BSR/ASHRAE Standard 32.1-2017R

Public Review Draft

# Methods of Testing for Rating Refrigerated Vending Machines for Sealed Beverages

First Public Review ( September 2026)

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### Methods of Testing for Rating Refrigerated Vending Machines for Sealed Beverages



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## FOREWORD

*First published in 1982, ASHRAE Standard 32.1 has been periodically updated to respond to changes in machine and package design. Key changes in the 2017 edition are as follows:*

- *Updated scope and definitions to emphasize intended application to refrigerated beverage vending machines and combination machines.*
- *Removed distinctions between zone-cooled (typically solid-front) machines and fully cooled (typically glass-front) machines, as these distinctions are not necessary for conducting the test.*
- *Updated references to other documents, including the methodology for measuring refrigerated volume.*
- *Enhanced instrumentation calibration and accuracy requirements.*
- *Removed the 90°F (32.2°C) ambient condition for the energy consumption test and designated the 75°F (23.9°C) ambient condition as the singular test condition.*
- *Clarified test setup requirements, including ambient temperature measurement location, beverage temperature locations, test package construction, and sensor wire installation.*
- *Incorporated minimum functionality requirements that must be included and the controls that are permitted in the vending machine under test.*
- *Clarified the method for calculating integrated average temperature.*

*In addition, various editorial changes have been implemented to improve clarity.*

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## 1. PURPOSE

The purpose of this standard is to specify methods of testing for rating the capacity and efficiency of self-contained, mechanically refrigerated vending machines for sealed beverages.

## 2. SCOPE

This standard

a. establishes uniform methods of testing for determining laboratory performance of refrigerated beverage vending machines;
b. applies to refrigerated beverage vending machines and combination machines;
c. does not apply to climate-controlled snack vending machines, frozen-food vending machines, refrigerated-food-served-hot vending machines, or hot-beverage vending machines;
d. lists and defines the terms used in the methods of testing;
e. defines standard sealed-beverage storage capacity; and
f. establishes test conditions for rating.

## 3. DEFINITIONS

***active mode:*** the state of normal operation of the vending machine where the cooling system is active, merchandising is active, and the vending machine is ready to vend products.

***basic model:*** all vending machines of a given type with electrical characteristics that are essentially identical and without any differing physical or functional characteristics that affect performance and energy consumption.

***bottle* or *can:*** a container in which a beverage is sealed.

***energy management system:*** a control device (including software) or set of control devices that allow for adjustment of the operation of refrigerated vending machines with the intent of reducing energy consumption as compared to active-mode operation, based on environmental and other operational variables in the vending location.

***full loading:*** sealed beverages placed in conformance with Section 5.2 of this standard.

***instantaneous average next-to-vend beverage temperature:*** the average of all standard test packages in the next-to-vend beverage positions at a given time.

***integrated average temperature:*** the average temperature of all standard test package measurements in the next-to-vend beverage positions taken over the duration of the test.

***low-power mode:*** the reduced power state of a refrigerated beverage vending machine during extended periods of inactivity.

***product:*** items available for sale from a vending machine, including sealed beverages.

***product storage rack:*** that portion of the machine into which sealed beverages or other packages are placed for vending.

***recovery time:*** the time taken by a vending machine when tested according to Section 7.3 to cool sealed beverages to the desired vending temperature.

***refrigerated volume:*** the gross volume of the refrigerated space.

***sealed beverage:*** bottle, can, or other closed container containing liquid beverage.

***stabilized operation:*** the operating condition at which all test values would be repetitive (or cyclic) if the machine were operated for an extended period of time.

***standard sealed beverage:*** the sealed beverage to be used in testing the beverage vending machine.

***standard test package:*** a standard sealed beverage container of the size and shape for which the vending machine is designed, altered to include a temperature measuring instrument at its center of mass. The package may be of a different

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*This is a revision of Standard 32.1-202X. This standard was prepared under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). It may be used, in whole or in part, by an association or government agency with due credit to ASHRAE. Adherence is strictly on a voluntary basis and merely in the interests of obtaining uniform standards throughout the industry.*

*The changes made for the 2026 revision were:*

- *References were updated*
- *Bibliography was updated*

type of material than the material that is used for the containers in the vending machine.

***vend:*** to dispense product.

***vending machine:*** a cabinet containing a product storage area and an on-board control system that manages the payment system, a product selection system, a product delivery system, and merchandising lighting to deliver product to a consumer. Common vending machine types include the following:

***climate controlled snack vending machine:*** a vending machine intended for merchandising snack foods that maintains internal temperature below some maximum value to prevent damage to the snack items.

