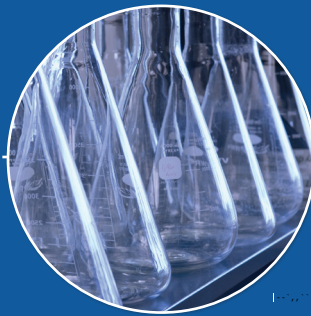




*NSF International Standard /
American National Standard*

NSF/ANSI 7 - 2016

Commercial Refrigerators and Freezers



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Chair, Joint Committee on Food Equipment
c/o NSF International
789 North Dixboro Road, P.O. Box 130140
Ann Arbor, Michigan 48113-0140 USA
Phone: (734) 769-8010 Telex: 753215 NSF INTL
FAX: (734) 769-0109 E-mail: info@nsf.org
Web: <http://www.nsf.org>



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Foreword²

The purpose of this Standard is to establish minimum food protection and sanitation requirements for the materials, design, construction, and performance of commercial refrigerators and freezers.

This version of NSF/ANSI 7 – 2016 includes the following revisions:

Issue 9:

Sections 9.13.2 and 9.14.1 were revised establishing performance testing and labeling requirements for multi-zone refrigerated equipment.

Issue 10:

This revision made changes to subsections of section 9 covering Closed Display Units with Automatic Door Locks.

Issue 13:

A normative reference in section 2 was updated.

Issue 15:

Restrictions on the use of galvanized and zinc-alloy-coated materials in walk-in and roll-in refrigerators and freezers were added to section 8.

This Standard was developed by the NSF Joint Committee on Food Equipment using the consensus process described by the American National Standards Institute.

Suggestions for improvement of this Standard are welcome. This Standard is maintained on a Continuous Maintenance schedule and can be opened for comment at any time. Comments should be sent to Chair, Joint Committee on Food Equipment, c/o NSF International, Standards Department, P.O. Box 130140, Ann Arbor, Michigan, 48113-0140, USA.

² The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. Therefore, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

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NSF maintains laboratories in Michigan, as well as offices in Ann Arbor, MI, and Brussels, Belgium.

Commercial Refrigerator Manufacturers Division/Air Conditioning Refrigeration Institute

The Commercial Refrigerator Manufacturers Association (CRMA) was founded in 1933 as a national trade association dedicated to advancing the common interests of the commercial refrigeration industry. In April 2000, CRMA merged with the Air Conditioning Refrigeration Institute (ARI) to form the Commercial Refrigerator Manufacturers Division/Air Conditioning Refrigeration Institute. CRMD/ARI continues to target three primary objectives:

- to showcase technical and business information to help solve common problems and promote growth in industry.
- to represent the collective voice of the industry with any government organization addressing policies or issues affecting the industry.
- to support high voluntary standards for quality in equipment design and performance.

CRMD/ARI is a not-for-profit corporation of leading businesses meeting international demands for increasingly specialized and efficient refrigeration equipment. CRMD/ARI members serve a wide range of markets, including supermarkets, food stores, convenience stores, restaurants, hotels, motels, food processing establishments, and hospitals.

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NSF/ANSI International Standard for Food Equipment —

Commercial refrigerators and freezers

1 General

1.1 Purpose

This Standard establishes minimum food protection and sanitation requirements for the materials, design, manufacture, construction, and performance of commercial refrigerators and freezers and their related components.

1.2 Scope

This Standard contains requirements for refrigerators and freezers used to store and/or display cold food. The types of refrigerators and freezers covered by this Standard include, but are not limited to: storage refrigerators (e.g., reach-in, under counter, walk-in, roll-in); storage freezers (e.g., reach-in, under counter, walk-in, roll-in); rapid pull-down refrigerators and freezers; refrigerated food transport cabinets; refrigerated buffet units; refrigerated food preparation units; display refrigerators; beverage coolers; and ice cream cabinets.

This Standard does not establish equipment installation requirements. While the requirements of this Standard are intended to ensure that equipment may be installed in a sanitary manner, proper installation of equipment shall be governed by the applicable codes.

