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An American National Standard

Standard Specification for Freezers, Ice Cream, Soft Serve, Shake[1]

This standard is issued under the fixed designation F1604; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers commercial ice cream, soft serve, and shake freezers, which freeze and dispense frozen product (dairy, yogurt, custard, etc.) on a continuous basis. Included in this specification are conventional and heat-treatment freezers.

1.2 Equipment covered under this specification may contain a substance (or be manufactured with a substance) that harms public health and environment by destroying ozone in the upper atmosphere. This specification does not purport to address environmental regulations. It is the responsibility of the user of this standard to comply with environmental regulations (see 7.5).

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

~~A167~~A176 Specification for Stainless and Heat-Resisting ~~Chromium-Nickel~~Chromium Steel Plate, Sheet, and Strip (Withdrawn ~~2014)~~2015)[3]

~~A176~~A240/A240M Specification for ~~Stainless~~Chromium and ~~Heat-Resisting Chromium~~Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications ~~(Withdrawn 2015)~~

D3951 Practice for Commercial Packaging

F760 Specification for Food Service Equipment Manuals

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

F2795 Test Method for Performance of Self-Contained Soft Serve and Shake Freezers

2.2 *ANSI/UL Standard:*[4]

Standard ~~No.~~ 621 for Ice Cream Makers

2.3 *ANSI/NSF International Standard:*[5]

Standard ~~No.~~ 6 for Dispensing Freezers

Standard 51 for Plastic Materials and Components Used in Food Equipment

2.4 *ANSI Standards:*[6]

B1.1 Unified Inch Screw Threads (UN and UNR Thread Form)

Z1.4 Sampling Procedures and Tables for Inspection by Attributes

2.5 *Military Standards:*[7]

MIL-R-12323 Refrigerators and Related Equipment, Packaging and Packing

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

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

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[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] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from ~~Underwriters Laboratories,~~UL LLC, Inc., 333 Pfingsten Rd., Northbrook, IL 60062.

[5] Available from NSF International, P.O. Box 130140, Ann Arbor, MI 48113-0140.

[6] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

[7] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

MIL-STD-461 Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-1399/300 Interface Standard for Shipboard Systems Section 300A Electric Power, Alternating Current

3. Terminology

~~3.1 *corrosion-resistant steel*—corrosion-resisting steel shall conform to any of the 300 Series of Specification A167, or the 400 Series of Specification A176, where permitted by ANSI/NSF Std. 6.~~

3.1 *corrosion-resistant steel, n*—corrosion-resisting steel shall conform to any of the 300 Series of Specification A240/A240M, or the 400 Series of Specification A176, where permitted by ANSI/NSF Std. 6.

~~3.2 *heat-treatment freezers*—operate as conventional freezers and heat daily all product to 150°F (66°C) minimum for at least 30 min to destroy undesirable microorganisms.~~

3.2 *combination freezer, n*—a soft serve and shake machine employing two main compressors and two main condensers with one or more condenser fan motors and two separate freezer doors (or dispense head) (that is, one for soft serve and another for shake), designed to dispense shake and soft serve product in the same footprint.

~~3.3 *overrun*—the increase in volume due to the addition of air to frozen softserve and shake products, calculated by this formula:~~

$$\frac{A - B}{B} \times 100 = \text{percent overrun} \quad (1)$$

~~where:~~

~~*A* = weight of the liquid mix, and~~
~~*B* = weight of same volume of frozen product.~~

3.3 *overrun, n*—the increase in volume due to the addition of air to frozen softserve and shake products, calculated by this formula:

$$\text{Overrun} = (\text{Weight of liquid mix} - \text{Weight of frozen product}) / \text{Weight of frozen product} \quad (1)$$

~~3.4 *recovered materials*—materials that have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials.~~

3.4 *refrigeration system type, n*—
3.4.1 *air cooled freezer, n*—a soft serve or shake freezer that uses air passing over a main condenser in the refrigeration system.

3.4.2 *heat-treatment freezers, n*—operate as conventional freezers and heat daily all product to 150°F (66°C) minimum for at least 30 min to destroy undesirable microorganisms.

3.4.3 *water-cooled freezer, n*—a soft serve or shake freezer which uses water passing through a twin tube condenser in the freezer cylinder refrigeration system.

3.5 *single spout freezer, n*—a freezer with a single main compressor and single main condenser with one or more condenser fan motors with single spout and a freezer door.

3.6 *twin single spout freezer, n*—a freezer employing either of the below configurations (Twin Twist freezer "A" or "B") but with two single spout doors which can only dispense from one Freezer Cylinder.

3.7 *twin twist freezer "A", n*—a freezer using two main compressors and two main condensers with one or more condenser fan motors and a freezer door (3 spout) which the center spout draws from both freezer cylinders.