***combination vending machine:*** a refrigerated sealed-beverage vending machine that also includes volumes not deliberately refrigerated for the purpose of vending other, non-sealed-beverage merchandise.

***frozen-food vending machine:*** a vending machine that stores perishable food in a frozen state.

***hot-beverage vending machine:*** a vending machine that dispenses hot beverages.

***refrigerated-beverage vending machine:*** a commercial refrigerator that cools sealed beverages and dispenses the sealed beverages on payment.

***refrigerated-food-served-hot vending machine:*** a vending machine that stores perishable food under refrigeration until selected; once selected, the food is heated and served hot.

## 4. INSTRUMENTS

**4.1 Calibration.** Instruments shall be of the types and have the accuracies listed below and shall be calibrated annually traceable to National Institute of Standards and Technology (NIST) standards.

**4.2 Temperature Measurement.** Temperature shall be measured with a calibrated instrument accurate to ±1°F (±0.5°C).

**4.3 Humidity Measurement.** Humidity shall be measured with a calibrated instrument accurate to ±2% rh at the ambient relative humidity condition specified in Table 1.

**4.4 Electrical Measurement.** Electrical energy input shall be measured with an integrating instrument with resolution of 0.01 kWh or better. The instrument shall be accurate within the limits of ±0.5%. Input voltage shall be measured with an indicating instrument having an accuracy within the limits of ±1.0%.

**4.5 Time Measurement.** Time shall be measured with instruments having an accuracy within ±0.1% of the interval measured.

## 5. VENDING MACHINE CAPACITY

**5.1 Standard Sealed Beverages.** The standard sealed beverage shall be 12 oz. (355 mL) cans for machines that are capable of dispensing 12 oz. cans. For machines that are not capable of dispensing 12 oz. cans, the standard sealed beverage shall be 20 oz. (590 mL) plastic bottles. For machines not capable of dispensing 12 oz. cans or 20 oz. bottles, the standard sealed beverage shall be the sealed beverage specified by the manufacturer as the standard sealed beverage.

**Table 1 Standard Test Conditions for Energy Consumption Test**

| Test and Pretest Conditions | Energy Consumption Tests (Section 7.2) |
|---|---|
| Ambient temperature | 75°F ± 2°F<br>Acceptable range: 73°F to 77°F (23.9°C ± 1°C) |
| Relative humidity | 45% ± 5% rh<br>Acceptable range: 40% to 50% rh |
| Instantaneous average next-to-vend beverage temperature | 36°F ± 1°F (2.2°C ± 0.5°C)<br>At start of 24 h temperature stabilization period |
| Integrated average beverage temperature | 36°F ± 1°F (2.2 ± 0.5°C) |

**5.2 Vendible Capacity.** The vendible capacity shall be the maximum quantity of standard sealed beverages that can be dispensed from one full loading of the vending machine without further reload operations when used as recommended by the manufacturer.

Vendible capacity for combination machines shall include only the vendible capacity of the refrigerated compartment.

**5.3 Refrigerated Volume.** The refrigerated volume shall be measured in accordance with the methodology specified in Appendix C of this standard. This methodology is taken from AHAM HRF-1, *Energy and Internal Volume of Refrigerating Appliances* [1], Section 4, and used with permission of the Association of Home Appliance Manufacturers (AHAM).

The refrigerated volume for combination machines shall be measured only for the refrigerated beverage compartment. Compartments that are not deliberately refrigerated shall not be included in the refrigerated volume.

## 6. TEST CONDITIONS

**6.1 Standard Test Conditions.** The test conditions specified in Table 1 shall be used to determine standard performance.

**6.2 Voltage and Frequency.** Tests shall be performed

a. for vending machines with single nameplate voltages, at the nameplate-rated voltage ±2% and at the rated frequency ±1%, or
b. for vending machines with dual nameplate voltages, at the lower of the two voltages ±2% and at the rated frequency ±1%.

## 7. TEST PROCEDURES

### 7.1 General Requirements

**7.1.1 Installation.** The vending machine shall be

a. installed in accordance with the manufacturer's instructions;
b. installed in a level position, unless the instructions state otherwise;

c. located on the floor (or countertop), as it would be in service;
d. equipped with components sufficient to provide the functionality described in Section 7.1.2;
e. operated with normal lighting and thermal control settings, using energy management systems as detailed in Sections 7.1.2.3 and 7.2.2.6;
f. protected against effects of nearby heating or cooling equipment; and
g. protected from air moving at more than 50 ft/min (0.25 m/s).

