ANSI/AHRI Standard 820-2023 (SI/I-P)

2023 Standard for

Performance Rating of Ice Storage Bins

Approved by ANSI on 10 August 2023

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IMPORTANT

SAFETY DISCLAIMER

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ICS Code: 27.200

Note:

This standard supersedes AHRI Standard 820 (I-P)-2017 and AHRI Standard 821-2017 (SI).

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AHRI Standards are developed independently of AHRI Certification activities and can have scopes that include products that are not part of the AHRI Certification Program. The scope of the applicable AHRI Certification Program can be found on AHRI's website.

Intent

This standard is intended for the guidance of the industry, including manufacturers, engineers, installers, contractors, and users.

Review and Amendment

This standard is subject to review and amendment as technology advances.

2023 Edition

This edition of AHRI Standard 820 was prepared by Automatic Commercial Ice-makers Standards Technical Committee. The standard was approved by the Refrigeration Standards Subcommittee on 29 June 2023. This standard was approved as an American National Standard (ANS) on 10 August 2023.

Origin and Development of AHRI Standard 820

The initial publication was ARI Standard 820-1988, *Ice Storage Bins*. Subsequent revisions were:

ARI Standard 820-1995, *Ice Storage Bins*

AHRI Standard 820-2000, *Ice Storage Bins*

ANSI/AHRI Standard 820 (I-P)-2012, *Performance Rating of Ice Storage Bins*

ANSI/AHRI Standard 821 (SI)-2012, *Performance Rating of Ice Storage Bins*

AHRI Standard 820-2017 (I-P), *Performance Rating of Ice Storage Bins*

AHRI Standard 821-2017 (SI), *Performance Rating of Ice Storage Bins*

Summary of Changes

AHRI Standard 820 (SI/I-P) contains the following updates to the previous edition:

- Consolidated AHRI Standard 821 into AHRI Standard 820 to create a joint unit SI/I-P standard
- Clarified the scope for capacity of ice bins

Committee Personnel

Automatic Commercial Ice-makers Standards Technical Committee

Participant	Interest Category Classification	Voting Member Role	State or Province / Country
Stephen Schaefer Hoshizaki	Product Manufacturer	Chair	GA, USA
Jim Godiska Follett Products, LLC	Product Manufacturer	Primary	PA, USA
Bill Olson Manitowoc FSG Operations, LLC	Product Manufacturer	Primary	WI, USA
Raúl Perea ITV Ice Makers SL	Product Manufacturer	Primary	Valencia, Spain
Aniruddh Roy Energy Solutions	General Interest	Primary	AB, Canada
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Laura Degitz Energy Solutions	Product Manufacturer	Alternate to Aniruddh Roy	CA, USA
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Javier Rivera ITV Ice Makers SL	Product Manufacturer	Alternate to Raúl Perea	Valencia, Spain
Daniel Ziolkowski Scotsman Ice Systems	Product Manufacturer	Alternate to Christopher Salatino	IL, USA
AHRI Staff Liaison	James Spalding		

The Automatic Commercial Ice-makers Standards Technical Committee Scope:

The Automatic Commercial Ice-makers Standards Technical Committee (STC) is responsible for the development and maintenance of AHRI standards and guidelines pertaining to the performance ratings of Automatic Commercial Ice-makers and Ice Storage Bins.

Refrigeration Standards Subcommittee

Participant	Interest Category Classification	Voting Member Role	State or Province / Country
Mike Straub Heat Transfer Products Group, LLC	Product Manufacturer	Chair	AL, USA
Kunal Bansal Heatcraft Worldwide Refrigeration LLC	Product Manufacturer	Primary	GA, USA
Steve Combs Everidge	Product Manufacturer	Primary	VA, USA
Bruce Hierlmeier Zero Zone, Inc.	Product Manufacturer	Primary	WI, USA
Jennifer Kane Trane Technologies	Product Manufacturer	Primary	MO, USA
Scott Martin Hillphoenix	Product Manufacturer	Primary	GA, USA
Ron Shebik Hussmann Corporation	Product Manufacturer	Primary	MO, USA
Vince Zolli KeepRite Refrigeration	Product Manufacturer	Primary	ON, Canada
Karl Best	AHRI Staff Liaison		

Refrigeration Standards Subcommittee Scope:

The scope of the Refrigeration Standards Subcommittee is standards and guidelines related to the end products that are part of the AHRI Refrigeration Industry Sector. (The definition of and list of products associated with each sector are found on AHRI's website.)

