Designation: F2432 – 12

An American National Standard

Standard Specification for Ice Making Machines, Icemaker-Dispensers, and Ice Dispensing Equipment[1]

This standard is issued under the fixed designation F2432; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers requirements for commercial automatic ice making equipment. It covers the equipment and devices used in manufacturing and processing ice for human consumption and the attached equipment used in storing and dispensing ice in connection with this equipment.

1.2 This specification does not apply to icemakers of the tray type, ice vending machines, or icemakers and icemaker kits used in household refrigerators or freezers. This specification is not intended to cover block ice manufacturing plants.

1.3 The values stated in inch-pound units are to be regarded as the standard. The SI values given in parenthesis are provided for information only.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

A1008/A1008M Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

D3951 Practice for Commercial Packaging

F760 Specification for Food Service Equipment Manuals

F1166 Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities

2.2 *ANSI Standard:*[3]

Z1.4 Sampling Procedures and Tables for Inspection by Attributes

2.3 *ANSI/UL Standards:*[4]

No. 563 UL Standard For Ice Makers

No. 763 UL Standard for Operated Commercial Food Preparing Machines

No. 969 UL Standard for Marking and Labeling Systems

2.4 *ARI Standards:*[5]

Standard No. 810 Standard for Automatic Commercial Icemakers

Standard No. 820 Standard for Ice Storage Bins

2.5 *ASHRAE Standard:*[6]

Standard No. 29 Methods of Rating and Testing Ice Makers

2.6 *NSF/ANSI Standards:*[7]

No. 12 Automatic Ice making Equipment

No. 18 Manual Food and Beverage Dispensing Equipment

2.7 *Federal and Military Standards:*[8]

MIL-STD-1399/300 Interface Standard For Shipboard Systems Section 300A Electric Power, Alternating Current

MIL-STD-167/1 Mechanical Vibrations of Shipboard Equipment (Type I—Environmental and Type II—Internally Excited)

MIL-STD-461 Requirements For the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment

3. Terminology

3.1 *Definitions:*

3.1.1 *Capacity:*

3.1.1.1 *ice maker*—quantity of ice produced during a 24-h period at standard rating conditions defined by ARI 810.

3.1.1.2 *ice storage bin*—theoretical amount of ice, which can be contained within an ice storage bin at standard rating conditions defined by ARI 820.

[1] This specification is under the jurisdiction of ASTM Committee F26 on Food Service Equipmentand is the direct responsibility of Subcommittee F26.03 on Storage and Dispensing Equipment.

Current edition approved Aug. 1, 2012. Published September 2012. Originally approved in 2004. Last previous edition approved in 2004 as F2432 – 04. DOI: 10.1520/F2432-12.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

[4] Available from Underwriters Laboratories (UL), Corporate Progress, 333 Pfingsten Rd., Northbrook, IL 60062.

[5] Available from Air-Conditioning & Refrigeration Institute (ARI) 4100 N. Fairfax Drive, Suite 200 Arlington, VA 22203.

[6] Available from American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE), 1791 Tullie Circle, NE, Atlanta, GA 30329.

[7] Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140.

[8] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098.

3.1.2 *harvest*—function of removing or separating the manufactured ice from the evaporator.

3.1.3 *remote icemaker*—icemaker intended to be connected to a field-installed condenser located remote from the icemaker.

3.1.4 *self-contained icemaker*—unitary equipment consisting of a complete factory assembled and tested refrigerating system in which all refrigerant-containing parts are permanently connected at the factory.

3.1.5 *unitary icemaker*—equipment consisting of a complete factory assembled and tested refrigeration system comprising one or more assemblies that may be shipped separately but are intended to be used together.

4. Classification

4.1 *General*—Ice machines covered by this specification are classified by types, grades, classes, sizes and styles.

4.2 *Type:*
4.2.1 *Type I*—Ice machine with or without ice storage bin.
4.2.2 *Type II*—Icemaker-dispenser machine.
4.2.3 *Type III*—Ice dispenser.

4.3 *Grade:*
4.3.1 *Grade 1*—Air-cooled condenser (self-contained).
4.3.2 *Grade 2*—Water-cooled condenser (self-contained).
4.3.3 *Grade 3*—Remote water-cooled.
4.3.4 *Grade 4*—Remote air-cooled.

4.4 *Class:*
4.4.1 *Class A*—Cubed ice.
4.4.2 *Class B*—Flaked ice.
4.4.3 *Class C*—Nugget ice.
4.4.4 *Class D*—Other ice shapes.

