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Vending Machines for Food and Beverages
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NSF International Standard/
American National Standard
for Food Equipment –

Vending machines for
food and beverages

Standard Developer
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This Standard was revised to include the relocation of all definitions from section 3 to NSF/ANSI 170 – Glossary of food equipment terminology. Many editorial changes were made to clarify requirements and to achieve consistency with the “boilerplate” language in the NSF food equipment standards. Normative references were also updated.

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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 dispensing freezers and related components.

Issue 11

This revision updated the normative references in section 2 and updated boilerplate language in sections 5.21 and 5.29.4.1.

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 at standards@nsf.org, or 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 of a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.
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NSF/ANSI Standard for Food Equipment –

Vending machines for food and beverages

1 General

1.1 Purpose

This Standard establishes minimum food protection and sanitation requirements for the materials, design, construction, and performance of vending machines for food and beverages and their related components.

1.2 Scope

This Standard contains requirements for food and beverage vending machines, including those that vend packaged food and beverages and those that vend food and beverages in bulk.

Vending machine materials and components 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 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, vending machines that incorporate alternate materials, design, and 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 and significant figure rounding 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 recent editions of the documents indicated below. The most recent published edition of the document shall be used for undated references.

40 C.F.R. §180.940 Tolerance exemptions for active and inert ingredients for use in antimicrobial formulations (Food-Contact Surface Sanitizing Solutions)\(^3\)

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 to ensure that the materials used in the construction of vending machines for food and beverages 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 non-food zone areas shall be exempt from all requirements in 4.

6 International Association of Plumbing and Mechanical Officials, 5001 E. Philadelphia St., Ontario, CA 91761 <www.iapmo.org>.
7 International Code Council, 5203 Leesburg Pike, Suite 600; Falls Church, VA 22041 <www.iccsafe.org>.
8 ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428 <www.astm.org>.
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 Zone-specific materials requirements

4.2.1 Glass

Glass and similar materials shall not be used where fragments could enter bulk food or fall into the food zone. Glass used in the splash and non-food zones shall be heat tempered safety glass. If protective channels are used, they shall be tight fitting.

4.2.2 Solder

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

5 Design and construction

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

5.1 General sanitation

5.1.1 Vending machines 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 Vending machines and components shall be designed so that food and ingredients may be added and unit servings of bulk or packaged foods may be dispensed or removed in a sanitary manner.

5.1.3 Vending machines with food contact surfaces shall have a clip or other device suitable for holding a cleaning record inside the machine cabinet.

5.1.4 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.

5.1.5 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 or 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. Instructions for conducting in-place cleaning shall be posted inside the vending machine cabinet and in the written manual. The manufacturer shall provide written instructions for 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 §180.9403.

5.1.6 Splash zone surfaces shall be accessible and easily cleanable.

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

5.1.8 Unexposed non-food zone surfaces shall be accessible or closed.
5.2 Internal angles and corners

5.2.1 Internal angles or corners of 135° or less in a food zone shall be smooth and have minimum continuous radii of \( \frac{1}{8} \) in (3 mm). Lesser radii may be used when necessary to ensure the proper functioning of equipment components. Greater radii shall be provided, if necessary, to ensure adequate cleaning, maintenance, and product flow.

5.2.2 Solder and other fillet material shall not be used to obtain a required radius in a food zone.

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 Fasteners

5.4.1 Fasteners shall not be used in a food zone. Threaded components (other than fasteners) are permitted in a food zone when necessary for the proper functioning of the vending machine. Threads in a food zone shall be American Standard 60° Stub or equivalent. To facilitate cleaning, exposed threaded components shall have a major diameter of \( \frac{5}{8} \) in (16 mm) or greater. There shall be no more than eight exposed threads per 1 in (25 mm) in a food zone.

5.4.2 Fasteners in a splash zone or non-food zone shall not have deep recesses in the head. Examples of fasteners meeting this requirement include slot-head and Phillips-head screws and flush-break pop rivets. Non-flush-break pop rivets shall be capped or filled with a food-grade material.

5.4.3 Allen screws shall not be used in a splash zone. Allen screws may be used in a non-food zone provided that the heads are capped or filled with a food grade material.

5.4.4 Fasteners shall be tight fitting to the surface.

5.4.5 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.

5.4.6 There shall be no exposed fastener threads, projecting screws, or studs. This requirement shall not apply to non-food zones provided that there are no more than 2.5 exposed threads and no greater than \( \frac{1}{4} \) in (0.25 in, 6 mm) of exposed length. Exposed threads on electrical cord strain relief devices in a nonfood zone shall be exempt.

5.5 Joint and seams

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

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

5.5.3 Joints formed by overlapping sheets of material shall not create upwardly facing horizontal ledges (see figure 1b).

5.5.4 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.

5.5.5 Solder and other fillet material shall be securely bonded to its substrate. All flux and catalytic materials shall be removed.
5.5.6 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).

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 3).

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

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

5.8 Cabinet doors

5.8.1 Cabinet doors shall be sized to fit their openings and shall close properly.

5.8.2 Channel sections on cabinet doors shall be shallow and wide enough to be easily cleanable and shall have clean-out holes.

5.8.3 Insulated sections of double panel doors shall be sealed.

5.8.4 Door hinges shall meet the requirements of 5.12.

5.9 Door tracks and guides

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

5.9.2 Door tracks and guides shall:

- have clear open slots continuously or at intervals along their entire lengths; or
- have clean-out holes at each end; or
- terminate at least 1/2 in (0.50 in, 13 mm) from 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 suspension that are integral with the equipment surface and channel-type bottom tracks equipped with readily removable strips.

5.10 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 1/16 in (0.19 in, 5.0 mm) above the liquid level (see figure 4).
5.11 Covers

5.11.1 Covers protecting a food zone shall overlap the opening and shall be sloped to provide drainage from the cover surface. Inset covers for stackable pans are exempt from the slope requirement. Areas of handles and knobs of covers are not required to be sloped.

