NSF International Standard for Food Equipment –

Food equipment

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.


ANSI/ASSE 1001 – 2002. Performance Requirements for Atmospheric Type Vacuum Breakers

ANSI/ASSE 1020 – 2004. Performance Requirements for Pressure Vacuum Breaker Assembly

ANSI/ASSE 1022 – 2003. Performance Requirements for Backflow Preventer for Beverage Dispensing Equipment

ANSI/ASSE 1024 – 2004. Performance Requirements for DualCheck Backflow Preventers


APHA, Standard Methods for the Examination of Dairy Products, seventeenth edition

1 American National Standards Institute, 25 West 43rd Street, New York, NY 10036 www.ansi.org
2 ASME International, Three Park Avenue, New York, NY 10016-5990 www.asme.org
4 National Electrical Manufacturers Association, 1300 N. 17th Street, Rosslyn, VA 22209 USA www.nema.org
5 Underwriters Laboratories, Inc., 33 Pfingsten Road, Northbrook, IL 60062 www.ul.com
6 American Public Health Association, 800 I Street, NW, Washington, DC 20001 www.apha.org
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ASSE 1004 – 1990, *Performance Requirements for Backflow Prevention Requirement for Commercial Dishwashing Machines*

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

ASTM B117 –07a03, *Standard Practice for Operating Salt Spray (Fog) Apparatus*


IAPMO – Uniform Plumbing Code 2003

ICC – International Plumbing Code 2003


NSF/ANSI 2 — 2005a. *Food equipment*

NSF/ANSI 4 — 2002. *Commercial cooking, rethermalization, and powered hot food holding and transport equipment*

NSF/ANSI 7 — 2001. *Commercial refrigerators and freezers*

NSF/ANSI 12 — 2005. *Automatic ice making equipment*

NSF/ANSI 18 — 2005. *Manual food and beverage dispensing equipment*

NSF/ANSI 29 — 2003, *Detergent and chemical feeders for commercial spray-type dishwashing machines*

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

8 International Association of Plumbing and Mechanical Officials, 5001 E. Philadelphia St., Ontario, CA 91761 www.iapmo.org

9 International Code Council, 5203 Leesburg Pike, Suite 600; Falls Church, VA 22041 www.iccsafe.org

10 ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428 www.astm.org
5 Design and construction

This section contains design and construction requirements for equipment covered within the scope of this Standard.

Reason: This change was for clarification and based on other industry standards usage of verbiage in this area. This will be modified in the family of food equipment standards where applicable.

5.3 External angles and corners

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

5.4 Joints and seams

5.4.1 Permanent joints and seams in a food or splash zone shall be sealed and smooth.

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 (see figure 1a & 1b).

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 (see figure 2).

Reason: Figures were added from Standard 2 Supplement where applicable and will be added to the Food Equipment Family of standards as applicable.

5.5 Fasteners

5.5.1 Fasteners shall not be used in a food zone.

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 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.

5.5.5 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 ¼ in (0.25 in, 6.4 mm) of exposed threads, whichever is less, in a nonfood zone. Exposed threads on electrical cord strain relief devices in a nonfood zone shall be exempt.

Reason: Given that this change is for nonfood zones only, the task group found no reason not to exempt these types of electrical cord strain relief devices in a nonfood zone. This change will be made where applicable in the family of food equipment standards.

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

5.6 Insulation
Insulated spaces in the food and splash zones shall be sealed. Insulated spaces in the nonfood zone shall be closed.

5.7 Reinforcing and framing

5.7.1 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 3).

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 2 4).

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 of 5.44.3 (see figure 5).

5.13.8 All internal corners and angles of roll covers, tilt covers, and other similar covers that are less than 135° shall be more than 135° or shall have a minimum smooth radius of 1/8 in (0.13 in, 3.2 mm). Solder or other fillet material may be used to provide a minimum radius on the underside of roll-type covers.

Reason: The task group agreed to this clarification of language to maintain consistency within the family of food equipment standards. This change will be applied to the family of food equipment standards where applicable.

5.14 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 3/4 in (0.75 in, 19 mm) or 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 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 or knockdown shelves (see figure 6).
5.15 Openings into food zones

Openings into food zones shall be protected to prevent the entry of seepage, condensation, and spills. In areas where liquids may accumulate, top openings into food zones shall be protected by a raised rim that extends at least $\frac{3}{16}$ in (0.19 in, 5.0 mm) above the liquid level (see figure 37).