3.8 *twin twist freezer "B", n*—a freezer with single main compressor and single main condenser, with one or more condenser fan motors, with a freezer door (3 spout) which the center spout draws product from both freezer cylinders.

4. Classification

4.1 *General*—Ice cream freezers covered by this specification are classified by ~~type, size, group, style, class, and grade.~~Type, Style (was group), Size/Capacity (was size), Class (new – was covered under 7.1.1 – Electrical Input), Grade (updated to include what was Class), and Group (new –added to cover mounting options which should be part of the specification section for this equipment).

4.2 *Type:*
4.2.1 *Type I*—Commercial soft-serve freezer.
4.2.2 *Type II*—Commercial shake freezer.
4.2.3 *Type III*—Combination commercial soft-serve and shake freezer.

4.3 *Style:*
4.3.1 *Style 1*—One freezing cylinder.
4.3.2 *Style 2*—Two freezing cylinders.

4.3.3 *Style 3*—Three freezing cylinders.
4.3.4 *Style 4*—Four freezing cylinders.

4.4 ~~*Size:*~~*Size/Capacity:*
4.4.1 ~~*Size*~~*Size/Capacity 1*—1.0 to 4.9 gal/h (3.8 to 18.6 L/h) finished product output.[8]
4.4.2 ~~*Size 5—*~~*Size/Capacity 2*—5.0 to 9.9 gal/h (18.9 to 37.5 L/h) finished product output.[8]
4.4.3 ~~*Size 10—*~~*Size/Capacity 3*—10.0 to 14.9 gal/h (37.9 to 56.4 L/h) finished product output.[8]
4.4.4 ~~*Size 15—*~~*Size/Capacity 4*—15.0 to 19.9 gal/h (56.8 to 75.3 L/h) finished product output.[8]
4.4.5 ~~*Size 20—*~~*Size/Capacity 5*—20.0 to 29.9 gal/h (75.7 to 113.2 L/h) finished product output.[8]
4.4.6 ~~*Size 30—*~~*Size/Capacity 6*—30.0 to 39.9 gal/h (113.6 to 151.0 L/h) finished product output.[8]
~~4.3.7 *Size 40*—40.0 to 99.9 gal/h (151.4 to 378.1 L/h) finished product output.[8]~~

~~4.4 *Group:*~~
~~4.4.1 *Group 1*—One freezing cylinder.~~
~~4.4.2 *Group 2*—Two freezing cylinders.~~
~~4.4.3 *Group 3*—Three freezing cylinders.~~
~~4.4.4 *Group 4*—Four freezing cylinders.~~

~~4.5 *Style:*~~
~~4.5.1 *Style 1*—Floor.~~
~~4.5.2 *Style 2*—Countertop.~~

4.5 *Class:*
4.5.1 *Class* ~~*1—a*—Air-cooled condenser.~~120 V, 60 Hz, 1 Ph.
4.5.2 *Class* ~~*2—b*—Liquid-cooled condenser.~~ 208 V, 60Hz, 1 Ph.
4.5.3 *Class* ~~*3—c*—Remote air-cooled condenser.~~240 V, 60 Hz, 1 Ph.
4.5.4 *Class d*—208 to 230 V, 60 Hz, 1 Ph.
4.5.5 *Class e*—208 V, 60Hz, 3 Ph.
4.5.6 *Class f*—240 V, 60 Hz, 3 Ph.
4.5.7 *Class g*—208 to 230 V, 60 Hz, 3 Ph.
4.5.8 *Class h*—460 V, 60Hz, 3 Ph.
4.5.9 *Class i*—480 V, 60 Hz, 3 Ph.
4.5.10 *Class j*—230 V, 50 Hz, 3 Ph.
4.5.11 *Class k*—380 to 415 V, 50 Hz, 3 Ph.
4.5.12 *Class m*—380 V, 60 Hz, 3 Ph.
4.5.13 *Class n*—440 V, 60 Hz, 3 Ph (shipboard use).

4.6 *Grade:*
4.6.1 *Grade* ~~*1—A*—Nonheat-treatment freezer.~~Non-heat-treatment freezer with air-cooled condenser.
4.6.2 *Grade B*—Non-heat-treatment freezer with water-cooled condenser.
4.6.3 *Grade* ~~*2—C*—Heat-treatment freezer (see~~with ~~3.2).~~air-cooled condenser.
4.6.4 *Grade D*—Heat-treatment freezer with water-cooled condenser.

4.7 *Group:*
4.7.1 *Group a*—Floor with caster.
4.7.2 *Group b*—Floor with legs.
4.7.3 *Group c*—Floor with brackets.
4.7.4 *Group d*—Countertop with legs.
4.7.5 *Group e*—Countertop with brackets.
4.7.6 *Group f*—Countertop with seal (sealed to countertop).