5.11.2 Covers having slotted openings designed to allow serving utensils to remain in the food shall be exempt from 5.11.1. Slotted openings shall be no larger than 1\(\frac{1}{2}\) in x 1 in (38 mm x 25 mm) and shall be protected by a raised rim of at least \(\frac{3}{16}\) in (0.19 in, 5.0 mm).

5.11.3 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.

5.11.4 Hinges and pivots shall conform to 5.12.

5.11.5 Covers shall be readily removable and easily cleanable.

5.11.6 Sliding covers and hinged covers protecting a food zone shall be designed and manufactured to prevent accumulation of liquid or debris on the covers and contamination of the food zone during opening or closing.

5.11.7 Hood mountings for covered pitchers shall be accessible.

5.11.8 All internal corners of roll covers, tilt covers, and other similar covers shall be more than 135° or shall have a minimum smooth radius of \(\frac{1}{8}\) 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.

5.12 Hinges

5.12.1 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.

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

5.12.3 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).

5.12.4 Hinges on splash zone doors and covers weighing less than 80 lb (36 kg) shall conform to the requirements in 5.12.3 or each of the following:

   — the hinge shall be lift-off style or have a removable pin;

   — 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 separated by at least \(\frac{1}{8}\) in (0.13 in, 3.2 mm).

5.12.5 Fixed pin hinges may be used on covered pitchers if the hinge is offset and protected from splash and spillage.

5.13 Door gaskets

5.13.1 Exposed surfaces of door gaskets shall be easily cleanable. Hollow sections of door gaskets shall
be sealed.

5.13.2 Gaskets shall be capable of being removed and reinstalled by hand or with the use of simple tools. Staples, pop rivets, nails, adhesives, and other similar items that cannot be reattached easily shall not be used to secure door gaskets.

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

5.14 Shelving

5.14.1 Shelving shall be easily cleanable.

5.14.2 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 5).

5.14.3 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 6).

5.14.4 Where knock-down 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 knock-down shelving, joints and seams shall be either sealed or accessible for cleaning, and shall be capable of being completely drained.

5.14.5 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 7).

5.15 Entry ports

Entry ports through which piping, thermometers, rotary shafts, or other functional parts enter into a food zone shall be closed and sealed at the point of entry or shall be protected by a deflecting apron.

5.16 Ventilation openings

5.16.1 Ventilation openings shall be screened. The screening and assembly shall be accessible and easily cleanable. Perforated sheet metal, or a similar material, may be used in place of screening provided that it is accessible and easily cleanable and has comparable vermin exclusion properties.

5.16.2 Screens used on ventilation openings into food and container storage shall be at least 16 mesh (minimum 16 strands per 1 in [25 mm]), or equivalent. Screens of at least 8 mesh (minimum 8 stands per 1 in [25 mm]), or equivalent, shall be used on openings to areas housing condensing units.

5.16.3 Static or nonforced air condensing units may be mounted on cabinet exteriors, provided that they are designed to preclude the harborage of vermin. Mounted condensing units shall not require screening.
5.17 Louvers and flaps

Louvers and flaps shall be free of sharp edges and burrs and shall have spaces large enough to allow for easy cleaning. Louvers and flaps shall be of drip-deflecting design.

5.18 Service connection openings and other openings through the exterior wall

5.18.1 Service connection openings, shipping bolt holes, and other similar openings through an exterior wall shall be closed or shall have grommets, clamps, or other closure devices that prevent the entrance of vermin. When such openings are not used or filled until installation, closure devices shall be provided by the manufacturer with the vending machine and positioned upon installation.

NOTE — These requirements do not apply to coin apertures, coin returns, crown pullers, or openings of \( \frac{1}{16} \) in (2 mm) or less necessary for label inserts or similar functions.

5.18.2 Service connections to vending machines for potentially hazardous food shall be located so as to discourage unauthorized or unintentional disconnection.

5.19 Equipment mounting

5.19.1 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.

5.19.2 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 is more than 16 in (41 cm) 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 is more than 3.0 in (76 mm) from the point of cleaning access.

5.19.3 Portable equipment shall not weigh more than 80 lb (36 kg) and shall not exceed 36 in (90 cm) in any plane.
5.19.4 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.

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

5.19.6 If the bottoms of the side panels are bent inward to form a ledge for holding levelers, the horizontal ledge formed shall be no wider than 2 in (50 mm) and shall be easily cleanable. It shall not form a “U” channel or other uncleanable ledge. Hollow sections shall conform to 5.6.

5.19.7 If levelers are used, their threads shall be protected from soiling. Threads that extend through the bottom edge of side panels shall be easily cleanable.

5.20 Legs and feet

5.20.1 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.

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

5.20.3 If the outer dimension of a leg exceeds the outer dimension of its foot by 1/2 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 8a).

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

5.20.5 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 8b).

5.21 Casters and gliders

If used, casters and gliders shall be easily cleanable and shall conform to NSF/ANSI 2.

5.22 Temperature control

5.22.1 Vending machines that store and dispense potentially hazardous foods shall be equipped to maintain the temperatures specified in 6.2. Potentially hazardous food located in vending machine pipes, fittings, tubes, or dispensing devices outside of the effective heating or refrigeration compartment shall also be maintained at the applicable temperatures specified in 6.2; auxiliary heating or cooling should be used if necessary.

5.22.2 Vending machines shall not be designed to store packaged food by submersion in water, liquids, or ice.

5.22.3 Vending machines that store and dispense potentially hazardous foods shall be equipped with cut-off controls that conform to the requirements specified in 6.4. Vending machines with cut-off controls shall be equipped with an accessible manual reset device that is located inside the cabinet or a locked enclosure so that only trained personnel can reactivate the machine.

5.22.4 Unless provided with adequate refrigeration, vending machines that heat potentially hazardous foods shall not be equipped with a delay timer or other device that precludes potentially hazardous foods from being heated immediately after being placed in the vending machine.