These lists represent the membership at the time the Standards Technical Committee and Standards Subcommittee were balloted on the final text of this edition. Since that time, changes in the membership may have occurred. Membership on these committees shall not in and of itself constitute an endorsement by the committee members or their employers of any document developed by the committee on which the member serves.

Refrigeration Consensus Body

Participant	Interest Category Classification	Company
Philip Cantin	Consumer/User	mmic Medical Systems
Mike Devine	Component Manufacturer	Tecumseh Products Company
Jennifer Kane	Product Manufacturer	Trane Technologies
Jim Kendzel	General Interest	American Supply Association
Paul Lindahl	Product Manufacturer	SPX Cooling Technologies, Inc.
W. Vance Payne	Testing Laboratory	National Institute of Standards & Technology
Charles Plourde-LeBlanc	Product Manufacturer	Nortek Air Solutions, LLC
Kazuaki Watanabe	Component Manufacturer	Figaro USA, Inc.

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PERFORMANCE RATING OF ICE STORAGE BINS

Section 1. Purpose

This standard establishes definitions, test requirements, rating requirements, minimum data requirements for *published ratings*, marking and nameplate data, and conformance conditions for *ice storage bins*.

Section 2. Scope

This standard applies to factory-made *ice storage bins* as defined in Section 3.

Section 3. Definitions

All terms in this document shall follow the standard industry definitions in the ASHRAE Terminology website unless otherwise defined in this section.

3.1 Expression of Provisions

Terms that provide clear distinctions between requirements, recommendations, permissions, options, and capabilities.

3.1.1 "Can" or "cannot"

Express an option or capability.

3.1.2 "May"

Signifies a permission expressed by the document.

3.1.3 "Must"

Indication of unavoidable situations and does not mean that an external constraint referred to is a requirement of the document.

3.1.4 "Shall" or "shall not"

Indication of mandatory requirements to strictly conform to the standard and where deviation is not permitted.

3.1.5 "Should" or "should not"

Indication of recommendations rather than requirements. In the negative form, a recommendation is the expression of potential choices or courses of action that is not preferred but not prohibited.

3.2 Standard Specific Definitions

3.2.1 Baffle

Surface that can be in the form of a plate or wall used for separating spaces or deflecting ice.

3.2.2 Density of Ice

The mass per unit volume of ice used for the *ice storage bin*, lb/ft^3 (kg/m^3).

3.2.3 Ice Storage Bin

A factory-made assembly (can be shipped in more than one package) that consists of a non-refrigerated compartment for storage of ice.

3.2.4 Measured Internal Volume

The internal volume includes the space occupied by the *baffles* of the *ice storage bin*, ft^3 (m^3).

3.2.5 Published Rating

A statement of the assigned values of those performance characteristics, under stated *rating conditions*, where a unit can be chosen to fit the application. These values apply to all units of the same nominal size and type (identification) produced by the same manufacturer. This 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*.

3.2.5.1 Application Rating

A rating based on tests performed at *rating conditions* other than *standard rating conditions*.

3.2.5.2 Standard Rating

A rating based on tests performed at *standard rating conditions*.

3.2.6 Rating Conditions

Any set of operating conditions where a single level of performance results and causes only that level of performance to occur.

3.2.6.1 Application Rating Conditions

Ratings based on tests performed at conditions other than those specified in Section 5.2.1.

3.2.6.2 Standard Rating Conditions

Rating conditions used as the basis of comparison of performance characteristics.

3.2.7 Spacing Factor

The ratio of ice volume to *measured internal volume*, %.

3.2.8 Theoretical Storage Capacity

The theoretical maximum mass of ice that the *ice storage bin* can hold, lb (kg).

3.2.9 Theoretical Storage Effectiveness

A theoretical expression of the fraction of ice that under specific *rating conditions* can be expected to remain in the *ice storage bin* 24 hours after ice is produced, %.

