To: Joint Committee on Food Equipment

FROM: Michael Perez, Chair of the Joint Committee

DATE: October 26, 2023

SUBJECT: Proposed revisions to NSF/ANSI 3 – *Commercial Warewashing Equipment*

Revision 3 of NSF/ANSI 3 issue 21 is presented to the Joint Committee on Food Equipment (JCFE) for consideration. Please review the proposed new language to these standards and **submit your ballot by November 16, 2023** via the NSF Online Workspace at <www.standards.nsf.org>. Log in at https://standards.nsf.org/kws.

When adding comments, please add all comments under one comment number whenever possible. If additional space is needed, please use the comment template included as a reference document with these ballots and upload your comment document to the NSF Online Workspace.

Purpose

The purpose of this ballot is to affirm revised and new language regarding bottle washing machines in NSF/ANSI Standards 3.

Background

Issue paper **FE-2022-03** proposes revised and new language to Standard 3 to include bottle washing machines.

The issue proponent contends the scope of NSF/ANSI 3 does not currently include dedicated bottle washing machines or machines that can be adapted for cleaning and sanitizing bottles. In the field, there are many examples of foodservice establishments serving items like water, wine, juice and beer in reusable bottles. These same bottles are currently being washed and sanitized in equipment that have not been through the thorough vetting of NSF/ANSI Standard 3 Certification.

The original proposed language was sent to JCFE approval ballot in August 2022 which yielded a vote of **22 : 8 : 0 (Affirmative : Negative : Abstain)**. Since that time, the Task Group (TG) met twice and an Ad Hoc Group of Manufactures have also met a number of times to discuss further updating the language to reflect the comments received during the first approval ballot. A full report out to the JC was likewise presented during the Face-to-Face meeting in early August 2023.

Using the discussions and revision 1 approval ballot, the TG revised the language and set back to the TG as a straw ballot which yielded a vote of **6 : 1 : 0 (Affirmative : Negative : Abstain)** and two comments. The TG met again on October 3, 2023 to discuss this further and made additional updates to the language.

This revision 3 approval ballot reflects the language in its latest iteration and is being presented here for your consideration.

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Note 1: a definition for ***Bottle Washing Machine*** was part of the first approval ballot. As that section received no comments, this language is considered approved and is NOT part of this new ballot. The language however is part of the reference documents offered here.

Note 2: non germane comments were received suggesting a new definition be created for the term ***Bottle***. While voting and/or adding comments to this ballot please consider the following:

a) The 2022 FDA Food Code defines ***bottled drinking water***, but does not define ***bottle***

"Bottled drinking water" means water that is SEALED in bottles, packages, or other containers and offered for sale for human consumption, including bottled mineral water

https://www.fda.gov/media/164194/download?attachment

b) During the October 3, 2023 TG meeting, a participant offered to craft a definition for *bottle* which will be presented to the TG as a straw ballot in the near future.

If you have any questions about the technical content of the ballot, you may contact me in care of:

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c/o Allan Rose
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[Note – the recommended changes to the standard which include the current text of the relevant section(s) indicate deletions by use of ~~strikeout~~ and additions by grey highlighting. Rationale Statements are in *red italics* and only used to add clarity; these statements will NOT be in the finished publication.]

NSF/ANSI Standard for Food Equipment –

Commercial Warewashing Equipment

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1 General

1.1 Purpose

This standard establishes minimum public health and sanitation requirements for the materials, design, construction, and performance of commercial warewashing machines and their related components intended for use in a food establishment.

1.2 Scope

This standard applies to commercial dishwashing, glasswashing, bottle washing, and pot, pan, and utensil washing machines that wash their contents by applying sprays of detergent solutions, with or without blasting media granules, and sanitize their contents by applying sprays of hot water or chemical sanitizing solutions. Stationary rack and conveyor machines are covered under this standard. Equipment components and materials covered under other NSF or NSF/ANSI standards or criteria shall also comply with the requirements herein. This standard is not intended to restrict new unit design, provided that such design meets the minimum specifications described herein.

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5 Design and construction

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5.14 Racks

Racks, if provided, shall be designed and constructed to minimize the obstruction and masking of sprays. Racks shall conform to the material requirements of this standard but shall be exempt from the coating restrictions of Section 4.1 and may be rendered corrosion-resistant by the application of a coating or coatings. Coatings on racks shall conform to the requirements in Section 4.3.

Bottle washing racks for combination machines shall be constructed to prevent improper operation of the bottle washing function.