5.22.5 Vending machines shall not be designed to re-refrigerate potentially hazardous foods after they have been heated to temperatures of 140 °F (60 °C) or higher.
5.23 Temperature-indicating devices

5.23.1 Refrigerated and heated food storage compartments shall be equipped with a securely mounted temperature-indicating device that clearly displays the air temperature in the food storage compartment(s).

5.23.2 The temperature display shall be clearly visible during normal filling and servicing operations. It shall be protected against breakage. The sensing element of the device shall be easily cleanable and located to measure the air temperature in the warmest part of a refrigerated compartment and the coolest part of a heated compartment where food is normally stored.

5.23.3 Temperature-indicating devices shall be removable.

5.23.4 Temperature-indicating devices for refrigerated compartments shall be accurate to ± 2 °F (± 1 °C) when evaluated at 40 °F (4 °C). Temperature-indicating devices for heated compartments shall be accurate to ± 3 °F (± 1.5 °C) when evaluated at 145 °F (63 °C) and 170 °F (77 °C).

5.24 Refrigeration components

5.24.1 Evaporator coils and refrigeration tubing shall not be in contact with food contact surfaces and shall be installed so that condensate will not contact food or insulation.

5.24.2 If exposed to potential food splash or spillage, refrigeration coils shall be of finless design or shall be enclosed in a housing to protect them from being soiled. Their design shall provide for the drainage of condensate.

5.24.3 Evaporator drain pans shall be at least 1/2 in (13 mm) deep and shall be accessible for cleaning.

5.24.4 A vending machine having a condensing unit as an integral component located below food storage spaces shall have a dust-free barrier between the condensing unit and food storage space. Condensing units located above food storage spaces shall be sealed from the food storage spaces.

5.25 Opening devices

Parts of multi-use opening devices contacting food or food contact surfaces shall be protected from customer contact, dust, insects, rodents, and other contamination.

5.26 Vending stage openings

5.26.1 Service openings to the delivery chute or dispensing nozzles of bulk food and beverage vending machines shall be fabricated to minimize the entrance of dust, seepage, vermin, and other contaminants. Openings shall be designed and constructed to minimize customer handling of food contact surfaces and surfaces in contact with cup rims.

5.26.2 The vending stage of bulk food and beverage vending machines shall have a self-closing door or panel protecting it from dust and vermin. Doors or panels shall fit snugly in the closed position so that there is no crack or opening larger than 1/16 in (2 mm).

NOTE — Controlled location vending machines with a cup-filling area or platform shall not require a door or panel, provided that the area has no openings into the cabinet interior other than those for dispensing nozzles or trapped-waste tubing.

5.26.3 The chute or dispensing aperture on the outside of vending machines that dispense gumballs, nuts, popcorn, chips, or similar bulk foods, shall have a self-closing flap or similar closure at the outlet end to protect the food zone from contamination. Flaps shall close snugly so there is no crack or opening larger than 1/16 in (2 mm).
5.26.4 The dispensing tray or compartment of vending machines for packaged candy, cookies, pastry, or similar products shall have an attached rodent-proof cover, unless a baffle or other closure is provided in the dispensing chute to prevent rodent entry effectively.

5.26.5 The outlet end of delivery tubes, nozzles, chutes, and orifices of bulk food and beverage vending machines shall be protected from contamination by recessing or elevating the outlet or by installing vending stage components, such as baffles or drip aprons.

5.26.6 The vending stage of bulk food and beverage vending machines shall divert condensation or other non-food moisture away from the filling position of food or beverage containers. The vending stage shall be easily cleanable, shall have all joints and seams sealed, and shall be readily removable or readily accessible for cleaning and inspection. The vending stage of bulk food and beverage vending machines shall also have a self-closing door or panel, as required in 5.26.2.

5.27 Storage compartments for single service articles

5.27.1 Compartments intended for the storage or display of single-service articles (e.g., cups, containers, utensils) shall be designed and constructed so that the items may be added directly from their original packaging without food contact surfaces being handled.

5.27.2 Compartments in which single service articles are stored or displayed shall protect the items from manual contact, dust, rodents, and other sources of contamination while they are in the compartment. Storage magazines or turrets shall have fitted and overlapped lids or covers.

5.27.3 Storage compartments for single service articles shall have a sight glass or other means so that the quantity of articles remaining can be determined without causing contamination.

5.28 Water supply

Water, used as an ingredient, shall be piped into the machine under pressure, or brought to the machine in portable containers or urns conforming to this Standard.

5.29 Plumbing connections

5.29.1 Water and waste piping and fittings attached to the equipment shall conform to the material requirements for the applicable zones.

5.29.2 Water and waste piping and connections shall comply with the International Plumbing Code\textsuperscript{7}, International Code Council (ICC), or with the Uniform Plumbing Code\textsuperscript{6}, International Association of Plumbing and Mechanical Officials (IAPMO).

5.29.3 Waste lines shall not drain into or through a food zone.

5.29.4 Backflow prevention

5.29.4.1 Units intended to be connected to a water supply system under pressure shall have one of the following:

- an air gap at least twice the diameter of the water supply inlet but not less than 1.0 in (25 mm);  
- a vacuum breaker that conforms to ANSI/ASSE 1001\textsuperscript{4}, Atmospheric Type Vacuum Breakers (for intermittent pressure conditions); or  
- a vacuum breaker that conforms to ANSI/ASSE 1020\textsuperscript{4}, Pressure Vacuum Breaker Assembly (for continuous pressure conditions); or
— a backflow prevention device that conforms to ANSI/ASSE 1022\textsuperscript{4}, \textit{Backflow Preventer for Beverage Dispensing Equipment}; or

— a backflow prevention device that conforms to ANSI/ASSE 1024\textsuperscript{4}, \textit{Dual Check Backflow Preventers}; or

— a backflow prevention device that conforms to ASSE 1032\textsuperscript{4}, \textit{Performance Requirements for Dual Check Valve Type Backflow Preventers for Carbonated Beverage Dispensers – Post Mix Type}; or

— a statement in the installation instruction and on a label permanently affixed to the equipment that clearly indicates that the equipment is to be installed with adequate backflow protection to comply with applicable federal, state, and local codes.