Refrigerator and freezer components and materials covered under other NSF or NSF/ANSI Standards or Criteria shall also conform to the requirements therein. This Standard is not intended to restrict new unit design, provided that such design meets the minimum specifications described herein.

1.3 Alternate materials, design, and construction

While specific materials, design, and construction may be stipulated in this Standard, equipment that incorporates alternate materials, design, or construction may be acceptable when such equipment meets the applicable requirements herein.

1.4 Measurement

Decimal and SI conversions provided parenthetically shall be considered equivalent. Metric conversions have been made according to IEEE/ASTM SI 10.

2 Normative references

The following documents contain provisions that, through reference, constitute provisions of this NSF/ANSI Standard. At the time this standard was balloted, the editions listed below were valid. All documents are subject to revision, and parties are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below.

ANSI Z97.1-2004, *Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings*³

ANSI/ASHRAE 72 - 2014, *Method of Testing Open and Closed Commercial Refrigerators and Freezers*⁴

ANSI/UL 471-2006, *Standard for Commercial Refrigerators and Freezers*⁵

ANSI/UL 197 – 2004. *Standard for Commercial Electric Cooking Appliances*⁵

ASHRAE Refrigeration Handbook⁴

ASTM A653/A653M, *Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process*, Vol. 01.06⁶

ASTM A924/A924M, *Specification for General Requirements Steel Sheet, Metallic-Coated by the Hot Dip Process*, Vol. 01.06⁶

BS857:1967. *Specification for safety glass for land transport*⁷

IEEE/ASTM SI 10-2002, *Standard for the Use of the International System of Units (SI): The Modern Metric System*⁶

NSF/ANSI 2. *Food equipment*

NSF/ANSI 51. *Food equipment materials*

NSF/ANSI 170. *Glossary of food equipment terminology*

3 Definitions

Terms used in this Standard that have special technical meaning are defined in NSF/ANSI 170.

4 Materials

This section contains general requirements that apply to all equipment covered under the scope of this Standard.

The requirements contained in this section are intended to protect food from contamination and ensure that the materials used in the manufacture of refrigerators and freezers resist wear; penetration by vermin; and the effects of foods, cleaning compounds, sanitizers, refrigerants, and other substances that may contact the materials in the intended use environment.

³ American National Standards Institute, 23 West 23rd Street, New York, NY 10036 www.ansi.org

⁴ American Society of Heating, Refrigeration, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329-2305 www.ashrae.org

⁵ Underwriters Laboratories, Inc., 33 Pfingsten Road, Northbrook, IL 60062 www.ul.com

⁶ ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428 www.astm.org

⁷ British Standard, 389 Chiswick High Road, London W4 4AL United Kingdom www.bsi-global.com

4.1 Conformance to NSF/ANSI 51

Materials shall conform to the requirements in NSF/ANSI 51 applicable to the zone in which the material is used.

4.2 Zinc-coated materials

4.2.1 Galvanized and other zinc-alloy-coated materials shall not be used inside refrigerated food storage compartments, except compartments intended exclusively for the storage and/or display of packaged foods only or the material is protected by an additional coating conforming to NSF/ANSI 51.

4.2.2 Zinc-coated fasteners may be used in food zones but shall not be used in areas having direct food contact.

4.3 Solder

Solder containing lead as an intentional ingredient shall not be used in a food zone or splash zone.

4.4 Gaskets

Gaskets shall be made of resilient rubber, rubber-like materials, plastics, or a combination thereof.

4.5 Canopies and awnings

Canopies, awnings, and similar overhead decorative items located at least 36 in (90 cm) above all working surfaces shall be exempt from the material smoothness and cleanability requirements of this Standard. These items shall conform to applicable design and construction requirements of this Standard.

4.6 Storage shelving

Storage shelving that is manufactured, in whole or in part, of metallic materials and is intended for use in refrigerator or freezer interiors shall meet the corrosion resistance requirements in NSF/ANSI 51 section 8.