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5.20.3 Dual sanitizing mode machines

5.20.3.1 Machines designed for field conversion of the sanitization mode shall be designed so that conversion from one sanitization mode to another does not require modification to the basic design and construction of the machine. Conversion may require the addition or removal of a chemical sanitizer feeder, the changing of final sanitizing rinse spray arms, and the readjustment of the timing and water temperature controls.

5.20.3.2 Dual sanitizing mode machines shall have a means of clearly indicating (to the operator) the sanitization mode in which the machine is operating.

5.20.3.3 The data plate(s) or labels on dual sanitizing mode machines shall meet the requirements in both Sections 7.1.1 and 7.2.1, and shall state that the conversion is to be conducted by the manufacturer or its authorized service representative.

Rationale: allows option of permanent label in lieu of metal data plate.

5.20.4 Bottle Washing Machines

5.20.4.1 Machines designed to wash bottles shall be marked in accordance with section 7.3.3.

6 Performance

Equipment performance tests shall be performed with the equipment operating at its lowest operational settings and shortest cycle times. If a machine is intended to wash dishware and bottles with or without modifications to the basic machine, all performance tests must be run in both bottle washing mode and normal dishwashing mode. All sanitizing efficacy tests shall be performed according to the following:

***Rationale**: clarifies test requirements for combination machines. Also points out that some bottle washing machines may be derived from modifications to a conventional dishwasher or glasswasher.*

— if the machine is marked for final rinse pressure ratings of 20 ± 5 psi (138 ± 34 kPa), the test shall be run at 20 ± 1 psi (138 ± 7 kPa); or
— if the machine is marked for final rinse pressure ratings other than 20 ± 5 psi (138 ± 34 kPa), and the marked pressure range is > 5 psi (34 kPa), the test shall be run with the final rinse pressure set at both the minimum and maximum ratings marked on the unit (a unit marked 5 to 15 psi [34 to 104 kPa] shall be tested at both 5 and 15 psi [34 to 104 kPa]); or

— if the machine is marked for final rinse pressure ratings other than 20 ± 5 psi (138 ± 34 kPa), and the marked pressure range is ≤ 5 psi (34 kPa), the test shall be run with the final rinse pressure set at the minimum rating marked on the unit (a unit marked 5 to 10 psi [34 to 69 kPa] shall be tested at 5 psi [34 kPa]).

NOTE 1 — Figures 1 through 5 in this section show specific patterns in which dishes and glasses shall be arranged when evaluating machine performance. These patterns are applicable to most machine designs. However, the test patterns may be modified when necessary to accommodate an alternate machine design, size, or configuration. In such cases, the test pattern shall be representative of the patterns shown in Figures 1 through 5, to the extent possible.

NOTE 2 — The intent of this standard is to include water used for post-sanitizing rinse in any reported water consumption figures, when applicable.

6.1 Soil removal

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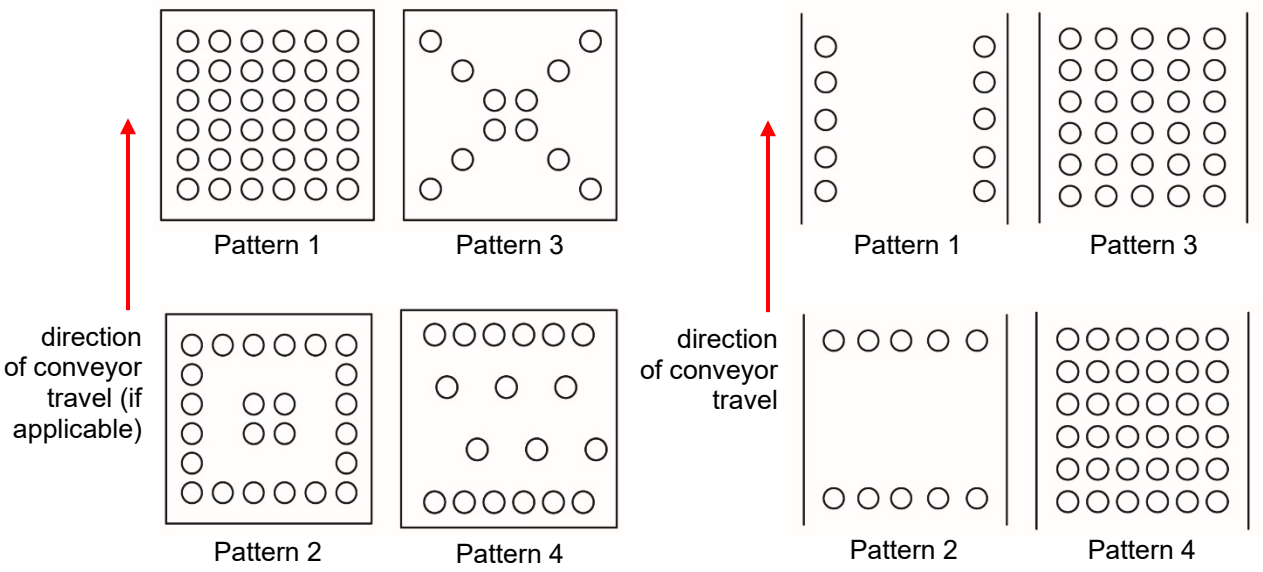