5.29.4.2 A screen of at least 100 mesh (minimum 100 strands per inch) shall be installed immediately upstream of all check valve type backflow preventers used for water supply protection. The screen shall be accessible and removable for cleaning or replacement.

5.30 Backflow prevention on carbonated beverage vending machines

5.30.1 Carbonators and vending machines with internal carbonators intended to be connected to a water supply system under pressure shall have one of the following located upstream of the CO\textsubscript{2} injection system:

— an air gap equal to at least twice the diameter of the water supply inlet and not less than 1 in (25 mm); or

— a backflow prevention device that conforms to ANSI/ASSE 1022\textsuperscript{4}; or

— a backflow prevention device that conforms to ASSE 1032\textsuperscript{4}.

5.30.2 A screen of at least 100 mesh (minimum 100 strands per 1 in [25 mm]) shall be installed immediately upstream of all check valve-type backflow preventers used for water supply protection. The screen shall be accessible and removable for cleaning or replacement.

5.31 Water filters

Water filters and similar water treatment devices on vending machines shall conform to the requirements of NSF/ANSI 42, NSF/ANSI 53, and NSF/ANSI 58 as applicable.

5.32 Ice making equipment

Ice making equipment shall conform to NSF/ANSI 12.

5.33 Drains, drain pans and outlets

5.33.1 The product storage compartment in vending machines that dispense packaged liquid food shall be self-draining or shall have a drain outlet to permit the complete draining of product leakage or condensate.

5.33.2 Drainage collection pans and drainage contact surfaces shall be easily cleanable and corrosion resistant. The drainage surfaces in drain outlets shall be sloped to the opening. Drains shall be cleanable.

5.33.3 Drains that do not terminate in closed areas shall be protected from the entrance of vermin by a 16 mesh (minimum 16 strands per 1 in [25 mm]) screen or effective trap. Screens shall be removable for cleaning.
5.33.4 Drains shall be at least 1 in (25 mm) in diameter to prevent overflow of the drainage compartment.

5.33.5 Overflow drains for reservoirs, heater tanks, and other potable water receptacles shall not be connected to other drain tubing and shall have an effective air gap.

5.34 Waste containers and controls

5.34.1 Vending machines that dispense bulk liquids shall have containers that collect drip, spillage, overflow, or other internal wastes. Controlled location vending machines that do not generate internal liquid wastes may have readily removable drip pans at the dispensing platform. Controlled location vending machines that are connected to a water supply and have no internal waste containers shall have at least two independently operated controls to prevent continued flow in case of failure of any single flow control.

5.34.2 Liquid waste containers may be used to collect and store coffee grounds, coffee containers, and similar solid materials provided that the waste containers meet the applicable requirements in 5.34.1.

5.34.3 Other than the containers covered under 5.34.1 and 5.34.2, there shall be no refuse or trash containers located inside the vending machine cabinet. Vending machines that dispense packaged beverages with crown closures may have a closure receptacle located in the machine.

5.34.4 Containers that store liquid wastes in the vending machine shall be leak-proof, readily removable, easily cleanable, and corrosion resistant.

5.34.5 Vending machines that dispense bulk liquids shall have automatic shut-off devices that detect full waste containers. The shut-off devices shall make the machine inoperative until the waste container has been emptied. The waste container shut-off mechanism shall be set to permit the removal of the waste container without spillage and shall prevent water or bulk liquids from continuously running if there is a failure of a flow control device.

6 Performance

6.1 Cleaning and sanitizing procedures

6.1.1 Performance requirement

In-place cleaning and sanitizing procedures recommended by the manufacturer shall effectively clean and sanitize food contact surfaces.

NOTE — This requirement applies to manual cleaning and sanitizing procedures and to in-place cleaning and sanitizing procedures recommended by the manufacturer.

6.1.2 Test method

Microbiological methods for stock culture preparation, and enumeration/analysis of *Escherichia coli*, shall be performed as specified in Annex A.

6.1.2.1 The equipment shall be filled with the *E. coli* suspension.

6.1.2.2 The equipment shall be operated so that food contact surfaces are exposed to the *E. coli* suspension. The equipment shall then be cleaned and sanitized according to the manufacturer's instructions and refilled with SBDW. The SBDW shall be dispensed, and five 100-mL samples shall be collected at intervals from the start of the dispensing until the unit is empty. When adequate sample volumes cannot be realized, more SBDW shall be added accordingly. The equipment shall then be operated so that food contact surfaces intended for in-place cleaning are exposed to the SBDW. Sufficient SBDW shall then be dispensed. The challenge organisms present in each sample shall be collected and enumerated using
the Standard Total Coliform Membrane Filter Procedure in accordance with APHA’s *Standard Methods for the Examination of Water and Wastewater*.

### 6.1.3 Acceptance criteria

For each sample, the total counts on the initial inoculum density ($N_i$) of at least 1,000,000 ($1 \times 10^6$) and the total counts on the CFUs recovered ($N_f$) shall demonstrate a reduction equal to or greater than 99.9999% (6 log). The log reduction, $R$, is calculated from the equation where:

$$R = \log_{10} \left( \frac{N_i}{N_f} \right)$$

and

$N_i$ = Initial inoculum density (CFU/mL)

$N_f$ = The number of CFU recovered in each sample (CFU/mL)

If $N_f < 1$, the samples shall be considered acceptable.

### 6.2 Temperature performance

The performance requirements in this section apply only to vending machines that store and dispense potentially hazardous foods.

#### 6.2.1 Cold food vending machines

##### 6.2.1.1 Performance requirement

Vending machines shall be capable of maintaining an air temperature of 41 °F (5 °C) or less in all refrigerated food storage compartments intended for potentially hazardous food.

##### 6.2.1.2 Test method

The ability of a refrigerated vending machine unit to maintain the temperature of its food storage compartment at 41 °F (5 °C) or less shall be evaluated by monitoring of the air temperature of the food storage compartment. The test shall be conducted on a unit fully loaded with intended product. The test shall be conducted in a test chamber in which the following conditions are maintained for the duration of the test:

- ambient air temperature of 100 ± 4 °F (38 ± 2 °C);
- no vertical temperature gradient exceeding 1.5 °F per ft (2.5 °C per m); and
- relative humidity of 25% ± 5%.

