NSF/ANSI Standard
for Food Equipment –

Food equipment materials

2 Normative references

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

ANSI Z97.1 – 2004. *Safety Performance Specifications and Methods of Test for Glazing Materials Used in Buildings*[1]

ANSI/UL 197 – 2004. *Standard for Commercial Electrical Cooking Appliances*[2]

ASTM A1016/A1016M-08. *Standard Specification for General Requirements for Ferritic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes*[3]

ASTM B 117 – 07a. *Standard Practice for Operating Salt Spray (Fog) Apparatus*[3]

ASTM B 916 – 01(2007). *Standard Test Method for Adherence of Porcelain Enamel Coatings to Sheet Metal*[3]

ASTM D 2794–93 (2004). *Standard Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)*[3]

ASTM D 3359–08. *Standard Test Methods for Measuring Adhesion by Tape Test*[3]

BS857:1967. *Specification for Safety Glass for Land Transport.*[4]

IEEE/ASTM SI 10 – 2002. *Standard for the Use of the International System of Units (SI): The Modern Metric System*[3]

Federal Food, Drug, and Cosmetic (FD&C) Act, Section 201 (21 U. S. C. 321)[4]

FD&C Act, Section 409 (21 U. S. C. 348)[4]

NSF/ANSI 2. *Food equipment*

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

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[1] American National Standards Institute, 25 West 43rd Street, New York, NY 10036 www.ansi.org
[2] Underwriters Laboratories, Inc., 33 Pfingsten Road, Northbrook, IL 60062 www.ul.com

[3] ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428 www.astm.org
[4] British Standards, 389 Chiswick High Road, London W4 4AL, United Kingdom. www.sbsi.global.com

USFDA Code of Federal Regulations, Title 21, (21 CFR) Parts 170-199, *Food and Drugs*[5]

3 Definitions

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

4 Material formulation

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4.1 General requirements

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4.1.2 Food zone materials shall not contain lead, arsenic, cadmium, or mercury as intentional ingredients. ~~except where~~ Brass and bronze materials may contain lead ~~are specifically~~ as ~~permitted for use~~ under 4.2.3.2.

Reason: This requirement has been interpreted by some to imply that other heavy metals such as arsenic, cadmium, or mercury may still be permitted in brass or bronze. The language has been clarified only permit the use of lead in brass or bronze as described in 4.2.3.2.

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4.2 Requirements for specific types of materials

This section establishes limitations on the use of specific types of materials. All materials shall conform to the general requirements in 4 and 5 and to the additional material-specific requirements established in this section.

4.2.1 Stainless steel

4.2.1.1 Stainless steel used in food equipment shall be of a type in the:

- ~~AISI~~ ASTM[6] 200 series alloys;
- ~~AISI~~ ASTM 300 series alloys; or
- ~~AISI~~ ASTM 400 series alloys.[7]

[5] Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402-0001www.gpo.gov
[6] ~~American Iron and Steel Institute, 1101 17th St. NW, Washington, D.C. 20036 www.steel.org~~ ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428 www.astm.org

4.2.1.2 When used in a food zone, stainless steel shall have a minimum chromium content of 16%. Stainless steel with a chromium content of less than 16% may be used for cutlery, blades, and similar applications requiring a sharp edge, provided that the alloy has been hardened or tempered by an appropriate post-heat treatment process.

4.2.2 Aluminum alloys

When used in a food zone, aluminum alloys shall have one of the following Aluminum Association[8] alloy designations or equivalent:

4.2.2.1 Wrought alloys (sheet and extrusion)

1xxx series alloys	5xxx series alloys
3xxx series alloys	6xxx series alloys
4xxx series alloys	

4.2.2.2 Casting alloys

218.x	356.0	514.0
308.0	360.0	520.0
319.0	413.0	713.0
332.0	B443.0	

4.2.3 Copper and copper alloys

4.2.3.1 Copper and copper alloys shall not be used in a food zone or splash zone except where rendered corrosion resistant or where exposure to food is limited to potable, non-carbonated water under constant service pressure. Exceptions to this requirement are specified in 4.2.3.2 for brass and bronze and in 4.2.3.~~3~~4 for copper-nickel alloys.

4.2.3.2 Brass and bronze may be used in a food zone or splash zone only where rendered corrosion resistant or where exposure to food is clearly and specifically limited to tea, coffee, or water. When used, the lead content of brass and bronze components shall not exceed 8.0%.