a) Stationary rack dishwashing machines and conveyor dishwashing machines that use racks.

b) Rackless conveyor dishwashing machines.

○ = single glass

Figure 2
Test patterns for the soil removal test for glasswashing machines

6.1.4 Bottle washing machines

6.1.4.1 Performance requirement

When operated in accordance with manufacturer's instructions, bottle washing machines shall render bottles free of soil and detergents.

6.1.4.2 Test method

The soil removal efficacy of bottle washing machines shall be evaluated by observing the machine's ability to remove a dry coating of buttermilk from the surface of bottles. A coating of buttermilk (1% milkfat) shall be applied to the outer lips and interior surfaces of Libbey #13150020[8] (34 oz) glass water bottles or the equivalent. The soiled bottles shall be inverted and allowed to drain for 45 min before being transferred to racks where they shall be allowed to air dry at 100 °F (37 °C) for 17 h. The bottles shall be arranged in the racks or directly on the conveyor according to the full rack test patterns shown in Figure 2, pattern 1 for stationary machines or pattern 4 for rackless conveyor machines. The full rack patterns shown in Figure 2 are based on standard 20 × 20 in rack sizes. If a bottle washing machine is specifically designed and manufactured to accommodate fewer bottles, the patterns shall be adjusted accordingly to achieve the maximum number of bottles the bottle washing machine will accommodate. In addition, the bottles shall be loaded in accordance with the manufacturer's instructions, including aligning the bottle with the adjacent wash and rinse nozzles, if applicable, to facilitate optimum washing and rinsing. Up to two trials of the full rack test pattern shall be subjected to a complete bottle washing machine cycle in accordance with the manufacturer's instructions. The surfaces of the bottles shall be visually inspected for any remaining buttermilk or detergent.

6.1.4.3 Acceptance criteria

The surfaces of all bottles for the full rack pattern shall be free of visible soil and detergent. The presence of soil or detergent on bottles following the full rack pattern is not grounds for rejection unless soil or detergent is also present following a second, separate trial of the same pattern.

Rationale: adds soil removal performance requirements specifically for bottle washing machines.

6.2 Sanitization efficacy

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6.2.6 Bottle washing machines

6.2.6.1 Performance requirement

To ensure adequate sanitization, the complete cycle of hot water sanitizing bottle washing machines shall deliver a minimum of 3600 HUE at the surface of bottles.

6.2.6.2 Test method

HUE delivered by a hot water sanitizing bottle washing machine shall be quantified by continuous monitoring of the temperature at the bottom, inside surface of a bottle over the course of a complete machine cycle. The bottle shall be a Libbey #13150020[Error! Bookmark not defined.] (34 oz) water bottle or the equivalent. Prior to the test, the machine shall be operated for at least one cycle to verify that the machine is operating in accordance with the manufacturer's minimum specifications. After verification of proper machine functioning, a standard rack containing a single bottle at each of the three locations shown in Figure 7 shall be subjected to one complete machine cycle.

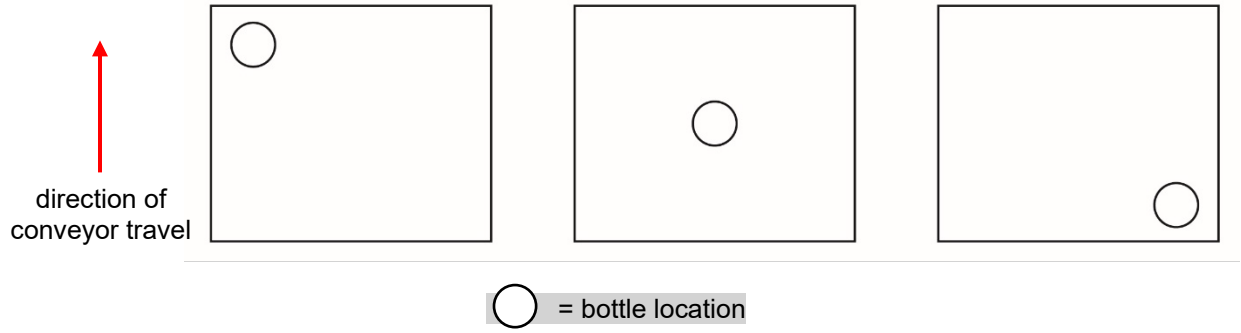

Figure 7
Bottle location for determining the heat unit equivalents (HUE) delivered by a hot water sanitizing bottle washing machine