*Reason: This was updated for consistency. The title and the body differed and now are the same. The agreed term was based on the intent of the section. This will be altered in the family of food equipment standards where applicable.*

5.20 Equipment mounting

5.20.1 Floor-mounted equipment shall be designed and manufactured to be:

- portable; or
- mobile; or
- sealed to the floor; or
- elevated on legs that provide a minimum unobstructed clearance beneath the unit of 6.0 in (150 mm); or
- elevated on legs that provide a minimum unobstructed clearance beneath the unit of 4.0 in (100 mm) provided that no part of the floor under the equipment is more than 6.0 in (150 mm) from the point of cleaning access.

5.20.2 Counter-mounted equipment shall be designed and manufactured to be:

- portable; or
- sealed to the counter; or
- elevated on legs that provide a minimum unobstructed clearance beneath the unit of 4.0 in (100 mm); or
- elevated on legs that provide a minimum unobstructed clearance beneath the unit of 3.0 in (76 mm) provided that no part of the counter top under the footprint of the equipment unit is more than 16-20 in (4150 mm) from the point of cleaning access; or
- elevated on legs that provide a minimum unobstructed clearance beneath the unit of 2.0 in (50 mm) provided that no part of the counter top under the footprint of the equipment unit is more than 3.0 in (76 mm) from the point of cleaning access.

*Reason: This reduces the maximum reach requirement for cleaning to improve cleanliness. It clarifies the intent that the point of access is under the footprint of the equipment and not the full depth of the counter top on which the equipment is installed. This will be updated in the family of food equipment standards where applicable.*

5.20.3 Portable equipment shall not weigh more than 80 lb (36 kg) and shall not exceed 36 in (90 cm) in any plane.
5.20.4 Utility connections on portable equipment and mobile equipment shall be designed to be disconnected without the use of tools or shall be of sufficient length to permit the equipment to be moved for cleaning.

5.20.5 Kick plates on floor-mounted equipment shall be removable.

5.21 Legs and feet

5.21.1 Legs and feet shall be fastened to the body of the machine and shaped at their floor or counter contacts to minimize the accumulation of dirt and the harborage of vermin.

5.21.2 Legs and feet shall be sufficiently rigid to support the machine with a minimum of cross bracing.

5.21.3 If the outer dimension of a leg exceeds the outer dimension of its foot by \( \frac{1}{2} \text{ in} \) (0.50 in, 13 mm) or more in the same plane, then the foot shall extend 1.0 in (25 mm) below the leg at the minimum adjustment (see figure 8b).

5.21.4 Hollow sections between leg and foot shall be closed. Legs and feet shall have no exposed threads at the maximum adjustment.

5.21.5 Gussets shall be assembled to the equipment and shall be easily cleanable and designed to prevent vermin harborage. The resultant assembly shall have no recessed areas (see figure 8a and 8b).

5.25 Shelving

5.25.1 Shelving shall be easily cleanable.

5.25.2 Readily removable shelves shall be sized to permit handling by one person. Shelves used as readily removable false bottoms shall have flanged corners that are closed or are sufficiently notched to permit cleaning (see figure 49).

5.25.3 Diverting shelves intended to prevent seepage or retain splashes and spills shall have sealed corners and seams. The back and end edges shall be turned up a minimum of 1.0 in (25 mm), and the corners and seams shall be sealed. Shelf surfaces exposed to unpackaged foods shall conform to 5.2 (see figure 510).

5.25.4 Where knockdown shelving is provided with a solid shelf, the seam between the leg and shelf shall be equal to or above the flood level of the shelf. If pressure cleaning is recommended for knockdown shelving, joints and seams shall be either sealed or accessible for cleaning, and shall be capable of being completely drained.

5.25.5 The back and end edges of fixed interior shelving shall:

- be turned upward a minimum of 1.0 in (25 mm) and form a closed seam along an adjacent back and side panel; or

- be spaced at least 1.0 in (25 mm) from an adjacent back or side panel; or

- form sealed seams with an adjacent back or side panel (see figure 611).
5.25.6 Support brackets and pilasters for readily removable shelving and adjustable shelving shall be readily removable or easily cleanable as installed (see figure 712).

5.26 Counter steps and platforms

Counter steps and platforms shall not be closed or hollow. Foot rests and rails shall have open space between the lower edge and the floor.