4.2.3.3 Equipment having brass or bronze components in contact with tea, coffee, or water (as permitted in 4.2.3.2) shall not impart a lead (Pb) concentration greater than 15 µg/L when tested in accordance with annex B.

NOTE 1 – If a coating (organic or metallic) is applied to the brass or bronze components, testing in accordance with annex B is still applicable.

NOTE 2 – Equipment such as but not limited to proofers, steamers, combination ovens and other systems with similar humidification and vaporization pathways shall be exempt from 4.2.3.3.

4.2.3.~~3~~4 Copper-nickel alloys may be used in a food zone or splash zone only where rendered corrosion resistant or where exposure to food is clearly and specifically limited to non-acidic foods and beverages (i. e., food and beverages with a pH of 6.0 or greater).

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[7] Under the Unified Numbering System (UNS), these types are designated as S2xxxx, S3xxxx, and S4xxxx, respectively.

[8] Aluminum Association, 900 19th St. NW, Washington, DC 20006 www.aluminum.org

4.2.4 Glass and glass-like materials

Glass and glass-like materials, including porcelain, porcelain enamels, and ceramic coatings, shall not be used on surfaces intended for direct food contact that are also subject to impact by hard objects during use (e. g., countertops, tabletops, cutting boards, cooking surfaces) except as permitted in 4.2.4.1.

4.2.4.1 Glass and glass-like materials may be used on grated cooking surfaces.

4.2.4.2 When used on ~~non-food-contact~~ food zone non-direct food contact surfaces that may be subject to impact by hard objects during use, glass and glass-like ~~materials~~ coatings shall meet the impact resistance requirements in 10.3.

4.2.4.3 When used on direct food contact surfaces that are not subject to impact, glass and glass-like ~~materials~~ coatings shall meet the impact resistance requirements in 10.4. Glass-like coatings shall yield an adherence rating of 3 or better when tested according to ASTM B 916.

Reason: 4.2.4.2 and 4.2.4.3 mention that impact testing is required for glass like materials while the testing requirements found in 10.3 and 10.4 are specific to glass like coatings. Language clarified to differentiate between a glass like material and a glass like coating as it relates to the requirement for impact testing.

4.2.4.4 Glass, other than light fixtures, that may be subject to contact during use and routine maintenance and cleaning shall conform:

- to the impact test in ANSI Z97.1 for Class A glass, or
- to the impact test within ANSI/UL 197, or
- to the impact test within BS857:1967.

Reason: 4.2.4.4 specifies requirement for glass. All material requirement are in NSF/ANSI 51. Therefore, the glass requirements are being added to NSF/ANSI 51.

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5 General materials requirements

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5.2 Corrosion resistance

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5.2.2 Storage shelving intended for wet environments

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

NOTE – Shelving shall not include non-removable parts of the refrigerator interior liner.

Reason: Clarification. The intent of the requirement was not intended to apply to the interior liner of the refrigerator itself. Section 5.21.2 of NSF/ANSI 7 requires shelving to be readily removable and based on that requirement, the bottom of the interior liner should not be considered as a shelf.

5.2.2.1 Shelving manufactured of stainless steel in the AISI 200 or 300 series or of aluminum of the alloy series/designations listed in 4.2.2.1 and 4.2.2.2 is exempt from corrosion resistance requirements.

5.2.2.2 Other requirements in this Standard, including the coating requirements in 6, shall also apply to storage shelving.

6 Coatings

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6.2 Organic coatings

6.2.1 Food zones

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6.2.1.7 Fluoropolymer coatings and other non-stick coatings used on heated food zones ~~and where expressly permitted under other NSF Food Equipment Standards~~ shall be exempt from impact resistance, abrasion resistance, adhesion ability, and heat resistance performance tests.