**7.1.2 Functionality.** Except for payment mechanisms, the vending machine shall include sufficient functionality necessary for cooling and vending sealed beverages in field installations—i.e., inventory, temperature management, product merchandising, product selection, and product transport and delivery. Component-specific guidance is provided in Sections 7.1.2.1 through 7.1.2.3.

**7.1.2.1 Video Screens.** Video screens not providing product selection functionality shall be powered off during the test. Video screens that provide product selection functionality or that cannot be powered off shall be energized and operated in their lowest power-consuming state.

**7.1.2.2 Payment Mechanisms.** Payment mechanisms shall be disconnected during testing. If payment mechanisms are included in the unit under test, this shall be indicated in the test report (see Appendix A, Table A-1).

**7.1.2.3 Energy Management Systems.** Energy management systems may be used during the test subject to the test procedure requirements of Section 7.2.2.6.

**7.1.2.4 Accessories.** Other accessories nonessential to the functions listed in Section 7.1.2 shall be disabled.

**7.1.3 Installation Clearances.** To restrict the circulation of air at the rear of the vending machine, a vertical partition or wall shall be located 6 in. (150 mm) from the rear of the cabinet or in accordance with Section 7.1.1(a), whichever is greater, and extend at least 12 in. (300 mm) beyond each side of the cabinet from the floor (or countertop) to not less than 12 in. (300 mm) above the top of the cabinet. No partitions shall be located within 36 in. (915 mm) of either side of the vending machine.

**7.1.4 Measurement of Ambient Temperature.** The ambient temperature shall be measured by one sensor located 36 in. (915 mm) in front of the vending machine at approximately the midpoint of the cabinet.

**7.1.5 Measurement of Beverage Temperature**

**7.1.5.1 Beverage Temperature Test Packages.** The test packages shall be of the size and shape of the standard sealed beverage (Section 5.1). The packages shall be fitted with solid tops that are predrilled to accommodate a temperature sensor well and one temperature measurement device (e.g., thermocouple, resistance temperature detector [RTD], integrated circuit [IC], thermistor) per test package (see Figure 1).

Fill or refill the test packages with 33% propylene glycol/67% water solution before each test. Insert a temperature measurement device (e.g., thermocouple, RTD, IC, thermistor) into the temperature sensor well located at the center of mass for each test package before loading the machine.

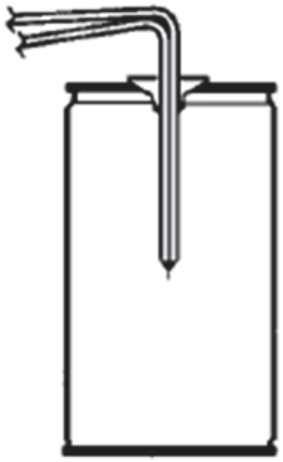

**Figure 1 Beverage temperature test package diagram.**

**7.1.5.2 Beverage Temperature Measurement Locations.** The beverage temperature shall be measured in standard test packages according to product storage rack configuration.

**7.1.5.2.1 Stack Vendors.** For refrigerated-beverage vending machines with products arranged vertically (e.g., in stacks), place standard test packages in the refrigerated compartments in each next-to-vend product location.

**7.1.5.2.2 Shelf-Style Vendors.** For refrigerated-beverage vending machines with products arranged horizontally (e.g., on shelves or in product spirals), place standard test packages in the refrigerated compartments in the following locations, as shown in Figure 2:

a. For odd-number shelves, when counting starting from the bottom shelf, standard test packages shall be placed at
   1. the left-most next-to-vend product position;
   2. the right-most next-to-vend product position; and
   3. for equipment with greater than or equal to five product positions on each shelf, either
      i. the next-to-vend product position in the center of the shelf (i.e., equidistant from the left-most and right-most next-to-vend product positions) if there are an odd number of next-to-vend products on the shelf, or
      ii. the next-to-vend product position immediately to the right and the left of the center position if there are an even number of next-to-vend products on the shelf.
b. For even-numbered shelves, when counting from the bottom shelf, standard test packages shall be placed at either,
   1. for equipment with less than or equal to six next-to-vend product positions on each shelf, the next-to-vend product positions
      i. one product position towards the center from the left-most next-to-vend product position and
      ii. one product position towards the center from the right-most next-to-vend product position; or