5.27 Pipe chases

Pipe chases for gas, steam, electrical, and plumbing lines shall be constructed with removable access panels where possible. Pipe chases shall be designed to eliminate vermin harborage (see figure 813).

5.28 Enclosed spaces

Enclosed spaces shall be sealed or shall have removable access panels. Removable panels shall be provided where condensation is likely to occur within an enclosed space.

5.29 Food and flatware containers and drawers

5.29.1 Food zone requirements shall apply to food containers and drawers. Food zone design requirements shall apply to flatware containers. Fillet material and solder shall not be used to fill or cove the angles or corners.

5.29.2 Drawers and drawer pan assemblies shall be readily removable for cleaning. Joints and seams between drawer pan assemblies and drawer slides shall be closed, and recessed areas shall be minimized (see figure 914).

NOTE – Drawer tracks and slides need not be readily removable provided that they are easily cleanable as installed.

5.29.3 Containers used for dispensing flatware shall be readily removable for cleaning and shall comply with food zone requirements. Containers shall be constructed so that flatware can be picked up by handles only, with other portions of the flatware covered and protected from handling.

5.30 Pots, pans and utensils

5.30.1 Rims of pots and pans shall be easily cleanable. Rolled-type beads shall be closed and sealed. Bun pans and baking pans shall be exempt from the sealing requirement.

5.30.2 Handles and handle assembly parts shall be closed at the point of attachment to the pot, pan, or utensil.

NOTE – Easily cleanable pan head or truss head fasteners may be used to fasten handles (knobs) to lids provided that the assembly is readily removable. Low profile rivets, attached without open joints and seams, may be used to fasten handles to the pots, pans, and lids. Low profile rivets used for this purpose must be tight fitting.

5.30.3 The internal knuckle radius of drop handles shall not exceed a $\frac{1}{6}$ in (0.13 in, 3.2 mm) tolerance of the wire handle. The seam between the drop handle assembly and pan shall be closed (see figure 150).
5.35 Food shields

Food shields covered under section 5.35 shall conform to the requirements in 5.35.1 through 5.35.6.

5.35.1 Food shield materials shall conform to the splash zone material requirements of 4 (see figure 16).

5.35.2 Food shields shall be designed and manufactured to conform to the splash zone requirements of 5.

5.35.3 A food shield shall provide a barrier between the mouth of a customer and unpackaged food to minimize the potential of contamination of the food by a customer. A food shield in compliance with the applicable requirements herein shall be considered to be in compliance with the barrier requirement.

5.35.4 If provided, lights, heating elements and other accessory fixtures shall be designed, manufactured and installed to conform to the splash zone requirements of 4 and 5.

5.35.5 Food shield glass shall conform to the requirements of 5.44.3. To protect against chipping, exposed edges of glass shall be protected by tight fitting channels, stripping materials, or other means such as rounding the edges of tempered glass.

5.35.6 A vertical barrier (end shield) shall be provided at each end of a foodshield. The vertical barrier shall be a minimum of 18 in (450 mm) deep (front-to-back) beginning at the bottom leading edge of the foodshield. The minimum height of the vertical barrier shall be equal to the overall height of the foodshield. The maximum distance from the bottom edge of the vertical barrier and counter top shall be 1.5 in (38 mm).

5.35.6.1 A foodshield intended to be installed a maximum of 3 in (76 mm) from a building wall perpendicular to the foodshield is exempt from the requirements of 5.35.6 provided that the height of the building wall is not lower than the overall height of the foodshield. The manufacturer's specification sheet, brochure, installation instructions and/or shop drawings shall include these building wall and proximity requirements.

5.35.7 Self service food shields (see figure 16)

5.35.11 Food shields for use on cooking and/or carving station operations (see figure 16A)

5.35.12 Food shields for use on cafeteria counters (see figure 16B)

5.38 Sinks

5.38.1 Sinks shall be exempt from the requirements of 5.15.

5.38.2 Exposed surfaces of sink bowls and partitions, shall conform to food zone requirements. All other exposed surfaces (as installed) shall conform to splash zone requirements, but shall be exempt from the requirement to be smooth in 5.4.1. The sink bowl shall be self-draining.
5.38.3 The space between sink bowls shall be sealed or open a minimum of 2.0 in (50 mm) at the front, bottom, and back of each sink bowl (see figure 172).