4.6.1 Shelving manufactured of stainless steel in the AISI 200 or 300 series, or of aluminum of the alloy series/designations listed in NSF/ANSI 51 section 4.2.2.1 and 4.2.2.2, is exempt from corrosion resistance requirements.

4.6.2 The coating requirements in section 6 of NSF/ANSI 51 shall also apply to storage shelving.

5 Design and construction

This section contains general requirements that apply to all equipment covered within the scope of this Standard.

5.1 General sanitation

5.1.1 Equipment shall be designed and manufactured to prevent the harborage of vermin and the accumulation of dirt, debris, and moisture, and to permit the inspection, maintenance, servicing, and cleaning of the equipment and its components.

5.1.2 Food zones and surfaces in direct contact with packaged foods shall be readily accessible and easily cleanable.

5.1.3 Splash zone surfaces shall be accessible and easily cleanable.

5.1.4 Non-food zone surfaces shall be accessible and cleanable.

5.1.5 Unexposed non-food zone surfaces shall be accessible or closed.

5.2 External angles and corners

Exposed external angles and corners in a food zone shall be sealed and smooth (See figure 1).

5.3 Fasteners

5.3.1 Fasteners shall not be used in areas having direct food contact.

5.3.2 Fasteners used in food storage compartments shall be removable. Rivets and other non-removable fasteners may be used:

- on electrical components and their housings; and
- in refrigerators intended solely for the storage or display of packaged foods (e.g., beverage coolers, self-service display refrigerators).

5.3.3 Fasteners shall be easily cleanable. Fasteners meeting this requirement include, but are not limited to, slot-head and Phillips-head screws, hex-head fasteners, and flush-break pop rivets. Hex-key screws and nonflush-break pop rivets may be used in a splash zone or non-food zone provided that the heads are capped or filled.

5.3.4 Fasteners shall be tight-fitting to the surface except as permitted in 5.3.5.

5.3.5 No more than one locking washer and one flat washer shall be used per fastener head. The diameter of the washer adjacent to the fastening surface shall not be less than the diameter of the washer under the fastener head. External-tooth lock washers shall not be used.

5.3.6 There shall be no exposed threads, projecting screws, or studs in a food or splash zone. There shall be no more than 2.5 exposed threads or $\frac{1}{4}$ in (0.25 in, 6.4 mm) of exposed threads, whichever is less, in a non-food zone. Exposed threads on electrical cord strain relief devices in a nonfood zone shall be exempt.

5.3.7 The sharp point of a fastener shall not be exposed.

5.4 Joints and seams

5.4.1 Permanent joints and seams in a food or splash zone shall be sealed and smooth. Seams formed by the attachment of breaker strips shall be exempt from this requirement.

5.4.2 In addition to conforming to 5.4.1, permanent seams located below the liquid overflow level of a food storage compartment shall be filled and made flush with the adjoining surfaces.

5.4.3 Joints formed by overlapping sheets of material shall not create upwardly facing horizontal ledges.

5.4.4 Permanent joints and seams in a non-food zone shall be closed. Welded joints and seams in a non-food zone shall be deburred.

5.4.5 Sealants shall only be used to seal joints and seams that are structurally sound and are less than $\frac{1}{8}$ in (0.13 in, 3.2 mm) wide before sealing. Sealants may be used to fill spaces around collars, grommets, and service connections. Sealants shall not be used in place of grommets or gaskets.

5.4.6 Solder

Solder and other fillet material shall be smooth and securely bonded to its substrate so that it will not crack or chip. All flux and catalytic material shall be removed.

5.5 Edges and nosings

If a shelf or unit top is reinforced by forming its edge into a structural shape (nosing), and there is an adjoining vertical surface (i.e., cabinet body), the following requirements shall apply:

- the nosing shall be integral with the shelf or unit top; and
- the edge shall be deburred; and
- the nosing and adjoining vertical surface shall be closed or shall have a clearance of at least $\frac{3}{4}$ in (0.75 in, 19 mm) or $\frac{1}{3}$ of the nosing's vertical dimension, whichever is greater.

