods of testing prescribed in Section 4.

**5.4** *Tolerance.* To comply with this standard, Published Ratings shall be based on data obtained in accordance with the provisions of Sections 4 and 5 of this standard, and shall be such that any production unit, when tested, shall meet these ratings within the following tolerances:

**5.4.1** Measured Internal Volume, Theoretical Storage Effectiveness, and Theoretical Storage Capacity shall not be less than 95% of the Published Ratings.

## **Section 6. Minimum Data Requirements for Published Ratings**

**6.1** *Minimum Data Requirements for Published Ratings.* Published Ratings shall include all Standard Ratings. All claims to ratings within the scope of this standard shall include the verbiage “Rated in accordance with AHRI Standard 820 (SI)”. All claims to ratings outside the scope of this standard shall include the verbiage “Outside the scope of AHRI Standard 820 (SI)”. Wherever Application Ratings are published or printed, they shall include a statement of the conditions at which the ratings apply.

## **Section 7. Marking and Nameplate Data**

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

## **Section 8. Conformance Conditions**

**8.1** *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 of 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 shall not 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 standard. All references in this appendix are considered as part of this standard.

**A1.1** *ASHRAE Terminology*, <https://www.ashrae.org/resources--publications/free-resources/ashraeterminology>, 2017, 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.

**B1.1** AHRI Standard 811 (SI)-2016, *Performance Rating of Automatic Commercial Ice-Makers*, 2016, Air-conditioning, Heating, and Refrigeration Institute, 2111 Wilson Blvd., Suite 500, Arlington, VA 22201, U.S.A.

## APPENDIX C. METHOD OF TEST OF ICE STORAGE BINS – NORMATIVE

### C1 *Purpose and Scope.*

**C1.1** *Purpose.* The purpose of this appendix is to specify the method to be used when testing Ice Storage Bins, to specify the type of instrumentation and test apparatus required in testing, to specify methods of calculating results and to specify data to be recorded.

**C2** *Instrumentation and Apparatus.* Measurements of the internal dimensions, to determine the internal volume of the Ice Storage Bin, shall be accurate to within 1mm.

The allowable tolerances on test conditions and performance measurements for Ice Storage Bins are specified in Table C1:

<b>Table C1. Allowable Tolerances</b>	
Item	Tolerance
Dimensions	±1 mm
Ambient air temperature	±0.5 K
Ice temperature	±0.5 K
Ice mass	±1.0%
Meltage-water mass	±1.0%
Elapsed time	±60 s

### C3 *Test Method.*

**C3.1** *Measured Internal Volume.* Measure the internal dimensions including the space occupied by the Baffles of the Ice Storage Bin using a tape measure and calculate the volume of the Ice Storage Bin.

**C3.2** *Theoretical Storage Effectiveness.*

The unit undergoing test shall be exposed to the ambient temperature for at least 2 hours prior to the addition of ice.

A quantity of cube-ice equal to the Theoretical Storage Capacity, at the specified initial ice temperature, shall be added to the Ice Storage Bin through the ice-maker opening.

The ice-maker opening shall be sealed closed with rigid foam insulation having a thermal resistance of  $R_{SI}$  5.3.

Meltage water from the bin drain shall be captured and weighed 2 hours after the bin was filled and again after an additional 4 hours have elapsed.

### C4 *Data to be Recorded.*

**C4.1** Ice Storage Bin manufacturer and brand name

**C4.2** Model number and serial number

**C4.3** Internal dimensions, mm

**C4.4** Initial weight of ice, kg

**C4.5** 2-hour (stabilization) meltage weight, kg

**C4.6** 4-hour (test) meltage weight, kg

**C4.7** Ambient temperature, °C

**C4.8** Initial ice temperature, °C



**C5** *Calculations.*

**C5.1** *Theoretical Storage Effectiveness.* The Theoretical Storage Effectiveness shall be determined as follows:

$$e_s = \frac{(W_i - M_2 - 6M_4)}{(W_i - M_2)} \cdot 100\% \tag{C1}$$

Where:

- $e_s$  = 24-hour Theoretical Storage Effectiveness, %
- $M_2$  = Meltage weight from hour 0 to 2 in test, kg
- $M_4$  = Meltage weight from hour 2 to 6 in test, kg
- $W_i$  = Initial weight of ice, kg

Note:  $6 \cdot M_4$  represents the calculated 24-hour meltage total.

## APPENDIX D. CALCULATION AND PUBLICATION FOR THEORETICAL STORAGE CAPACITY OF ICE STORAGE BINS – INFORMATIVE

### D1 *Purpose and Scope.*

**D1.1** *Purpose.* The purpose of this appendix is to specify the method to be used when calculating and publishing Theoretical Storage Capacity.

### D2 *Calculation.*

**D2.1** *Theoretical Storage Capacity.* The Theoretical Storage Capacity, lb, is determined as follows:

$$c_t = A \cdot v_m \cdot B \quad \text{D1}$$

Where:

$A$  = Spacing Factor, %

$B$  = Density of Ice, kg/m<sup>3</sup>

$c_t$  = Theoretical Storage Capacity, kg

$v_m$  = Measured Internal Volume, m<sup>3</sup>

### D3 *Publication.*

**D3.1** *Theoretical Storage Capacity.* When publishing the Theoretical Storage Capacity, the Spacing Factor, Density of Ice and the Measured Internal Volume shall be published as well.