5.38.4 Self-rimmed, drop-in type sinks shall not be used for warewashing and/or food preparation operations.

5.38.5 Overflow gutters and drain troughs between two sink compartment bowls, if provided, shall be a minimum of 4.0 in (100 mm) wide and fitted with a readily removable strainer plate or basket (see figure 18).

5.38.6 Drains shall be a minimum of 1½ in (3.81 cm) IPS or equivalent. Fountain and underbar sink drains shall be at least 1 in (2.54 cm) IPS or equivalent. Strainer baskets, if provided, shall be readily removable (see figure 19).

5.38.7 If provided, standing overflows shall be placed near the wall of the sink bowl.

5.38.8 The sink bowl interior of a hand sink shall conform to food zone design and construction requirements, and all other exposed working surfaces of the unit shall conform to splash zone requirements. All other surfaces shall be exempt from the requirement to be smooth in 5.4.1. Hand sinks shall have an integral seamless backsplash of at least 6.0 in (150 mm). The minimum bowl size for a hand sink shall be 8.0 in (200 mm) X 8.0 in (200 mm) X 5.0 in (130 mm) in depth.

5.38.9 Drainboards shall:
- preclude pooling water;
- prevent contamination of other areas;
- have edges turned up at least ½ in (0.50 in, 13 mm);
- be integral with sinks; and
- comply with 5.2, 5.4.1, and 5.4.6.

Sink drainboards within 36 in (90 cm) or shorter shall be pitched a minimum of a 1/16 in (0.13 in, 3.2 mm) per 12 in (300 mm) toward the sink. Drainboards longer than 36 in (90 cm) shall be self-draining. Corrugation of drainboards, when provided, shall be a minimum of 3/32 in (0.094 in, 2.4 mm) high (see figure 20).

Reason: The text was clarified that the type of drainboard covered in this section is one that is attached to or immediately adjacent to a sink and is up to 36" long.

5.44 Breakable glass components

5.44.1 Fixtures and devices that, if impacted, may break and contaminate food shall be protected by guards. This requirement shall not apply to view ports and windows constructed of heat tempered glass.

5.44.2 Light bulbs that have been plastic coated or otherwise treated to resist shattering shall have a permanent label affixed near the bulb indicating that the lamp has been treated to resist shattering and must be replaced with a similarly treated lamp.

5.44.3 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, or to the impact test within ANSI/UL 197, or to the impact test within BS857:1967.
Reason: The task group agreed to list this reference since it exists and industry is utilizing it for this purpose. The pertinent section is consistent with the intent of the impact test. The addition will be made in the family of food equipment standards where applicable.

5.47 Beverage (urn) stands

Urns shall have self-draining pitched troughs equipped with nonsplash removable drain plates beneath the dispensing faucets. The troughs shall be provided with a 1 in (2.54 cm) IPS, or equivalent, drain connection or removable drain cup. The edges of punched slots and openings shall be smooth. In areas where liquids may accumulate, top openings shall be protected by a raised rim that extends at least $\frac{3}{16}$ in (0.19 in, 5.0 mm) above the liquid level (see figure 1321).

5.52 Canopies and hoods

The interior surfaces of canopies and hoods shall meet the food zone material requirements and shall meet the splash zone design and construction requirements. Interior reinforcing shall be smooth and easily cleanable, and shall not act as a dam or create a surface on which grease or condensate may collect and drip. Gutters, when provided, shall be smooth, easily cleanable, and fitted with a drain or clean-out opening. The exterior surfaces of canopies and hoods shall be classified as nonfood zones, except that joints and seams shall be sealed and there shall be no exposed threads (see figure 22).

6.1.1 Shear test

6.1.1.1 Performance requirement

Wood test samples shall be of sufficient strength to resist shearing.

6.1.1.2 Test method

Three 2.0 x 2.0 x 1.0 in (50 x 50 x 25 mm) wood test samples shall be stored in a controlled environment of 73 $\pm$ 3 °F (23 $\pm$ 2 °C) and a relative humidity 50% $\pm$ 5% for a minimum of 24 h. The sample shall be notched according to figure 4423 to facilitate shearing. After conditioning, each wood test sample shall be placed in a load frame, as shown in figure 4524, with a 5000 lb (22.2 kN) load cell. The shearing shall be performed against a 2.0 x 1.0 in (50 x 25 mm) side of the sample, opposite the notch, along a glue joint in a direction parallel to the direction of the wood grain. The speed of the load frame shall be $\frac{1}{4}$ in/min (0.25 in/min, 6.4 mm/min). After shearing each test sample, the shear strength shall be calculated using the following formula:

$$ \text{shear strength PSI (MPa)} = \frac{\text{force required for shear, N} \cdot 10^6 \text{ (lb$_f$)}}{\text{area of shear plane, in}^2 \text{ (mm}^2\text{)}} $$

