



*NSF International Standard /
American National Standard*

NSF/ANSI 4 - 2019

Commercial Cooking, Rethermalization,
and Powered Hot Food Holding
and Transportation Equipment



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NSF International Standard /
American National Standard
for Food Equipment –

**Commercial Cooking, Rethermalization,
and Powered Hot Food Holding
and Transport Equipment**

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Standard Developer
NSF International

Designated as an ANSI Standard
August 21, 2019
American National Standards Institute

Prepared by
The NSF Joint Committee on Food Equipment

Recommended for adoption by
The NSF Council of Public Health Consultants

Adopted by
NSF International
August 1958

Revised July 1967	Revised August 1968	Revised April 1970
Revised July 1971	Revised April 1973	Revised June 1986
Revised May 1992	Revised May 1996	Revised March 1997
Revised May 1999	Revised November 2000	Revised March 2002
Revised October 2005	Editorial revision November 2005	Revised February 2006
Editorial revision May 2006	Revised April 2007	Editorial revision May 2007
Revised April 2009	Addendum November 2009	Revised October 2014
Revised November 2016	Revised February 2020	

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Published by
NSF International
PO Box 130140, Ann Arbor, Michigan 48113-0140, USA

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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 cooking, rethermalization, and powered hot food holding and transport equipment.

This Standard uses inch-pound units as the primary units with SI (metric) units provided in parentheses for informational purposes. The Joint Committee carried a motion that this convention be adopted in future revisions to this Standard. The SI units provided in parentheses generally represent a hard conversion of the inch-pound units, meaning that the SI value may have been rounded to provide a reasonable and measurable dimension.

This edition of the Standard contains the following revisions:

Issue 27

This revision adds language regarding a permissible backflow prevention option in Section 5.31.4.1.

Issue 29

This revision updates the year on the American National Standard for Metric Practice reference for IEEE/ASTM SI 10 from 2010 to 2016.

The Interpretations Annex contains responses to interpretation requests. The responses will be published in each version of the Standard until such time that the interpretation response is no longer applicable.

This revision also includes an editorial update to the names of the Annexes within. The Annexes are being changed from alpha characters to numeric, preceded by a 'Normative' or 'Informative'. The Annexes have also been reordered so the Normative Annexes appear first, followed by the Informative Annexes. The table below shows the previous name of the Annex with the corresponding new name of the Annex:

Annexes	
Previously known as:	Now known as:
Annex A	Normative Annex 1 (N-1)
Annex B	Normative Annex 2 (N-2)
Annex C	Normative Annex 3 (N-3)
Annex D	Informative Annex 1 (I-1)
Annex E	Informative Annex 2 (I-2)

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

This Standard and the accompanying text are intended for voluntary use by certifying organizations, regulatory agencies, and/or manufacturers as a basis of providing assurances that adequate health protection exists for covered products.

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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 at standards@nsf.org, or c/o NSF International, Standards Department, PO Box 130140, Ann Arbor, Michigan 48113-0140, USA.

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NSF/ANSI Standard for Food Equipment –

Commercial Cooking, Rethermalization, and Powered Hot Food Holding and Transport Equipment

1 General

1.1 Purpose

This Standard establishes minimum food protection and sanitation requirements for the materials, design, construction, and performance of commercial cooking, rethermalization, and hot food holding and transport equipment and their related components. This Standard does not contain safety requirements.

1.2 Scope

Equipment covered by this Standard includes, but is not limited to, ranges, ovens, fat / oil fryers, fat / oil filters, griddles, tilting griddle skillets, broilers, steam and pressure cookers, kettles, rotisseries, toasters, coffee makers and other hot beverage makers, component water heating equipment, proofing boxes and cabinets, hot food holding equipment, rethermalization equipment, and hot food transport cabinets.

Section 7 of this Standard pertains to food handling and processing equipment that has been designed and manufactured for special use purposes. Food equipment designed and manufactured with a security package is utilized in environments such as correctional facilities, mental health facilities, or some schools. For these environments, where both sanitation and security are concerns, Section 7 contains exceptions to this Standard that shall only be applicable to the splash and nonfood zones of food equipment provided with a security package.