The air temperature in the food storage compartment and remote feed lines (if applicable) shall be monitored in at least three locations by remote temperature sensors (thermocouples) accurate to ± 1 °F (± 0.5 °C). The air temperature in the food storage compartment shall be allowed to stabilize at 41 °F (5 °C) or below before the test is started.

The temperature at each thermocouple location shall be recorded every 5 min during a 24-h test period.

##### 6.2.1.3 Acceptance criteria

The air temperature at each thermocouple location shall not exceed 41 °F (5 °C) for the duration of the test.
6.2.2 Hot food vending machines

6.2.2.1 Performance requirement

Vending machines shall be capable of maintaining an air temperature of 140 °F (60 °C) or greater in all heated food storage compartments intended for potentially hazardous food.

6.2.2.2 Test method

The ability of a heated vending machine unit to maintain the temperature of its food storage compartment at 140 °F (60 °C) or above shall be evaluated by monitoring of the air temperature of the food storage compartment. The test shall be conducted on a unit fully loaded with the intended product. The test shall be conducted in a test chamber in which the following conditions are maintained for the duration of the test:

- ambient air temperature of 50 ± 4 °F (10 ± 2 °C); and
- no vertical temperature gradient exceeding 1.5 °F per ft (2.5 °C per m).

The air temperature of the food storage compartment and remote feed lines (if applicable) shall be monitored in at least three locations by remote temperature sensors (thermocouples) accurate to ± 1 °F (± 0.5 °C). The air temperature in the food storage compartment shall be allowed to stabilize at 140 °F (60 °C) or above before the test is started.

The temperature at each thermocouple location shall be recorded every 5 min during a 24-h test period.

6.2.2.3 Acceptance criteria

The air temperature at each thermocouple location shall be no less than 140 °F (60 °C) for the duration of the test.

6.2.3 Frozen food vending machines

6.2.3.1 Performance requirement

Frozen food vending machines shall be capable of maintaining an air temperature of 0 °F (-18 °C) or less in all frozen food storage compartments intended for potentially hazardous food. This requirement shall not apply during a defrost cycle, nor during the 75 min immediately following the completion of a defrost cycle.

6.2.3.2 Test method

The ability of a frozen food vending machine to maintain the temperature of its food storage compartment at 0 °F (-18 °C) or below shall be evaluated by monitoring of the air temperature of the food storage compartment and remote food lines (if provided). The test shall be conducted on a unit fully loaded with intended product. The test shall be conducted in a test chamber in which the following conditions are maintained for the duration of the test:

- ambient air temperature of 100 ± 4 °F (38 ± 2 °C);
- no vertical temperature gradient exceeding 1.5 °F per ft (2.5 °C per m); and
- relative humidity of 25 ± 5%.

The air temperature in the food storage compartment and remote feed lines (if applicable) shall be monitored in at least three locations by remote temperature sensors (thermocouples) accurate to ± 1 °F (± 0.5 °C). The air temperature in the food storage compartment shall be allowed to stabilize at 0 °F (-18 °C) or below before the test is started.
The temperature at each thermocouple location shall be recorded every 5 min during a 24-h test period. The time at the start and completion of all defrost cycles shall be noted.

6.2.3.3 Acceptance criteria

The air temperature at each thermocouple location shall not exceed 0 °F (-18 °C) for the duration of the test, except during a defrost cycle and the 75 min immediately following the completion of a defrost cycle.

6.3 Temperature recovery (open door test)

The performance requirements in this section apply only to vending machines that store and dispense potentially hazardous foods.

6.3.1 Cold food vending machines

6.3.1.1 Performance requirement

A cold food vending machine shall require no more than 30 min to restore the air temperature in its food storage compartment to 41 °F (5 °C) or below after having its door open for 10 min.

6.3.1.2 Test method

An “open door” test shall be conducted to evaluate the ability of a cold food vending machine to restore the food storage compartment air temperature to 41 °F (5 °C) or below within 30 min after having its door open for 10 min. The test may be conducted on a unit under no-load, partial-load, or full-load conditions. The test shall be conducted in a test chamber in which the following conditions are maintained at the start of the test (conditions may be affected by opening of the door to the food storage compartment):

— ambient air temperature of 73 ± 4 °F (23 ± 2 °C); and
— no vertical temperature gradient exceeding 1.5 °F per ft (2.5 °C per m).

The air temperature in the food storage compartment shall be monitored in at least three locations by remote temperature sensors (thermocouples) accurate to ± 1 °F (± 0.5 °C). The air temperature in the food storage compartment shall be allowed to stabilize at 41 °F (5 °C) or below before the test is started.

The door to the food storage compartment shall be opened and shall remain open for 10 ± 0.5 min before being closed. Starting at 30 min after the door is closed, the air temperature at each thermocouple location shall be recorded at 1-min intervals for 10 min.

6.3.1.3 Acceptance criteria

After the 30-min recovery period, the air temperature at each thermocouple location shall not exceed 41 °F (5 °C).

6.3.2 Hot food vending machines

6.3.2.1 Performance requirement

A hot food vending machine shall require no more than 120 min to restore the air temperature in its food storage compartment to 140 °F (60 °C) or greater after having its door open for 10 min.

6.3.2.2 Test method

An “open door” test shall be conducted to evaluate the ability of a hot food vending machine to restore the food storage compartment air temperature to 140 °F (60 °C) or above within 120 min after having its door open.
open for 10 min. The test may be conducted on a unit under no-load, partial-load, or full-load conditions. The test shall be conducted in a test chamber in which the following conditions are maintained at the start of the test (conditions may be affected by opening of the door to the food storage compartment):

- ambient air temperature of 73 ± 4 °F (23 ± 2 °C); and
- no vertical temperature gradient exceeding 1.5 °F per ft (2.5 °C per m).