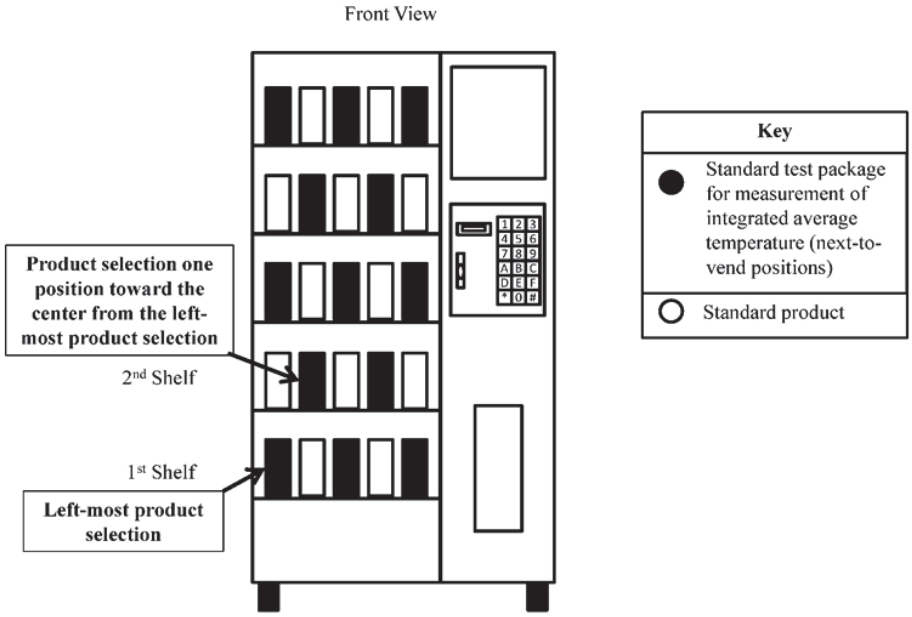


**Figure 2 Location of standard test packages for shelf-style vendors.**

2. for equipment with greater than six next-to-vend product positions on each shelf, the next-to-vend product positions
   i. two product positions towards the center from the left-most next-to-vend product position and
   ii. two product positions towards the center from the right-most next-to-vend product position.

**7.1.5.3 Installation of Beverage Temperature Sensors.** Sensors and their associated wiring shall be installed in a manner that does not affect energy performance. For example, the sensor pathway into the refrigerated cabinet shall be sealed to prohibit air infiltration and shall not disrupt internal airflow.

***Informative Note:*** Regulatory bodies may require the method of temperature sensor installation to be documented. Test technicians are advised to consult manufacturer's supplemental test instructions for the optimal routing path.

### 7.2 Energy Consumption Test

**7.2.1 Purpose.** The purpose of this test is to determine the stabilized daily and per-unit capacity energy consumption of the vending machine operating over a 24 hour period.

**7.2.2 Procedure**

**7.2.2.1** Ambient temperature and humidity shall be maintained within the ranges specified in Table 1 for each recorded measurement throughout the test.

**7.2.2.2** The vending machine shall be fully loaded to maximum capacity. For combination machines, the nonrefrigerated compartments must not be loaded with any standard products, test packages, or other vendible merchandise. The temperature control of the machine shall be adjusted to achieve the instantaneous average next-to-vend beverage temperature specified in Table 1. It shall be allowed to operate under standard test conditions until stabilized. Temperature stabilization is considered to be achieved 24 hours after the instantaneous average next-to-vend beverage temperature reaches the specified value (see Table 1) and energy consumption for two successive 6 hour periods are within 2% of each other.

**7.2.2.3** The test shall begin after temperature stabilization has been achieved, and the following shall be recorded for 24 consecutive hours, in 1 minute intervals:

a. Ambient temperature, °F (°C)
b. Relative humidity, %
c. Energy consumption, kWh
d. Input voltage, V
e. Duration of test, h and/or min
f. Beverage temperature, °F (°C)

**7.2.2.4** Instantaneous average next-to-vend beverage temperature shall be calculated as the average of all next-to-vend test package measurements taken at a given time interval.

$$T_i = (\sum T_{xi})/n$$

where

$T_i$ = instantaneous average next-to-vend beverage temperature at interval $i$, °F (°C)

$T_{xi}$ = measured beverage temperature for next-to-vend test package $x$ at interval $i$

$n$ = total number of next-to-vend test packages

**7.2.2.5** Integrated average temperature shall be calculated as the average of all instantaneous average next-to-vend beverage temperatures over the 24 hour test period.

$$T_{iat} = (\sum T_i)/d$$

where

$T_{iat}$ = integrated average temperature, °F (°C)

$d$ = total number of recorded intervals

**7.2.2.6** To ensure that the vending machine operates independently of external influences during the test period, other than those specified herein, the test chamber and vending machine shall not be disturbed throughout the duration of the energy consumption test once the measurement instrumentation is in place. Interaction necessary to defeat low-power modes is allowed but shall be documented in Table A-3 (see Appendix A).