Equipment components and materials covered under other NSF or NSF/ANSI Standards or Criteria shall also comply with 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 Alternative 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 intent of the applicable requirements herein.

1.4 Measurement

Decimal and SI conversions provided parenthetically shall be considered equivalent. Metric conversions and significant figure rounding have been made according to IEEE/ASTM SI 10.^{3,4}

³ Institute of Electrical and Electronics Engineers, Inc. 3 Park Avenue, New York, NY 10016 <www.ieee.org>

⁴ ASTM International. 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. <www.astm.org>

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 recent editions of the documents indicated below. The most recent published edition of the document shall be used for undated references.

40 CFR § 180.940, *Tolerance exemptions for active and inert ingredients for use in antimicrobial formulations (Food-contact surface sanitizing solutions)*⁵

ANSI Z97.1 – 2009, *Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test*⁶

APHA/AWWA/WEF, *Standard Methods for the Examination of Water and Wastewater* (hereinafter referred to as *Standard Methods*)⁷

ASSE 1001 – 2008, *Atmospheric Type Vacuum Breakers*⁸

ASSE 1020 – 2004, *Pressure Vacuum Breaker Assembly*⁸

ASSE 1022 – 2003, *Backflow Preventer for Beverage Dispensing Equipment*⁸

ASSE 1024 – 2004, *Dual Check Backflow Preventers*⁸

ASSE 1032 – 2004, *Dual Check Valve Type Backflow Preventers for Carbonated Beverage Dispensers – Post Mix Type*⁸

BS857:1967, *Specification for safety glass for land transport*⁹

IAPMO – *Uniform Plumbing Code* 2009¹⁰

ICC – *International Plumbing Code* 2009¹¹

IEEE/ASTM SI 10 – 2016, *American National Standard for Metric Practice*^{3,4}

NSF/ANSI 18, *Manual Food and Beverage Dispensing Equipment*

NSF/ANSI 51, *Food Equipment Materials*

NSF/ANSI 170, *Glossary of Food Equipment Terminology*

UL 197 – 2004, *Standard for Commercial Electric Cooking Appliances*¹²

⁵ US Government Publishing Office. 732 North Capitol Street NW, Washington, DC 20401. <www.govinfo.gov/app/collection/cfr>

⁶ American National Standards Institute. 1899 L Street NW, 11th floor, Washington, DC 20036. <www.ansi.org>

⁷ American Public Health Association, American Water Works Association, and Water Environment Federation. *Standard Methods for the Examination of Water and Wastewater*. <www.standardmethods.org>

⁸ ASSE International. 18927 Hickory Creek Drive, Suite 220, Mokena, IL 60448. <www.asse-plumbing.org>

⁹ British Standards Institution (BSI). 389 Chiswick High Road, London, W4 4AL. <www.bsigroup.com>

¹⁰ International Association of Plumbing and Mechanical Officials. 4755 E Philadelphia St., Ontario, CA 91761. <www.iapmo.org>

¹¹ International Code Council. 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001. <www.iccsafe.org>

3 Definitions

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

4 Materials

The requirements contained in this Section are intended to protect food from contamination, and ensure that the materials used in the manufacture of commercial cooking, rethermalization, and powered hot food holding and transport equipment resist wear, penetration by vermin, and the effects of foods, heat, cleaning compounds, sanitizers, and other substances that may contact the materials in the intended use environment. Materials used in unexposed nonfood zone areas shall be exempt from all requirements in Section 4.

4.1 Conformance with NSF/ANSI 51

4.1.1 Except as noted in Sections 4.1.2 through 4.1.4, materials shall conform to the requirements in NSF/ANSI 51 applicable to the zone in which the material is used.