5. Ordering Information

5.1 *Ordering Data*—Purchasers shall select the preferred options permitted herein and include the following information in procurement documents:
5.1.1 Title, number, and date of this specification;
5.1.2 Type, ~~size, group,~~ style, size/capacity, class, grade, and ~~grade~~group of freezer required (see 4.1);
5.1.3 When hardware and fittings are to be other than as specified (see 6.2);
~~5.1.4 Voltage and frequency (hertz) of input power (see 7.1.1);~~
5.1.4 If sampling and inspection procedures are required, see 10.2;
5.1.5 Level of preservation and packing required if other than as stated in Practice D3951 (see ~~15.1~~13.1);

[8] Per freezing cylinder. Combination freezers may require two size ratings, for example: 15 soft serve/20 shake.

~~5.1.7 When mounting options are required (see 5.4);~~

5.1.6 When Federal/Military procurement is required, review and implement the applicable supplementary requirements (see Supplementary Requirements S1 and S2);

5.1.7 Type of refrigerant, insulation, and other manufacturing processes required (see 7.5); and

5.1.8 When a certification report is required.

5.2 *Freezer Selection and Application*—Prior to the use of Section 4 classifications, the purchaser will ensure the user is not restricted by some aspect of the freezer design such as weight or external dimensions that would prevent the unrestricted use of the classifications listed in Section 4.

5.3 *Freezer Availability*—Although Section ~~4~~4 lists a wide range of ~~sizes,~~ types, styles/capacities, classes, ~~groups,~~grades, and ~~styles~~groups for commercial types of freezers, not all combinations may be available.

~~5.4 *Mounting Options* (see 5.1.7):~~

~~5.4.1 Casters.~~

~~5.4.2 Legs.~~

~~5.4.3 Brackets.~~

~~5.4.4 Seals.~~

5.4 *Supplementary Requirements*—The supplementary requirements shall apply only when specified by the purchaser in the contract or order.

6. Materials

6.1 *General*—Freezers shall conform to the applicable documents listed in Section 2. Materials used shall be free from defects that would affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new or fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. None of the preceding shall be interpreted to mean that the use of used or rebuilt products are allowed under this specification unless otherwise specified.

6.2 *Hardware and Fittings*—Unless otherwise specified (see ~~5.1~~5.1.3), all hardware and fittings shall be corrosion-resistant or suitably processed to resist corrosion in accordance with the manufacturer's standard practice.

6.3 *Threaded Parts*—All threaded parts shall conform to ANSI B1.1.

7. Design and Construction

7.1 *Electrical ~~Requirements:~~Components:*

~~7.1.1 *Nominal Input Power*—Unless otherwise specified (see 5.1), the freezer shall be designed to operate on one of the following:~~

~~7.1.1.1 120 V, 60 Hz, single phase;~~

~~7.1.1.2 208 V, 60 Hz, single phase;~~

~~7.1.1.3 240 V, 60 Hz, single phase;~~

~~7.1.1.4 208 to 240 V, 60 Hz, single phase;~~

~~7.1.1.5 208 V, 60 Hz, three phase;~~

~~7.1.1.6 240 V, 60 Hz, three phase;~~

~~7.1.1.7 208 to 240 V, 60 Hz, three phase; and~~

~~7.1.1.8 480 V, 60 Hz, three phase.~~

7.1.1 *Electric Motors*—All electric motors shall have bearings that require no additional lubrication.

7.2 *Steel Fabrication*—The steel used in fabrication shall be free from kinks, sharp bends, and other conditions that would be deleterious to the finished product. Manufacturing processes shall not reduce the strength of the steel to a value less than intended by the design. Manufacturing processes shall be done neatly and accurately. All bends shall be made by controlled means to ensure uniformity of size and shape.

7.3 *Lubrication*—All bearings (unless lifetime lubricated), gears, and sliding parts shall have provision and instructions for lubrication. Bearings or parts in the food zone requiring lubrication shall be identified in the operator's manual and acceptable food grade lubricants shall be specified by the manufacturer.

7.4 *Interchangeability*—All units of the same classification furnished with similar options under a specific contract shall be identical to the extent necessary to ensure interchangeability of component parts, assemblies, accessories, and spare parts.

7.5 Use of ozone-depleting chemicals must comply with national regulations.

7.5.1 *Refrigerants*—Unless otherwise specified (see 5.1), shall be the manufacturer's standard chemical(s).

~~7.5.2 *Insulation*—Unless otherwise specified (see 5.1), shall be the manufacturer's standard chemical(s).~~

~~7.5.3 *Other*—Unless otherwise specified (see 5.1), shall be cleaned or processed using the manufacturer's standard chemical(s).~~