The air temperature in the food storage compartment shall be monitored in at least three locations by remote temperature sensors (thermocouples) accurate to ± 1 °F (± 0.5 °C). The air temperature in the food storage compartment shall be allowed to stabilize at 140 °F (60 °C) or above before the test is started.

The door to the food storage compartment shall be opened and shall remain open for 10 ± 0.5 min before being closed. Starting at 120 min after the door is closed, the air temperature at each thermocouple location shall be recorded at 1-min intervals for 10 min.

6.3.2.3 Acceptance criteria

After the 120 min recovery period, the air temperature at each thermocouple location shall be 140 °F (60 °C) or greater.

6.3.3 Frozen food vending machines

6.3.3.1 Performance requirement

A frozen food vending machine shall require no more than 75 min to restore the air temperature in its food storage compartment to 10 °F (-12 °C) or below after having its door open for 10 min.

6.3.3.2 Test method

An "open door" test shall be conducted to evaluate the ability of a frozen food vending machine to restore the food storage compartment air temperature to 10 °F (-12 °C) or below within 75 min after having its door open for 10 min. The test may be conducted on a unit under no-load, partial-load, or full-load conditions. The test shall be conducted in a test chamber in which the following conditions are maintained at the start of the test (conditions may be affected by opening of the door to the food storage compartment):

- ambient air temperature of 73 ± 4 °F (23 ± 2 °C); and
- no vertical temperature gradient exceeding 1.5 °F per ft (2.5 °C per m).

The air temperature in the food storage compartment shall be monitored in at least three locations by remote temperature sensors (thermocouples) accurate to ± 1 °F (± 0.5 °C). The air temperature in the food storage compartment shall be allowed to stabilize at 10 °F (-12 °C) or below before the test is started.

The door to the food storage compartment shall be opened and shall remain open for 10 ± 0.5 min before being closed. Starting at 75 min after the door is closed, the air temperature at each thermocouple location shall be recorded at 1-min intervals for 10 min.

6.3.3.3 Acceptance criteria

After the 75-min recovery period, the air temperature at each thermocouple location shall not exceed 10 °F (-12 °C).

6.4 Automatic cut-off controls (abnormal operations test)

The performance requirements in this section apply only to the vending machines that store and dispense potentially hazardous foods.
6.4.1 Cold food vending machines

6.4.1.1 Performance requirement

Automatic cut-off controls on cold food vending machines shall inactivate the vending mechanism if the air temperature in the food storage compartment is greater than 45 °F (7 °C) for more than 5 min. This requirement does not apply during the 30-min recovery period immediately following machine filling and servicing.

6.4.1.2 Test method

Two abnormal operations tests shall be conducted to verify that the automatic cut-off controls on cold food vending machines will inactivate the vending mechanism when the air temperature of the food storage compartment is greater than 45 °F (7 °C) for more than 5 min. Each test may be conducted on a unit under no-load, partial-load, or full-load conditions. The tests shall be conducted in a test chamber in which the following conditions are maintained at the start of the test (conditions may be affected by opening of the door to the food storage compartment):

- ambient air temperature of 73 ± 4 °F (23 ± 2 °C); and
- no vertical temperature gradient exceeding 1.5 °F per ft (2.5 °C per m).

The air temperature in the food storage compartment shall be monitored in at least three locations by remote temperature sensors (thermocouples) accurate to ± 1 °F (± 0.5 °C). The air temperature in the food storage compartment shall be allowed to stabilize at 41 °F (5 °C) or below before each test is started.

In the first test, the refrigeration system (i.e., the compressor) shall be disabled and the air temperatures in the food storage compartment monitored. When the temperature of the food storage compartment exceeds 45 °F (7 °C) for a minimum of 5 min, an attempt shall be made to operate the vending mechanism.

In the second test, the power to the machine shall be interrupted, causing the machine to shut down. The air temperature in the food storage compartment shall be monitored. When the temperature of the food storage compartment exceeds 45 °F (7 °C) for a minimum of 5 min, the power shall be restored and an immediate attempt shall be made to operate the vending mechanism.

6.4.1.3 Acceptance criteria

The vending mechanism shall not operate under the test conditions described above.

6.4.2 Hot food vending machines

6.4.2.1 Performance requirement

Automatic cut-off controls on hot food vending machines shall inactivate the vending mechanism if the air temperature in the food storage compartment falls below 140 °F (60 °C) for more than 5 min. This requirement does not apply during the 120-min recovery period immediately following machine filling and servicing.

6.4.2.2 Test method

Two abnormal operations tests shall be conducted to verify that the automatic cut-off controls on hot food vending machines will inactivate the vending mechanism when the air temperature of the food storage compartment falls below 140 °F (60 °C) for more than 5 min. Each test may be conducted on a unit under no-load, partial-load, or full-load conditions. The tests shall be conducted in a test chamber in which the following conditions are maintained at the start of the test (conditions may be affected by opening of the door to the food storage compartment):
— ambient air temperature of 73 ± 4 °F (23 ± 2 °C); and
— no vertical temperature gradient exceeding 1.5 °F per ft (2.5 °C per m).

The air temperature in the food storage compartment shall be monitored in at least three locations by remote temperature sensors (thermocouples) accurate to ± 1 °F (± 0.5 °C). The air temperature in the food storage compartment shall be allowed to stabilize at 140 °F (60 °C) or below before each test is started.

In the first test, the heating mechanism shall be disabled and the air temperatures in the food storage compartment monitored. When the temperature of the food storage compartment falls below 140 °F (60 °C) for a minimum of 5 min, an attempt shall be made to operate the vending mechanism.

In the second test, the power to the machine shall be interrupted, causing the machine to shut down. The air temperature in the food storage compartment shall be monitored. When the temperature of the food storage compartment falls below 140 °F (60 °C) for a minimum of 5 min, the power shall be restored and an immediate attempt shall be made to operate the vending mechanism.

6.4.2.3 Acceptance criteria

The vending mechanism shall not operate under the test conditions described above.