**7.2.2.6.1 Active Mode.** The vending machine shall be maintained in the active mode for the entire test.

**7.2.2.6.2 Low-Power Modes.** For machines with an integrated energy management system, it shall not be allowed to operate in low-power mode. Energy management systems that modify operation based on traffic or other factors shall be defeated by the test technician. Consult the manufacturer on proper method for defeating these systems.

**7.2.2.7 Combination Machines.** Testing of combination machines shall follow the procedure described in Section 7.2.2, with sealed beverages and test packages in the refrigerated compartment. The nonrefrigerated cabinet shall be empty and lighted as in normal operation.

### 7.2.3 Energy Consumption Calculations

**7.2.3.1 Calculation of Daily Energy Consumption.** The daily rated energy consumption of each basic model of a vending machine shall be determined as follows:

$$E_D = (E_T/t_T) \times 24$$

where

$E_D$ = primary rated energy consumption per day, kWh

$E_T$ = energy consumed during the test, kWh

$t_T$ = duration of the test, h

24 = the number of hours per day

**7.2.3.2 Calculation of Energy Consumption per Unit Capacity.** Rated energy consumption per unit volume shall be calculated by dividing the rated energy consumption per day $E_D$ by the refrigerated volume of the machine.

## 7.3 Recovery Test

**7.3.1 Purpose.** The purpose of this test is to determine the product temperature recovery time of a vending machine when loaded with product at the temperature specified in Table 2.

***Informative Note:*** Product is not vended in this test.

### 7.3.2 Procedure

**7.3.2.1** The temperature control setting used in Section 7.2.2.2 shall be used under the standard test conditions specified in Table 2. For stack vendors, the product storage rack shall be empty except for standard test packages placed in each next-to-vend position. For shelf-style vendors, the product storage rack shall be filled to 40% of maximum capacity, including standard test packages placed in next-to-vend positions following Section 7.1.5.2.2. The machine shall be allowed to reach stabilized operation, which is considered to be achieved a minimum of 2 hours after the instantaneous average next-to-vend beverage temperature reaches the specified pretest value (see Table 2) and the compressor has cycled at least 3 times.

**Table 2 Standard Test Conditions for Recovery Test**

| Test and Pretest Conditions | Recovery Test |
|---|---|
| Ambient temperature | 90°F ± 2°F (32.2°C ± 1°C) |
| Relative humidity | 65% ± 5% rh |
| Reloaded sealed-beverage temperature | 90°F ± 1°F (32.2°C ± 0.5°C) |
| Pretest instantaneous average next-to-vend beverage temperature | 36°F ± 1°F (2.2°C ± 0.6°C) |
| Final instantaneous average next-to-vend beverage temperature | 32°F to 40°F (0.6°C to 4.4°C) |

**Table 3 Standard Test Conditions for Vend Test**

| Test and Pretest Conditions | Vend Test |
|---|---|
| Ambient temperature | 90°F ± 2°F (32.2°C ± 1°C) |
| Relative humidity | 65% ± 5% rh |
| Reloaded sealed-beverage temperature | 90°F ± 1°F (32.2°C ± 0.5°C) |
| Maximum acceptable beverage temperature | 40°F (4.4°C) or less |

**7.3.2.2** The machine shall then be opened and the product storage rack reloaded to rated capacity with product at the temperature specified in Table 2 while the machine door is open for the length of time specified in Table 4.

**7.3.2.3** The beverage temperature shall be measured in standard test packages following Section 7.1.5.2. The recovery test will be judged complete when the final instantaneous average next-to-vend beverage temperature reaches the conditions specified in Table 2.

**7.3.2.4** The recovery time between door closing in Section 7.3.2.2 and meeting the condition specified in Section 7.3.2.3 shall be reported. The actual time of door open, door closed, and end of test, as well as calculated recovery time, shall be reported.

## 7.4 Vend Test

**7.4.1 Purpose.** The purpose of this test is to determine how much cold product a machine will deliver when bottles, cans, or other sealed packages are vended at a rate of two per minute, 3 hours after a half-full machine is refilled with product at the beverage temperature specified in Table 3.

### 7.4.2 Procedure

**7.4.2.1** The temperature control setting obtained in Section 7.2.2.2 shall be used. All standard test packages shall be removed, and the machine shall be unloaded until half of its capacity of standard sealed beverages remains, distributed evenly across the product storage rack. It shall then be operated under standard test conditions (specified in Table 3) for a minimum of 12 hours.