6.1.1.3 Acceptance criteria
The minimum shear strength of each specimen shall be 1800 psi (12.4 MPa).

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Figure 1a – External corners or angles

Figure 1b – Examples of joints and seams formed by Overlapping sheets of metal
Where equipment is intended to be joined in the field, the resulting seam shall meet the applicable requirement of 5.4.6.

Figure 2 – Field Joints
inverted hat channel bracing  angle bracing
ends must be closed
channel bracing

Figure 3 – Examples of acceptable reinforcing and framing

Channel Sections shall be shallow and wide enough to be easily cleanable, with clean-out holes.

Figure 4 – Single panel door
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Figure 5 – Glass Doors

Figure 6 – Exposed Edges and Nosings
Liquid level

3/16 in (0.19 in, 4.8 mm)

Raised rim

Food zone

Legs must be closed against underside of top

Channel Bracing

Space to facilitate cleaning

Figure 7 – Openings and rims – food zone

Figure 8a – Legs and Feet
When \( X \) exceeds \( Y \) by \( \frac{1}{2} \) in (0.50 in, 13 mm) or greater then \( Z \) must be 1.0 in (25 mm) below the leg at the minimum adjustment.

Figure 8b– Example of Leg and Foot

Figure 9 – Perforated false bottom
Figure 10 – Diverting shelves

Figure 11 – Interior fixed shelves

Figure 12 – Rack slides
Figure 13 – Pipe chases

- Clearance for cleaning
- Pipe slot in bottom shelf for service lines
- Bottom shelf turned up full width to create pipe chase

Figure 14 – Drawers

- Readily removable drawer pan assembly
- Drawers bins and drawer carriages shall be readily removable for cleaning
- No recesses
- Fabricated drawer pan assembly

Figure 15 – Drop handle assembly

- Drop handle assembly
- Shaded area ≤ ⅛ in (0.13 in, 3.2 mm)
- Wire handle ≤ ⅛/32 in (0.031 in, 0.79 mm)

Pan
Compliance Criteria (5.35.7.3): \( X + Y \geq 20" \) (508 mm)

either \( x \) or \( y \) may = 0

Figure 16 – Self Service Food Shield (5.35.7)
minimum = 3/4 of 5.35.11.2 (5.35.11.3)

bottom edge of foodshield

6" (152 mm) maximum
(5.35.11.2)

front inside edge of displayed food (5.35.11.3)

60" (1524 mm) minimum height
(5.35.11.1)

finished floor

Figure 16A – Cooking / Carving Food Shields (5.35.11)
Compliance Criteria (5.35.12.1): $X + Y \geq 32''$ (813 mm)
when $x = 0''$, the overall height of the food shield shall be 60'' (1524 mm) minimum

Figure 16B – Cafeteria Counter Food Shield (5.35.12)
sinks or sink bowls, including partitions, are considered food zone

When space between sink bodies is less than 2.0 in (50 mm), the front, bottom and back of the opening must be sealed.

Figure 17 – Overflow Gutters and Drain Troughs

Readily removable Strainer basket or plate

Figure 18 – Sinks
Readily removable strainer, if provided

Minimum 1-1/2 in IPS drain (except fountain or underbar sinks which shall not be less than 1 in IPS)

Figure 19 – Drains and Overflows – Sinks
Sink Drainboards 36 in (90cm) or shorter shall be pitched a minimum of 1/8 in (0.13 in, 3.2 mm) per 12 in (300 mm) toward the sink.

Figure 20 – Drainboards

Figure 21 – Urn stands and water stations
Materials including coatings must meet requirements for Splash Zone. “Paint” is not acceptable.

Seams (in front of filter) inside the hood sealed

Readily removable Grease filters

Figure 22 – Plenum-type Hoods

1.0 in (25 mm)

2.0 in (50 mm)

Glue joint

1/4 in (0.25 in, 6.4 mm) notch

2.0 in (50 mm)

Figure 23 – Notched wood test sample
Figure 24 – Sample Placement under load cell
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