4.1.2 Oven interiors: Oven interiors shall be nontoxic; corrosion-resistant metal; metal treated with a heat-resistant coating; or another nontoxic, corrosion-resistant, and cleanable material. The use of refractory concrete and other high-temperature ceramic materials, including fire brick, shall be limited to the following:

- oven decks whose direct contact with food is restricted to pizza and bread products only. The oven may be used for cooking other types of food, provided that the food is cooked in or on pans or other containers to prevent spillage onto the oven deck;
- interior surfaces (including walls, ceilings, and decks) of ovens intended for cooking pizza and bread products only. The oven shall have a permanent, heat-resistant label stating that its use is restricted to cooking pizza and bread products only. The label shall be clearly visible to the user after installation of the equipment;
- interior surfaces (including walls, ceilings, and decks) of pyrolytic self-cleaning hearth ovens meeting the performance test requirements of Section 6.5, whose direct contact with food is restricted to pizza and bread products only. The oven may be used for cooking other types of food, provided that the food is cooked in or on pans or other containers to prevent spillage onto the oven deck. Manufacturers shall provide instructions for pyrolytic oven cleaning procedures in the operation manual; and
- oven decks and interiors may be constructed of asbestos cement if the asbestos cement is able to meet the abrasion resistance criteria of Section 6.6.

4.1.3 Materials that are not corrosion resistant may be used for the following applications:

- surfaces on fat / oil fryers and fat / oil filtration systems continually wetted by fat or oil during normal operation, including fryer bowl aprons and surrounding areas;
- the tops of hot-top ranges and griddles;
- cooking grates;
- burners and heating elements;
- splash guards on griddles;
- spreader plates; and

¹² UL LLC. 33 Pfingsten Road, Northbrook, IL 60062. <www.ul.com>

- supports located between a cooking surface and a burner.

4.1.4 Heated metal components used exclusively to generate steam by means of contact with potable water are not required to be corrosion resistant, provided that the components are not located in a food zone or splash zone and that any corrosion products are diverted to a drain.

4.1.5 Fluoropolymer coatings, such as polytetrafluoroethylene, may be used in a heated food zone provided that the substrate material conforms to the food zone material requirements in NSF/ANSI 51.

4.2 Solder

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

4.3 Gaskets

Gaskets shall be made of resilient rubber, rubber-like materials, or plastics. Gasket materials shall conform to NSF/ANSI 51 and shall function at any temperature to which they are exposed in normal operation. Oven gaskets may be made of woven fiberglass or similar materials that conform to NSF/ANSI 51.

4.4 Fryer and steam cooker baskets

Baskets on fat / oil fryers and steam cookers shall be constructed of stainless steel or metallic-coated steel conforming to the food zone material requirements in NSF/ANSI 51. Tin coatings, if used, shall be at least 95% pure tin.

4.5 Fat / oil fryers and filters

4.5.1 Materials used for the drain valves and piping of fat / oil fryers shall conform to the food zone requirements of NSF/ANSI 51.

4.5.2 The interiors of enclosure cabinets for fat / oil filters shall conform to the food zone materials requirements of NSF/ANSI 51, unless the filter is equipped with a protective cover. If a protective cover is provided, nonfood zone material requirements shall apply to the cabinet interior.

4.5.3 Filter paper and filter aids for fat / oil filters shall not be required to be easily cleanable. Absorbent materials may be used.

4.6 Brick

Construction brick and similar uncleanable materials shall not be used except as permitted in Section 4.1.2. The use of fire brick is acceptable only on surfaces located behind or below cooking surfaces. Fire brick shall not be used on surfaces intended for direct food contact.

5 Design and construction

Unless otherwise specified, the interiors of heated compartments, such as those in ovens, steam cookers, pressure cookers, proofing cabinets, rethermalization equipment, hot food transport cabinets, and hot food holding cabinets, shall conform to the splash zone design and construction requirements of this Standard. Food zone material requirements shall apply.

NOTE — For floorless walk-in or roll-in equipment, food zone material requirements shall not apply to the floor.

5.1 General sanitation

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

5.1.2 Equipment shall be designed and manufactured so that food may be added, processed, finished, dispensed, removed, and/or served in a sanitary manner.