4.5 *Size:*
4.5.1 *Cube Ice Makers:*

Ice Maker Size	Production Capacity	
	(lb)	(kg)
1	100 and under	45.3 and under
2	101 to 150	45.8 to 68.0
3	151 to 200	68.5 to 90.7
4	201 to 250	91.1 to 113.4
5	251 to 350	113.8 to 158.7
6	351 to 450	159.2 to 204.1
7	451 to 550	204.5 to 249.8
8	551 to 650	249.9 to 294.8
9	651 to 900	295.2 to 408.2
10	901 to 1250	408.6 to 566.9
11	1251 to 1500	567.4 to 680.3
12	1501 and over	680.8 and over

4.5.2 *Flake Ice and Nugget Makers:*

Ice Maker Size	Production Capacity	
	(lb)	(kg)
1	200 and under	90.7 and under
2	201 to 300	91.1 to 136.0
3	301 to 400	136.5 to 181.4
4	401 to 550	181.8 to 249.4
5	551 to 700	249.9 to 317.5
6	701 to 1000	317.9 to 453.5
7	1001 to 1200	454.0 to 544.3
8	1201 to 2000	544.7 to 907.1
9	2001 and over	907.6 and over

NOTE 1—This specification does not purport to address all of the sizes that may be available, but is an overview of the most common sizes used in the industry today (see Appendix X1).

4.6 *Style:*
4.6.1 *Style 1*—Corrosion-resisting steel cabinet.
4.6.2 *Style 2*—Carbon steel cabinet.
4.6.3 *Style 3*—Plastic.

5. Ordering Information

5.1 *Ordering Data*—Purchasers shall select the ice making machines, icemaker-dispensers, and ice dispensing equipment and any preferred options and include the following information in the purchasing document:
5.1.1 Title, number, and date of this specification,
5.1.2 Type, grade, class, size, and style of machine required,
5.1.3 Quantity to be furnished,
5.1.4 Ice storage bin size,
5.1.5 Electrical power supply characteristics: voltage, phase, frequency (see 7.3.1),
5.1.6 Accessory equipment such as water/beverage dispensing heads, spare parts, maintenance parts required, or other options available by the manufacturer, or a combination thereof,
5.1.7 When Federal/Military procurement is required, review and implement the applicable supplementary requirements (see S1.1 through S8.8.3),
5.1.8 When specified, the purchaser shall be furnished certification that samples representing each lot have been either tested or inspected as directed in this specification and the requirements have been met. When specified, a copy of the test results shall be furnished (see 14.1 through 14.3),
5.1.9 Level of preservation and packing required if other than as stated in Practice D3951 (see 17.1), and
5.1.10 Labeling requirements (if different than 15.1).

6. Materials and Manufacture

6.1 *General*—Ice making machines, icemaker-dispensers, and ice dispensing equipment shall conform to NSF/ANSI No. 12. Materials used shall be new and free from defects, or reclaimed and recycled conforming to the same quality standards for new materials.
6.1.1 *Stainless Steel*—Stainless steel shall conform to the 300 series of Specification A167 as applicable.
6.1.2 *Carbon*—Carbon steel sheet or strip shall conform to Specification A1008/A1008M as applicable.
6.1.3 *Ozone-Depleting Compounds*—Type one ozone-depleting compounds shall not be used as a refrigerant or as a component of foam insulation and shall be the manufacturer's standard chemicals.
6.1.4 *Insulation*—Insulation used in construction shall be fabricated to efficiency requirements in accordance with ARI 820.

7. Design and Construction

7.1 *General*—Ice machines shall be the manufacturer's standard product delivered assembled, ready for mounting, connected to electricity and water, and used as applicable.

7.2 The ice machine shall have a means of harvesting and storing ice, a water circulating system, motor or motor drives, and all necessary piping, wiring, control and safety devices, and accessories required to provide an automatic operating ice

making machine with automatic control of ice level in storage bin. Storage bins shall be sized accordingly, with respect to production capacities, and be compatible with the ice making machine or icemaker-dispenser. Ice dispensing equipment shall be units with a means of dispensing ice by actuation of a lever or button device. All parts of ice making machines, icemaker-dispensers, and ice dispensing equipment shall be located to permit repair or replacement.

7.2.1 *Exterior Cabinet*—Equipment shall be designed, constructed, and tested to be in compliance with ANSI/UL 563 and NSF/ANSI No. 12 or NSF/ANSI No. 18 as applicable.

7.3 *Electrical Requirements:*

7.3.1 *Nominal Input Power*—Unless otherwise specified (see 5.1.5), the machine shall be designed to operate on one of the following:

7.3.1.1 120 V, 60 Hz, single phase.