**7.4.2.2** The machine shall then be opened and the product storage rack reloaded to rated capacity with product at the

**Table 4 Door Open Durations**

| Vending Capacity (standard sealed beverages) | Vend Test, min | Recovery Test, min |
|---|---|---|
| ≤500 | 10 | 10 |
| >500 and ≤650 | 15 | 15 |
| >650 | 20 | 20 |

beverage temperature specified in Table 3 while the door is open for the length of time specified in Table 4.

**7.4.2.3** The machine shall be closed and allowed to operate for 3 hours. Product vending shall then commence, and each vended standard sealed beverage shall be opened and the beverage temperature measured by a sensor inserted at approximately the center of mass of the liquid. Product shall be vended at a uniform rate of one per 30 seconds using a regular product selection sequence that ensures each product storage rack position has been vended equally.

**7.4.2.4** Product shall be vended and beverage temperatures recorded until half of the load has been vended or until 7% of the vendible capacity has been vended with a beverage temperature above 40°F (4.4°C) in consecutive vends, whichever occurs first.

**7.4.2.5** The temperature of each product and the number of products with a beverage temperature less than the maximum acceptable beverage temperature specified in Table 3 shall be reported.

## 8. NORMATIVE REFERENCES

2019

AHAM. 2~~008.~~ ANSI/AHAM Standard HRF-1, *Energy, Performance and Capacity of Household Refrigerators, Refrigerator-Freezers and Freezers*. Washington, DC: Association of Home Appliance Manufacturers.

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## INFORMATIVE APPENDIX A
## REPORTING FORM FOR EQUIPMENT TESTED USING ANSI/ASHRAE STANDARD 32.1

**Table A-1 General Description**

| Section | Measure | Data |
|---|---|---|
| N/A | Manufacturer | |
| N/A | Model number | |
| N/A | Combination machine (yes/no) | |
| 5.1 | Standard sealed beverage type and size (i.e., 12 oz. canned beverage, 20oz. bottled beverage, or special package) | |
| 5.2 | Vendible capacity (number of standard sealed beverages) | |
| 5.3 | Refrigerated volume, $ft^3$ (L) | |
| 6.2 | Rated voltage, V | |
| 6.2 | Rated frequency, Hz | |
| 7.1.2 | List of components, included in test machine (provide description or make/model number) | ❑ Payment mechanism: _____<br>Accessories<br>❑_____: _____<br>❑ _____: _____<br>❑ _____: _____ |
| 7.1.5.3 | Describe routing of beverage temperature sensors (optional) | |

**Table A-2 Most Recent Calibration (Section 4)**

| Section | Measure | Data |
|---|---|---|
| 4.2 | Temperature measurement, °F (°C) | |
| 4.3 | Humidity measurement, % | |
| 4.4 | Electrical energy measurement, kWh | |
| 4.4 | Voltage measurement, V | |
| 4.5 | Time measurement, s | |

**Table A-3 Energy Consumption Test (Section 7.2) at 75°F Ambient Temperature**

| Section | Measure | Data |
|---|---|---|
| 7.2.2.3(a) | Average ambient temperature, °F (°C) | |
| 7.2.2.3(b) | Average ambient relative humidity, % | |
| 7.2.2.3(c) | Energy consumption, kWh | |
| 7.2.2.3(d) | Average input voltage, V | |
| 7.2.2.3(e) | Duration of test, h and/or min | |
| 7.2.2.5 | Integrated average temperature, °F (°C) | |
| 7.2.2.6 | Describe interactions necessary to defeat low power modes (if any) | |
| 7.2.3.1 | Energy consumed per 24 h day, kWh | |
| 7.2.3.2 | Energy consumed per unit refrigerated volume, kWh per day per $ft^3$ (kWh per day per L) | |

**Table A-4 Recovery Test (Section 7.3)**

| Section | Measure | Data |
|---|---|---|
| 7.3.2.1 | Average ambient temperature, °F (°C) | |
| 7.3.2.1 | Average ambient relative humidity, % | |
| 7.3.2.3 | Average reloaded sealed beverage temperature, °F (°C) | |
| 7.3.2.4 | Final instantaneous average next-to-vend beverage temperature, °F (°C) | |
| 7.3.2.2 | Door open time, h:min | |
| 7.3.2.4 | Door closed time, h:min | |
| 7.3.2.4 | End of test time, h:min | |
| 7.3.2.4 | Recovery time (door closed to end of test), h:min | |