6.4.3 Frozen food vending machines

6.4.3.1 Performance requirement

Automatic cut-off controls on frozen food vending machines shall inactivate the vending mechanism if the air temperature in the food storage compartment exceeds 10 °F (-12 °C) for more than 15 min. This requirement does not apply during the 30-min recovery period immediately following machine filling and servicing.

6.4.3.2 Test method

Two abnormal operations tests shall be conducted to verify that the automatic cut-off controls on frozen food vending machines will inactivate the vending mechanism when the air temperature of the food storage compartment exceeds 10 °F (-12 °C) for more than 15 min. Each test may be conducted on a unit under no-load, partial-load, or full-load conditions. The tests shall be conducted in a test chamber in which the following conditions are maintained at the start of the test (ambient conditions may be affected by opening of the door to the food storage compartment):

— ambient air temperature of 73 ± 4 °F (23 ± 2 °C); and
— no vertical temperature gradient exceeding 1.5 °F per ft (2.5 °C per m).

The air temperature in the food storage compartment shall be monitored in at least three locations by remote temperature sensors (thermocouples) accurate to ± 1 °F (± 0.5 °C). The air temperature in the food storage compartment shall be allowed to stabilize at 10 °F (-12 °C) or below before each test is started.

In the first test, the refrigeration system (i.e., the compressor) shall be disabled and the air temperatures in the food storage compartment monitored. When the temperature of the food storage compartment exceeds 10 °F (-12 °C) for a minimum of 15 min, an attempt shall be made to operate the vending mechanism.

In the second test, the power to the machine shall be interrupted causing the machine to shut down. The air temperature in the food storage compartment shall be monitored. When the temperature of the food storage compartment exceeds 10 °F (-12 °C) for a minimum of 15 min, the power shall be restored and an immediate attempt shall be made to operate the vending mechanism.
6.4.3.3 Acceptance criteria

The vending mechanism shall not operate under either of the test conditions described above.
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

Figure 3 – Examples of acceptable reinforcing and framing
Liquid level

3/16 in (0.19 in, 4.8 mm)

Raised rim

Food zone

Figure 4 – Openings and rims – food zone

Corner or flange notched to permit cleaning or closed tight

Sectional removable false bottoms

Figure 5 – Perforated false bottom
Figure 6 – Diverting shelves

Figure 7 – Interior fixed shelves
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 8a– Example of Leg and Foot](image)

Legs must be closed against underside of top

![Figure 8b– Legs and Feet](image)
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Annex A
(normative)

Methods for preparing and analyzing in-place cleaning bacteria surrogate

A.1 Summary

*E. coli* is used as the challenge organism for the in-place cleaning test. Presented in this Annex are the methods used for suspension preparation, controls, and analysis of the challenge organism.

A.2 Equipment

- autoclave, 121 ± 1 °C (250 ± 1 °F); and
- incubator, 36 ± 1 °C (97 ± 1 °F); and
- refrigerator, 5 ± 1 °C (41 ± 3 °F); and
- water bath 50 ± 1 °C (122 ± 1 °F); and
- freezer; and
- vortex mixer; and
- pH meter; and
- colony counter; and
- filtration units, autoclavable glass or plastic filtration units; and
- sterile filtration apparatus; and
- analytical balance; and
- Bunsen burner; and
- blunt tipped forceps; and
- hot plate; and
- pipettor.

A.3 Microorganism

*Escherichia coli* (American Type Culture Collection #11229) shall be obtained from American Type Culture Collection, P.O. Box 1549, Manassas, VA 20108.

A.4 Supplies

- Petri dishes, 50 x 9 mm, sterile; and
- pipette tips, 1000 µL and 100 µL, sterile; and
- disposable sterile 250-mL polypropylene container; and
- test tubes, 16 x 125 mm; and
- sterile inoculating loop; and
- sterile 0.45 µm mixed cellulose esters membrane filters; and
- French squares bottles (250 mL); and
- autoclavable containers capable of holding up to 10 L.

A.5 Reagents

- Sterile buffered dilution water (SBDW) shall be prepared according to the *Standard Methods for the Examination of Water and Wastewater*" (dilution water: buffered water); and
— Sodium Thiosulfate Solution 10% \((\text{Na}_2\text{S}_2\text{O}_3)\) shall be prepared by adding 100 g reagent grade sodium thiosulfate per 900 mL DI water, and autoclaved for 30 min at 121 ± 1 °C (250 ± 1 °F); and

— Sodium Hydroxide \((\text{NaOH})\) Solution. 1N shall be used to adjust pH of reagents; and

— Hydrochloric Acid \((\text{HCl})\) Solution. 5 N shall be used to adjust pH of reagents; and

— Neutralizer stock solution shall be prepared as follows: 40 gm lecithin, 280 mL Tween 80, and 1.25 mL phosphate buffer shall be mixed together with 1L distilled water. pH shall be adjusted to 7.2. Solution shall be dispensed into 100-mL portions and autoclaved 15 min at 121 ± 1 °C (250 ± 1 °F); and

— Phosphate buffer solution shall be prepared according to the Standard Methods for the Examination of Water and Wastewater\(^5\) (dilution water: buffered water).

A.6 Safety precautions and hazards

A.6.1 Steam sterilized samples and equipment shall be handled with protective gloves when being removed from the autoclave.

A.6.2 Cryogenic culture vials shall be handled with cryoprotective gloves.

A.6.3 All microbiological samples and contaminated test supplies shall be steam sterilized to 121 ± 1 °C (250 ± 1 °F) at 15 psi for a minimum of 20 min prior to being discarded.

A.7 Growth medium

NOTE 1 — Common bacteriological media may be purchased from bacteriological medium manufacturers and prepared according to the manufacturer’s instructions.

NOTE 2 — The quality of the growth media shall be monitored by examining growth promotion and sterility prior to use.