7.3.1.2 208 to 230 V, 60 Hz, single phase.

7.3.1.3 208 to 230 V, 60 Hz, three phase.

7.3.1.4 220 to 240 V, 50 Hz, single phase.

7.3.2 *Electrical Motors*—All electric motors shall have bearings that require no additional lubrication.

7.4 *Refrigeration Unit*—The refrigeration unit shall be an integral part of the ice making machine or icemaker-dispenser. The assembled refrigeration unit shall be completely self-contained, completely wired, and completely dehydrated and charged with the proper amount and type of refrigerant and oil necessary for operation. The refrigerating system shall be fitted with a means of recovering and adding refrigerant to the system. The compressor and compressor motor shall be of the type and size to obtain the capabilities listed in 4.5.1 and 4.5.2. Motors shall be protected against damage from overloads and voltage fluctuations when starting or running by means of a thermal overload protector. When 50 Hz frequency is specified, the motor shall be specifically designed for operation on that frequency.

7.5 *Storage Bin*—Storage bins shall be insulated with material as specified in 6.1.4. Bins shall be available in various sizes to meet the storage and usage requirements of associated ice making machines. Bin selection shall be specified in the contract or purchase order (see 5.1.4).

7.5.1 *Ice Storage Bin Size*—The table below lists typical bin sizes. This specification does not purport to address all of the sizes that may be available, but is an overview of the most common sizes used in the industry today (see Appendix X1).

Ice Bin Size	Capacity	
	(lb)	(kg)
1	200 and under	90.7 and under
2	201 to 300	91.1 to 136.0
3	301 to 400	136.5 to 181.4
4	401 to 550	181.8 to 249.4
5	501 to 600	227.2 to 272.1
6	601 to 800	272.6 to 362.8
7	801 to 1000	363.3 to 453.5
8	1001 and over	454.0 and over

7.6 *Capacities*—The ice making machines and icemaker-dispensers shall have the ice making capacity as listed in 4.5 under the conditions specified in 11.1.

7.7 *Legs*—Floor style units shall be mounted on NSF/ANSI No. 12 approved 6-in. (152-mm) legs. Counter or dresser style units shall be mounted on NSF/ANSI No. 12 approved 4-in. (102-mm) legs.

8. Performance Requirements

8.1 Icemakers shall conform to ANSI/UL 563 and ASHRAE 29. Ice storage bins shall conform to ARI 820.

9. Workmanship, Finish, and Appearance

9.1 All components and assemblies of the machines shall be free from dirt and other extraneous materials, burrs, slivers, tool and grind marks, dents, and cracks. Castings, molded parts, and stampings shall be free of voids, sand pits, blowholes, and sprues. External surfaces shall be free from kinks, dents, and other deformities. Forming and welding shall not cause damage to the metal and shall be done neatly and accurately.

10. Sampling

10.1 A representative production model shall be selected for performing testing.

10.2 When specified in the contract or purchase order, sampling for inspection shall be performed in accordance with ANSI Z1.4.

11. Test Methods

11.1 *Performance and Operational Testing*—Equipment shall be designed, constructed, and tested to be in compliance with ANSI/UL 563, NSF/ANSI No. 12, ASHRAE 29, ARI 810, and ARI 820. Inability of the machines to operate as specified shall constitute failure of the test.

12. Inspection

12.1 *End Item Testing*—When specified in the contract or purchase order, one production item selected at random from each lot shall be tested by the manufacturer in accordance with the applicable paragraphs of Section 11. Performance results shall be recorded in a permanent file, and the information shall be available to the customer upon demand. Any subsequent change in design that would relate to performance shall require a new test record.

12.2 *Component and Material Inspection*—Incoming components and materials shall be inspected by the manufacturer to the design parameters as specified on drawings or purchase documents, or both.

13. Rejection and Rehearing

13.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing.

14. Certification

14.1 When specified in the purchase order or contract, the purchaser shall be furnished certification that indicates samples

representing each lot have been either tested or inspected as directed in this specification and the requirements have been met. When specified in the purchase order or contract, a certified test report of the results shall be furnished (see 5.1.8).

14.2 *Safety*—Acceptable evidence of meeting the requirements of ANSI/UL 563 or ANSI/UL 763 shall be one of the following:

14.2.1 A current ANSI/UL listing and display of the ANSI/UL seal on the unit, or

14.2.2 A certified test report from a nationally recognized testing laboratory acceptable to the purchaser indicating that the unit has been tested and conforms to ANSI/UL 563 or ANSI/UL 763.