5.1.3 Food zones shall be readily accessible and easily cleanable or shall be designed for in-place cleaning when a readily accessible design is not feasible.

5.1.4 Food zones for which in-place cleaning is intended shall be designed and manufactured so that cleaning and sanitizing solutions may be circulated or passed throughout the fixed system. The design shall ensure that cleaning and sanitizing solutions contact all food contact surfaces. The system shall be self-draining or capable of being completely evacuated. Equipment and appurtenances designed for in-place cleaning shall have a section of the cleaned area accessible for inspection or shall provide for other acceptable inspection methods. The manufacturer shall provide written instructions for the cleaning and sanitizing of all food zone surfaces for which in-place cleaning is intended. The type and concentration of sanitizing agent recommended in the instructions by the manufacturer shall comply with 40 CFR § 180.940.⁵

NOTE — In-place cleaning procedures are not required for fat / oil filter systems that circulate filtered fat or oil throughout the fixed system.

5.1.5 Splash zone surfaces shall be accessible and easily cleanable.

5.1.6 Nonfood zone surfaces shall be accessible and cleanable.

5.1.7 Unexposed nonfood zone surfaces shall be accessible or closed.

5.2 Internal angles and corners

5.2.1 Internal corners or angles of less than 135° in a food zone shall be smooth and have minimum continuous radii of 1/8 in (0.13 in, 3.2 mm).

5.2.1.1 Internal angles on heated food zones that reach 180 °F (82 °C) or more during normal operation shall be exempt from the food zone radius requirement. This exemption applies to, but is not limited to, the following equipment:

- fat fryer / oil containers and filters (including filter screens);
- fat / oil fryer baskets;
- steam cooker baskets;
- griddles;
- broiler and salamander grates;
- coffee makers;
- pasta cookers; and
- hot water urns and similar equipment whose food contact is limited to hot water only.

5.2.1.2 Lesser radii may be used where necessary to ensure the proper functioning of parts (e.g., sealing ring grooves or precision operating parts) provided that they are easily cleanable.

5.2.1.3 Greater radii shall be provided where necessary to ensure adequate cleaning, product flow, and maintenance.

5.2.2 Solder and other fillet materials shall not be used to effect a required minimum radius of an internal angle. Solder may be used to effect the radius on internal angles on the underside of roll-type covers.

5.3 External angles and corners

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

5.4 Joints and seams

5.4.1 Permanent joints and seams in a food zone or splash zone shall be sealed and smooth. This requirement shall not apply to:

- oven interiors;
- tight-fitting seams formed by assembling working surfaces of fry top ranges and griddles; or
- fat / oil filter screens.

This requirement shall not apply to hot food transport cabinets provided that:

- the unit is intended to be cleaned using high-pressure cleaning methods as described in written cleaning instructions provided by the manufacturer;
- the joints and seams are readily accessible for high-pressure cleaning methods; and
- the unit is capable of being completely drained in an upright position.

5.4.2 Permanent joints and seams in a nonfood zone shall be closed. Welded joints and seams in a nonfood zone shall be deburred.

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

5.4.4 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.

5.4.5 Solder and other fillet material shall be securely bonded to its substrate. All flux and catalytic materials shall be removed.

5.4.6 Equipment shall be designed and manufactured so that field joints may be made sanitary with the use of trim strips, welding, soldering, properly designed draw fastening, or other appropriate methods.

5.4.7 Walk-in or roll-in equipment without prefabricated floors shall be designed and manufactured so that the seams formed between the walls and floor or base may be closed and sealed upon assembly of the equipment.

5.5 Fasteners

5.5.1 Fasteners shall not be used in a food zone except as permitted in Section 5.5.6.

5.5.2 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 non-flush-break pop rivets may be used in a splash zone or a nonfood zone provided that the heads are capped or filled.

5.5.3 Fasteners shall be tight fitting to the surface except as permitted in Section 5.5.4.

5.5.4 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.