A.7.1 TSB (Tryptic Soy Broth)

<table>
<thead>
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<th>Ingredient</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>tryptone</td>
<td>1.7 g</td>
</tr>
<tr>
<td>soytone</td>
<td>0.3 g</td>
</tr>
<tr>
<td>dextrose</td>
<td>0.25 g</td>
</tr>
<tr>
<td>sodium chloride</td>
<td>0.5 g</td>
</tr>
<tr>
<td>dipotassium phosphate</td>
<td>0.25 g</td>
</tr>
<tr>
<td>DI water</td>
<td>100 mL</td>
</tr>
<tr>
<td>pH</td>
<td>7.3 ± 0.2</td>
</tr>
</tbody>
</table>

TSB shall be dissolved by boiling and adjusted to final pH. 8-mL aliquots shall be dispensed into 16 x 150 mm test tubes. TSB shall be autoclaved at 121 ± 1 °C (250 ± 1 °F) at 15 psi for 20 min. Cooled broth shall be stored at 5 ± 1 °C (41 ± 1 °F).
A.7.2 TSA (Tryptic Soy Agar)

<table>
<thead>
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<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>tryptone</td>
<td>7.5 g</td>
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<tr>
<td>soytone</td>
<td>2.5 g</td>
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<tr>
<td>sodium chloride</td>
<td>2.5 g</td>
</tr>
<tr>
<td>bacto-agar</td>
<td>7.5 g</td>
</tr>
<tr>
<td>DI water</td>
<td>500 mL</td>
</tr>
<tr>
<td>pH</td>
<td>7.3 ± 0.2</td>
</tr>
</tbody>
</table>

TSA shall be dissolved by boiling, adjusted to final pH, and autoclaved at 121 ± 1 °C (250 ± 1 °F) at 15 psi for 20 min. Tempered media shall be poured into sterile petri dishes. Agar plates shall be stored at 5 ± 1 °C (41 ± 1 °F). Plates shall be allowed to come to room temperature before use.

A.7.3 Coliform growth media

A.7.3.1 Coliscan® MFculture medium

Broth shall be purchased from the manufacturer. Broth shall be dispensed in 1.75 to 2 mL quantities into lower section of 50 x 9 mm sterile plastic petri dishes with pad. Broth shall be stored at 5 ± 1 °C (41 ± 1 °F).

A.7.3.2 CHROMagar® culture medium

Agar shall be prepared according to manufacturer's directions. It shall be brought to a boil and cooled to 45 ± 1 °C (113 ± 1 °F). Agar shall be dispensed in 4 to 5 mL quantities into lower section of 50 x 9 mm sterile plastic petri dishes.

A.8 Culture of E. coli

A.8.1 Stock culture preparation

a) E. coli #11229 shall be obtained from ATCC.

b) Stock culture shall be rehydrated with TSB and maintained in TSB. The culture shall then be incubated at 36 ± 1 °C (97 ± 1 °F).

c) This working stock culture may be maintained at 3 ± 2 °C (37.4 ± 1 °F) for up to one month, at which time the culture shall be passed to a new TSB tube. Working stock culture shall be discarded after 12 months/passes and a new vial reconstituted from ATCC.

A.8.2 Challenge culture preparation

a) 1 mL of the stock culture shall be transferred to a TSA slant prepared in a French bottle with a surface approximately 75 cm² in area. The media shall then be incubated at 36 ± 1 °C (97 ± 1 °F) for 24 h.

b) Cells shall be washed from agar surface with 5 mL of SBDW. Agar surface shall be scraped with sterile disposable loops.

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10 Trademark by Dr. A. Rambach; available from multiple sources.
c) 0.5 mL of *E. coli* culture suspension shall be pipetted into 4 L of SBDW. This will give a density of 1 to 5x10^6 colony forming units (CFU) per mL.

**A.8.3 Enumeration**

a) For each test sample, one 100-mL and 10-mL sample shall be aseptically processed using the membrane filter technique. A mixed cellulose ester membrane with a pore size of 0.45 µm shall be used. Test sample shall be plated on ColiScan® or CHROMagar®, inverted, and incubated at 36 ± 1 °C (97 ± 1 °F) for 24 h.

b) After incubation, plates containing 20 – 200 distinct colony forming units (CFU) shall be enumerated using a Colony Counter. Results shall be expressed as the number of CFU/100 mL.

**A.8.4 Negative control**

a) For the negative control samples, a 100-mL sample shall be aseptically processed using the membrane filter technique. A mixed cellulose ester membrane with a pore size of 0.45 µm shall be used. Test sample shall be plated on ColiScan® or CHROMagar®, inverted, and incubated at 36 ± 1 °C (97 ± 1 °F) for 24 h.

b) After incubation, plates containing 20 – 200 distinct colony forming units (CFU) using a Colony Counter shall be enumerated. Results shall be expressed as the number of CFU/100 mL.

**A.8.5 Positive challenge culture control**

a) For the positive challenge control samples, serial dilutions of the samples (10^0-10^-4) shall be made using SBDW. 10^-4 and 10^-5 dilutions shall be aseptically processed using the membrane filter technique. Test sample shall be plated on ColiScan® or CHROMagar®, inverted, and incubated at 36 ± 1 °C (97 ± 1 °F) for 24 h.

b) After incubation, plates containing 20 – 200 distinct colony forming units (CFU) shall be enumerated using a Colony Counter. Results shall be expressed as the number of CFU/100 mL.
## Annex B^{11}

(Informative)

### Food Equipment Joint Committee^{12}

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Standards Development Liaison: Al Rose

Membership Balance:
- Industry: 10
- Regulatory: 10
- User: 10

^{1}Committee or task group chair

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^{11} The information contained in this Annex is not part of the American National Standard (ANS) and has not been processed in accordance with ANSI’s requirements for ANS. As such, this Annex 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.

^{12} Food Equipment Joint Committee members on the date of publication - subject to change 5/07/2017
The following standards established and adopted by NSF as minimum voluntary consensus standards are used internationally:

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THE HOPE OF MANKIND rests in the ability of man to define and seek out the environment which will permit him to live with fellow creatures of the earth, in health, in peace, and in mutual respect.