14.3 *Sanitation*—Acceptable evidence of meeting the requirements of NSF/ANSI No. 12 or NSF/ANSI No. 18 shall be one of the following:

14.3.1 A current NSF listing and display of the NSF mark on the unit, or

14.3.2 A certified test report from a nationally recognized testing laboratory acceptable to the purchaser indicating that the unit has been tested and conforms to NSF/ANSI No. 12 or NSF/ANSI No. 18.

15. Product Marking

15.1 Each ice making machine, icemaker-dispenser, and ice dispenser shall be provided with an identification plate securely affixed to the item. The plate shall be molded, die-stamped, etched on metal, indelibly stamped on labels secured by pressure-sensitive adhesive, or other means as specified in the purchase document. If pressure-sensitive labels are used, the requirements of ANSI/UL 969 or equivalent must be met. The marking shall be durable and shall be legible and readily visible after the item is installed in the intended manner. The identification plate shall include the name, brand, or trademark of the manufacturer of such known character to be readily traceable to the manufacturer and shall state the electrical characteristics (voltage, amperage, and frequency) of the equipment. The plate shall also bear a distinctive number, letter or number, and letter code that will identify an individual item or production lot of a limited group of items. In addition, such information required by ANSI/UL and NSF/ANSI as applicable shall appear on the identification plate. The plate shall be located on an external surface.

16. Manuals

16.1 Format and content of applicable manuals shall be as indicated in Specification F760 and supplemental data if required.

17. Packaging and Package Marking

17.1 Unless otherwise specified (see 5.1.9), the complete machine shall be packaged and marked in accordance with Practice D3951. In addition, the package shall be marked showing the model number, serial number, and manufacturer's name.

18. Keywords

18.1 flake ice; food service equipment; ice; ice cubes; ice dispenser; ice machine; icemaker-dispenser; nugget ice

SUPPLEMENTARY REQUIREMENTS

FOR FEDERAL AND MILITARY PROCUREMENT

The supplemental requirements that follow apply to all Federal and Military procurements. Where provisions of this supplement conflict with the main body of this specification, this supplement shall prevail.

S1. Manual

S1.1 A manual complying with Specification F760 and its supplement shall be provided.

S2. First Article Inspection

S2.1 When required, the first article inspection shall be performed on one unit. The first article may be either a first production item or a standard production item from the supplier's current inventory, provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract.

S3. Label Plates

S3.1 Ice making machines, icemaker-dispensers, and ice dispensers shall be provided with data-name plates and instruction plates.

S3.2 *Data-Name Plates*—In addition to the manufacturer data plate, machines shall be provided with data-name plates readily visible to the operator during normal operating use and so as to not adversely affect the life and utility of the unit. Plates shall be attached to the front of the unit in such a manner as to meet the applicable National Sanitation Foundation sanitary requirements for this equipment. The plate shall contain the following information which shall be stamped, engraved, or applied by photosensitive means:

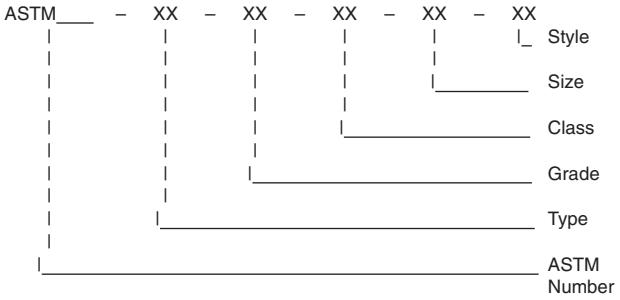
S3.2.1 National Stock Number, and

S3.2.2 Government Approved Manual Number.

S3.3 *Instruction Plate*—An instruction plate shall be made of an ANSI/UL accepted label material and shall be attached to the front of the machine. The instruction plate shall bear instructions for start-up, operation, and shutdown.

S4. Part Identifying Number

S4.1 The following part identifying numbering procedure is for government purposes and does not constitute a requirement for the contractor. The PINs to be used for items acquired to this document are created as follows:



The above is an example of the PIN for an item in accordance with ASTM Standard F_____, type XX, grade XX, class XX, size XX, style XX.

S5. Human Factors Criteria

S5.1 Human factors engineering criteria, principles, and practices as defined in Practice F1166 shall be used in the design of all ice making machines, icemaker-dispensers, and ice dispensers.

S6. Preservation, Packaging and Package Marking

S6.1 When other than commercial practice or conformance to Practice D3951 is desired, the preservation, packaging, and package marking requirements shall be stated in the purchase order or contract.