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6.3 Performance requirements for coatings

Coating type	Zone	Applicable performance test	
metallic	food zone – direct food contact	none	
metallic	food zone – serving and display ware	none	
metallic	splash zone	none	
metallic	non-food zone	none	
organic	food zone – direct food contact	9.1	abrasion resistance
		10.1	impact resistance
		11	heat resistance
		12.1	adhesion ability
organic	food zone – serving and display ware	9.3	abrasion resistance
		10.2	impact resistance
		12.2	adhesion ability
organic	food zone - non-direct food contact	9.2	abrasion resistance

		10.1	impact resistance
		11	heat resistance (heated food zone surfaces only)
organic	splash zone	9.2	abrasion resistance
		10.2	impact resistance
		11	heat resistance (heated splash zone surfaces only)
organic	non-food zone	none	
glass and glass-like	food zone – direct food contact	10.4	impact resistance
glass and glass-like	food zone – serving and display ware	10.4	impact resistance
glass and glass-like	food zone – non direct food contact	10.3	Impact resistance
glass and glass-like	splash zone	10.3	impact resistance
glass and glass-like	non-food zone	none	

Reason: Language added to be consistent with requirements in 4.2.4.

Annex B
(normative)

Method for conducting in-unit extraction testing of equipment

B.1 Purpose

This annex describes the method for conducting extraction testing of equipment, including coffee makers, espresso machines, and related equipment covered under the scope of NSF/ANSI 4.

The method has been developed for equipment in which beverages are in contact with a fixed system of tanks, tubing, valves, fixtures, and other components before being dispensed for consumption.

While this method is primarily intended for use in determining the extent to which lead (Pb) is extracted from equipment into a beverage product, it may be used to determine the extraction levels of other substances as needed to ensure conformance to the food zone material requirements of NSF/ANSI 51.

B.2 Preparation of exposure water

The exposure water shall have the following characteristics:

pH	8.0 ± 0.5
alkalinity	500 ± 25 ppm (as $NaHCO_3$)
dissolved inorganic carbon	122 ± 5 ppm
free available chlorine	2 ± 0.5 ppm

This exposure water shall be prepared by adding 46 g sodium bicarbonate ($NaHCO_3$), 3 mL of 5% sodium hypochlorite (aq) (NaOCl), and 32 mL of 1.86% hydrochloric acid (HCl) to 50 L of deionized water (ASTM D 1193 Type II reagent water).9

Exposure water shall be stored in a vessel and distribution system that will not impart substances to or affect the characteristics of the water. If the exposure water is to be stored for more than 24 h prior to use, the storage container shall be pressurized with nitrogen to 10-15 psi (70-105 kPa).

B.3 Exposure protocol

a) The exposure water storage vessel shall be pressurized to 50 ± 5.0 psi (350 ± 35 kPa) using nitrogen gas. A 125-mL control sample shall be collected from the distribution system.

b) The beverage unit shall be connected to the exposure water storage vessel using only stainless steel valves and fittings and polytetrafluoroethylene (PTFE) tubing.

c) While the beverage unit is operated in accordance with manufacturer's instructions, the unit shall be purged with a volume of exposure water equal to between 1.0 and 1.5 times the total volumetric capacity

9 ASTM D 1193-99: *Standard Specification for Reagent Water.* ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428 www.astm.org

of the unit. If there are multiple beverage outlets (e. g, dispensing spouts), it shall be ensured that approximately equal volumes of exposure water are purged from each outlet. Purged water shall be discarded.

d) With the exposure water in contact with all surfaces having contact with beverages under normal idle operating conditions, static conditions shall be maintained for 24 ± 1 h. The equipment shall be operated (including any heating operations) as intended without any water being dispensed. No ingredients or product shall be added during the exposure period.

e) 1.0 L of water, or a volume of water equal to the total volumetric capacity of the unit, whichever is less, shall be dispensed into a clean polyethylene or PTFE container with an airtight lid. If there are multiple beverage outlets (e. g, dispensing spouts), it shall be ensured that approximately equal volumes of extraction water are drawn from each outlet. If the extraction water is to be analyzed for lead and other metals, the sample container shall contain HNO_3 as a preservative.

f) The steps in annex B, sections B.3 c) through B.3 e) shall be repeated two additional times so that there is a composite volume comprised of three samples taken at 24-h intervals.

g) The composite volume shall be stirred with a PTFE or stainless steel stirring rod. A 125-mL sample shall be drawnfrom the composite volume into polyethylene or PTFE sample bottles containing 1.0 mL of HNO_3.

h) The composite water sample and the control sample shall be analyzed for the concentration of contaminant of concern. The control sample concentration shall be subtracted from the composite sample concentration to determine the contaminant concentration imparted by the beverage unit.