If the profile edge is turned in to form a channel-like configuration, the return (horizontal) shall not exceed $\frac{1}{2}$ in (0.50 in, 13 mm) and shall be angled downward at least 5° from the horizontal plane. This requirement does not apply to readily removable shelves or knockdown shelves.

5.6 Reinforcing and framing

5.6.1 Exposed reinforcing and framing members and gussets shall be easily cleanable. Reinforcing and framing members shall be designed and manufactured to prevent the harborage of vermin (See figure 2).

5.6.2 Horizontal surfaces of reinforcing and framing members and gussets shall not be located where debris may accumulate.

5.6.3 Vertical channels that form hollow sections shall be closed at each end, open at each end, or readily accessible along the entire channel. All other hollow sections shall be closed at each end.

5.7 Inspection and maintenance panels

When necessary for equipment inspection and maintenance, removable panels of adequate size shall be provided. Each panel shall be sized to permit removal and replacement by one person.

5.8 Veneers

When provided, veneers shall be permanently affixed to equipment surfaces. Air pockets between veneer materials and equipment surfaces shall be eliminated.

5.9 Doors

5.9.1 Doors shall be sized to fit their openings and shall close properly.

5.9.2 Sliding doors shall slide freely and shall be readily removable.

5.9.3 Exposed channel sections on single panel doors shall be inverted or easily cleanable. Clean-outs shall be provided if channels are not inverted (see figure 3).

5.9.4 Exposed edges of glass doors shall be protected by tight-fitting channels, stripping materials, or other means such as rounding the edges of tempered glass to protect against chipping. The glass shall conform to the requirements in 5.30.3 (See figure 4).

5.10 Hinges

5.10.1 Hinges located in a food zone shall be easily cleanable while in place or shall be designed to be disassembled, without the use of tools, for routine cleaning. Hinges located in a splash zone shall be easily cleanable while in place or shall be designed to be disassembled (with or without the use of tools) for routine cleaning.

5.10.2 Continuous hinges shall not be used in a food zone.

5.10.3 Hinges on splash zone doors and covers weighing 80 lb (36 kg) or more shall have no more than five knuckles in total per hinge set and shall have sealed joints and seams on the hinge body (except for seams at the pivot joint).

5.10.4 Hinges on splash zone doors and covers weighing less than 80 lb (36 kg) shall conform to the requirements in 5.10.3 or each of the following:

- the hinge pin shall be lift-off style or have a removable pin; and
- the diameter of the hinge pin shall be greater than or equal to $\frac{3}{16}$ in (0.19 in, 5.0 mm); and
- mating surfaces of the hinge (such as the joint between a knuckle and leaf) shall be closed or be separated by at least $\frac{1}{8}$ in (0.13 in, 3.2 mm).

5.11 Door gaskets

5.11.1 Door gaskets shall be easily cleanable and shall be removable for replacement

5.11.2 Retaining grooves and other devices for holding readily removable gaskets shall be easily cleanable.

5.12 Door tracks and guides

5.12.1 Door tracks and guides shall be easily cleanable. Channel tracks shall not have a depth greater than the width of the channel top.

5.12.2 Tracks and guides shall:

- have clear open slots continuously or at intervals along their entire length; or
- have clean-out holes at each end; or
- terminate at least $\frac{1}{2}$ in (0.50 in, 13 mm) short of framing at each end; or
- be integral with the equipment surface and have no square corners.

This shall not apply to lower guides for overhead door suspensions that are integral with the equipment surface and channel-type bottom tracks equipped with readily removable strips.

5.13 Covers

5.13.1 Covers protecting a food zone shall overlap the opening.

5.13.2 Covers shall be designed with sufficient clearance to prevent contact with food.

5.13.3 Port openings through a food zone cover shall be flanged upward at least $\frac{3}{16}$ in (0.19 in, 5.0 mm) and shall have a cover overlapping the flange.

5.13.4 Hinges and pivots shall conform to 5.10.