S7. Manufacturer's Certification

S7.1 If the manufacturer has successfully furnished the same equipment on a previous contract within the past three years, further inspection will not be required. The manufacturer shall certify in writing that the equipment to be furnished is the same as that previously furnished and approved, and that no major design changes have been made to the equipment.

S8. Naval Shipboard Requirements

S8.1 The following additional requirements apply when equipment is to be used for shipboard purposes.

S8.2 *Power Compatibility*— Unless otherwise specified (see 5.1), ice making machines, icemaker-dispensers, and ice dispensers shall be compatible with 115 Vac, 60 Hz, single phase, alternating current for shipboard as specified in MIL-STD-1399/300.

S8.3 *Condenser*—Shipboard ice making machines and icemaker-dispensers shall have an air-cooled condenser constructed of either copper, aluminum, or steel.

S8.4 *Access*—Ice making machines, icemaker-dispensers, and ice dispensers shall pass through a 26-in. (660-mm) wide by 66-in. (1676-mm) shipboard hatch without major disassembly. Machines for submarines shall pass through a 25-in. (635-mm) diameter circular hatch without major disassembly. Access must be provided from the front of unit for replacement of components or parts and to accomplish any maintenance related work.

S8.5 *Shipboard Ice Bins:*

S8.5.1 *Storage Bin*—Ice bins for shipboard use shall be lined with 300 series stainless steel as specified in 6.1.1.

S8.5.2 *Bin Locks/Key Lock Switches*—When specified for shipboard use, ice making machines shall be equipped with key locking devices on the ice bin covers to prevent access to stored ice. Shipboard icemaker-dispensers and ice dispensers shall be equipped with key lock switches to prevent dispensing of ice. The bin locks/key lock switch shall not interfere with the machine's ice making capabilities.

S8.5.3 *Mounting*—The ice making machine storage bins shall be provided with four removable legs suitable for bolting to the deck. Legs shall be 6 ± ½ in. (152 ± 13 mm) long fabricated from 14 gage minimum stainless steel 300 series adequately reinforced. Counter or dresser mounted icemaker-dispensers and ice dispensers shall be provided with four type 300 series stainless steel round legs, each a minimum 1-in. (25-mm) in diameter, 4-in. (102-mm) in length, for securing the unit to the dresser.

S8.6 *Environmental Suitability*—Ice making machines, icemaker-dispensers, and ice dispensers shall be capable of withstanding a ship's vibration and motion. Controls, switches, moving parts, and electrical circuits shall operate under shipboard conditions without malfunction, binding, excessive looseness, or damage (see S8.8.3).

S8.7 *Inclined Operation*—Ice making machines, icemaker-dispensers, and ice dispensers shall operate satisfactorily on surface ships when inclined at an angle of 15° each side of the vertical in each of two vertical planes at right angles to each other, with no spillage of fluid or product. For submarines the angle of inclination shall be 30°.

S8.8 *Quality Assurance Provisions:*

S8.8.1 *EMI Control Tests*—When specified, ice making machines, icemaker-dispensers, and ice dispensers shall be tested by the contractor in accordance with test methods of MIL-STD-461 for surface ships and submarines. The first article or the initial production unit, as applicable, shall be tested. The contractor shall furnish written certification that the equipment meets the requirements of MIL-STD-461. Nonconformance with the requirements specified shall constitute failure of the test.

S8.8.2 *Inclined Operational Test*—The ice making machines, icemaker-dispensers, and ice dispensers shall be bolted to a test platform similar to shipboard installation and inclined at an angle of 15° (30° for submarines). The machine shall be filled to 75 % capacity with product, then operated for 60 s each at each side of the vertical in each of two vertical planes at right angles to each other. Any non-conformance with specified requirements of S8.7 shall constitute failure of this test.

S8.8.3 *Shipboard Environmental Test*—When specified, the ice making machines, icemaker-dispensers, and ice dispensers under normal operating conditions shall be tested in accordance with MIL-STD-167/1, type I equipment. The machine shall be secured to the test machine in the same manner that it will be secured on shipboard. Failure of the machine to perform its function during or after testing or meet the requirements of S8.6 shall constitute failure of this test. The

government reserves the right to witness all tests of machines procured for Naval shipboard use, whether performed by the supplier or an independent testing agency.

APPENDIX

(Nonmandatory Information)

X1. ADDED FEATURES

X1.1 Some manufacturers offer additional sizes and features that extend the versatility of the ice making machines, icemaker-dispensers, and ice dispensers. The variety of sizes and options vary by manufacturer. A good source of general information can be found in the literature available from food service equipment manufacturers and dealers.

X1.2 Typically these options are added to the basic models at an additional cost. Any additional options that are required can be written into the procurement contract as desired.