**Table A-5 Vend Test (Section 7.4)**

| Section | Measure | Data |
|---|---|---|
| 7.4.2.1 | Average ambient temperature, °F (°C) | |
| 7.4.2.1 | Average ambient relative humidity, % | |
| 7.4.2.2 | Average reloaded sealed beverage temperature, °F (°C) | |
| 7.4.2.2 | Door open time, h:min | |
| 7.4.2.3 | Vending start time, h:min | |
| 7.4.2.4 | Vending end time, h:min | |
| 7.4.2.4 | Vending elapsed time (from vending start to end), h:min | |
| 7.4.2.5 | Number of sealed beverages vended | |
| 7.4.2.5 | Temperature of each product vended, °F (°C) | |
| 7.4.2.5 | Number of products with temperature less than 40°F (4.4 °C) | |

**(This appendix is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ANSI.)**

## INFORMATIVE APPENDIX B
## ENERGY CONSUMPTION TEST UNDER TROPICAL CONDITIONS

Users of this standard who wish to measure the energy consumption of a vending machine under extreme temperature conditions are recommended to follow the procedures described in Section 7.2, except with the ambient temperature conditions specified in Table 1 changed to 105°F ± 2°F (40.6°C ± 1°C) and 75% rh.

**(This is a normative appendix and is part of this standard.)**

## NORMATIVE APPENDIX C MEASUREMENT OF VOLUME

The following methodology for measuring refrigerated volume is excerpted from AHAM HRF-1, *Energy and Internal Volume of Refrigerating Appliances*. It is used with permission from the Association of Home Appliance Manufacturers (AHAM), 1111 19th Street NW, Suite 402, Washington, DC 20035 (http://www.aham.org).

## 4. METHOD FOR COMPUTING REFRIGERATED VOLUME OF REFRIGERATORS AND WINE CHILLERS

**4.1 Scope.** This section describes methods for computing total volume (Section 3.30.3) of refrigerators and wine chillers. Section 4 is intended to provide a uniform means of determining the size, taking into consideration the special features and/or functional components which are located within the refrigerated compartment(s). It is not intended to provide a means of measuring the food-storage capacity.

**4.2 Total Volume**

**4.2.1 Volume Measurements.** The fresh food compartment volume is to be recorded to the nearest 0.01 cubic feet (nearest 0.1 liter). The freezer compartment volume is to be recorded to the nearest 0.01 cubic feet (nearest 0.1 liter). The total volume shall be the sum of the volumes of all compartments and be recorded to the nearest cubic feet (nearest 1.0 liter).

**4.2.2 Determination of Volume.** The volume shall take into account the exact shapes of the walls including all depressions or projections. For through the door ice and water dispensers, the ice chute will be included in the volume up to the dispensing function.

When the volume is determined, internal fittings such as shelves, removable partitions, containers and interior light housings shall be considered as not being in place.

The items below shall be considered as being in place and their volumes deducted:

- The volume of control housings.
- The volume of the evaporator space (see Section 4.2.3).
- The volume of air ducts required for proper cooling and operation of the unit.
- Space occupied by shelves molded into the inner door panel.

For clarification, the through the door ice and water dispensers and the insulating hump are not included in the volume. No part of the dispenser unit shall be included as volume.

**4.2.3 Volume of Evaporator Space.** The volume of the evaporator space shall be the product of the depth, width and height.

The total volume to be deducted shall comprise the following:

a. In the case of a forced air evaporator, the total volume of and behind the evaporator cover shall be deducted including volume occupied by the evaporator fan and the fan scroll.
b. In the case of plate style (or roll-bond) evaporators, the volume behind vertically installed plate style evaporators and the volume above horizontally installed plate style evaporators if the distance between the horizontal plate style evaporator and the nearest above liner surface is less than 2 inches (50 mm). Removable drip trays/troughs shall be considered as not present.
c. In the case of refrigerant filled shelving, the volume above the uppermost shelf and below the lowermost shelf, if the distance between the shelf and the nearest horizontal plane of the cabinet inner wall is less than 50 mm (or 2 inches). All other refrigerated shelves are considered as not present.

**4.3 Legend for Figures 4-1 through 4-3.** Figures 4-1 through 4-3 show typical configurations and are not intended to cover all design variations. A combination of components from the various figures may be used for other designs.

These figures graphically support procedures for determination of volume described in Sections 4.2.2 and 4.2.3.