Section 4. Test Requirements

Ice storage bins shall be tested for rating in accordance with Appendix C.

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 can include *application ratings*.

5.1.1 Values of Published Rating

Published rating shall include the *measured internal volume* and the *theoretical storage effectiveness*, and can 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 ft^3 (0.01m^3).

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 lb (2.5 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:

1) Ambient temperature: 90.0°F (32.0°C)
2) Initial ice temperature: 32.0°F (0°C)

5.3 Application Rating Conditions

Ratings at conditions other than those specified in Section 5.2.1 can 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 Section 4 and Section 5, and shall be such that any production unit, when tested, shall meet these ratings within the following tolerances:

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

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 820 (SI/I-P)". All claims to ratings outside the scope of this standard shall include the statement "Outside the scope of AHRI Standard 820 (SI/I-P)". *Application ratings* within the scope of the standard shall include a statement of the conditions under which the ratings apply.

Section 7. Marking and Nameplate Data

As a minimum, the nameplate shall display the manufacturer's name and model designation.

Section 8. Conformance Conditions

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

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 the standard.

A.1. ASHRAE Terminology. ASHRAE. Accessed August 16, 2022. https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology

APPENDIX B. REFERENCES – INFORMATIVE

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.

B.1. AHRI Standard 810-2023 (SI/I-P), *Performance Rating of Automatic Commercial Ice-Makers*, 2023 Air-Conditioning Heating and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, USA

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

C.1. Purpose and Scope

C.1.1. Purpose

This appendix specifies the method used when testing *ice storage bins* including:

1) the type of instrumentation and test apparatus required for testing
2) methods of calculating results
3) data to be recorded

C.2. Instrumentation and Apparatus

Measurements of the internal dimensions, to determine the internal volume of the *ice storage bin*, shall be accurate to within 0.03 in (1 mm).

The allowable tolerances on test conditions and performance measurements for *ice storage bins* are specified in Table 1:

Table 1 Allowable Tolerances

Item	Tolerance (I-P)	Tolerance (SI)
Dimensions	±0.03 in	±1 mm
Ambient air temperature	±1.0°F	±0.5 K
Ice temperature	±1.0°F	±0.5 K
Ice mass	±1.0%	±1.0%
Meltage-water mass	±1.0%	±1.0%
Elapsed time	±60.0 s	±60.0 s

C.3. Test Method

C.3.1. 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*.

C.3.2. 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 R30.

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

C.4. Data to be Recorded

1) *Ice storage bin* manufacturer and brand name
2) Model number and serial number
3) Internal dimensions, in (mm)
4) Initial weight of ice, lb (kg)
5) Two-hour (stabilization) meltage weight, lb (kg)
6) Four-hour (test) meltage weight, lb (kg)

7) Ambient temperature, °F (°C)
8) Initial ice temperature, °F (°C)

C.5. Calculations

C.5.1. Theoretical Storage Effectiveness

The *theoretical storage effectiveness* shall be determined using Equation 1:

$$e_s = \frac{(W_i - M_2 - 6M_4)}{(W_i - M_2)} * 100\% \quad \textbf{1}$$

Where:

e_s = Twenty-four-hour *theoretical storage effectiveness*, %

M_2 = Meltage weight from hour 0 to 2 in test, lb (kg)

M_4 = Meltage weight from hour 2 to 6 in test, lb (*kg)*

W_i = Initial weight of ice, lb (kg)

Note: $6M_4$ represents the calculated twenty-four-hour meltage total.

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

D.1. Purpose

This appendix specifies the method used when calculating and publishing *theoretical storage capacity*.

D.2. Calculation Theoretical Storage Capacity

The *theoretical storage capacity*, lb (kg), is determined using Equation 2:

$$c_t = A * v_m * B \quad \textbf{2}$$

Where:

A = *Spacing factor*, %

B = *Density of ice*, lb/ft^3 (kg/m^3)

c_t = *Theoretical storage capacity*, lb (kg)

v_m = *Measured internal volume*, ft^3 (m^3)

D.3. Publication of Theoretical Storage Capacity

When publishing the *theoretical storage capacity*, the *spacing factor*, *density of ice*, and the *measured internal volume* shall be published.