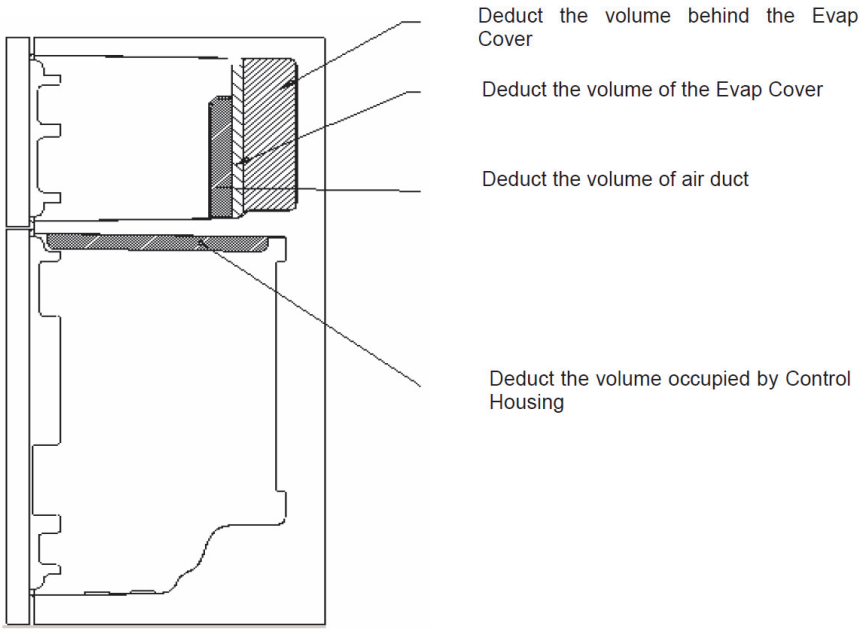


**Figure 4-1 This view is a Basic TM Model but applies to all SxS, BM, FF, FZ, etc. All deducts are the same. See the next figures for Dispenser Unit clarification.**

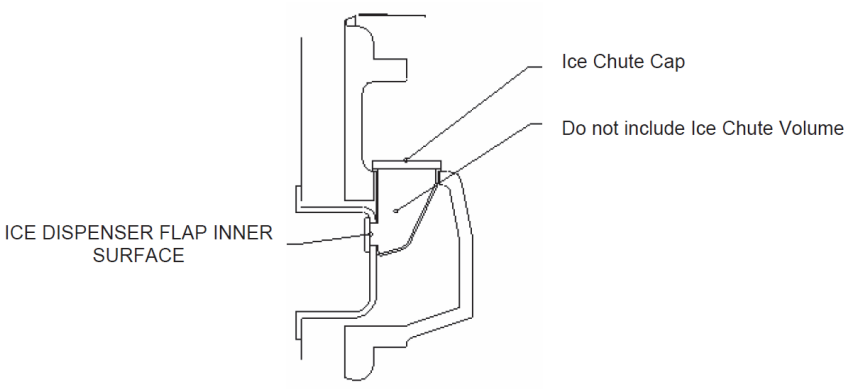


**Figure 4-2 IM dispenser with plug or cover over the ice chute.**

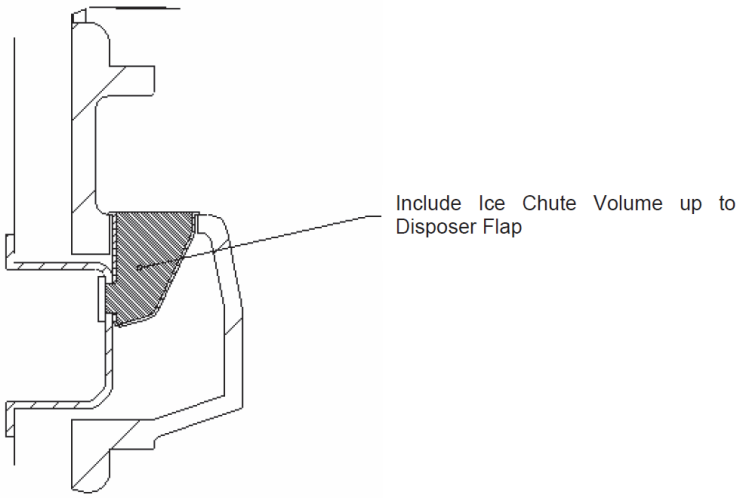


**Figure 4-3 IM dispenser without plug or cover over the ice chute.**

# POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

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ASHRAE, founded in 1894, is a global society advancing human well-being through sustainable technology for the built environment. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration, and sustainability. Through research, Standards writing, publishing, certification and continuing education, ASHRAE shapes tomorrow's built environment today.

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