A single empty rack may be run through a complete cycle just prior to the test rack. The temperature at the bottle surface shall be monitored by a calibrated thermocouple attached at the inside, bottom, center of the bottle . The thermocouple shall have an accuracy of ± 1 °F (± 0.5 °C). This test shall be repeated for the two remaining bottle locations indicated in Figure 7. For testing of rackless conveyor machines, the bottle shall be placed on the conveyor at locations corresponding to those on the rack in Figure 7. If required due to the type of construction, the bottles shall be loaded in accordance with the manufacturer's instructions, including aligning the bottle with the adjacent wash and rinse nozzles, if applicable, to facilitate optimum washing and rinsing.

If the bottle washing machine is specifically designed to accommodate fewer bottles, the location of the bottle shall be adjusted to achieve the maximum locations the machine will accommodate relative to the patterns in Figure 7.

For stationary rack machines, bottle temperatures shall be recorded at intervals of 1 s from the start of the cycle until 10 s after the cycle is finished (the machine door shall be opened at cycle completion). For

conveyor machines, bottle temperatures shall be recorded at intervals of 1 s from the time the bottle enters the machine until 10 s after the bottle has emerged from the final sanitizing rinse.

All temperature data points of 143 °F (62 °C) or greater shall be used to calculate the total HUE delivered. Calculation of HUE at each bottle location shall be based on the information in Annex N-1.

6.2.6.3 Acceptance criteria

A minimum of 3600 HUE shall be accumulated at each of the three bottle locations in the machine.

6.2.7 Chemical sanitizing dishwashing and bottle washing machines

6.2.7.1 Performance requirement

The sanitization portion of a chemical sanitizing machine shall be capable of yielding a 99.999% reduction (log_{10} reduction ≥ 5) of microorganisms of public health significance on the surface of dishes.

Sanitization efficacy testing shall not be required of machines that use a chlorine sanitizing solution, do not apply a post-sanitizing rinse and where one of the following conditions is met:

— the final sanitizing rinse is applied to all dishes for a minimum of 7 s; or

— the combined duration of the pumped rinse and the final sanitizing rinse is a minimum of 7 s, provided that the minimum temperature and free chlorine concentration specified for the final sanitizing rinse (see Table 6.1) are also maintained in the pumped rinse.

Table 6.1
Data plate specifications for the chemical sanitizing rinse

Sanitizing solution type	Sanitizing rinse temperature	Concentration
chlorine solution	min: 120 °F (49 °C)[1]	min: 50 ppm (as NaOCl)
iodine solution	min: 75 °F (24 °C)	min: 12.5 ppm, max: 25 ppm
quaternary ammonium solution	min: 75 °F (24 °C)	min: 150 ppm, max: 400 ppm

[1] See Section 7.2.6 for an exception to this requirement.

6.2.7.2 Test method

a) Prior to the test, the sanitization portion of the machine shall be operated for at least one cycle to verify that the machine is operating in accordance with the manufacturer's minimum specifications.

b) A suspension of *Escherichia coli* (ATCC #11229)[3] in sterile phosphate buffer deionized water (SBDW) shall be prepared by washing four 24 h French bottle slants into 0.5 L of SBDW. This technique ensures that the suspension contains more than 1.0×10^6 colony forming units per mL (CFU/mL).

[3] American Type Culture Collection (ATCC). 10801 University Boulevard, Manassas, VA 20110. <www.atcc.org>

An aliquot of the suspension shall be aseptically removed. Density shall be determined via optical density. The dispersion and morphological characteristics of the challenge culture suspension shall be microscopically examined using Brightfield microscopy and differential staining (i.e., gram stain). A Brightfield microscope and a calibrated ocular micrometer shall be used to verify the size, shape and arrangement of the organisms. The bacteria present in the challenge suspension shall be confirmed to be singlet in arrangement and dispersed in a homogeneous manner.

c) 12 Libbey #13150020**Error! Bookmark not defined.** (34 oz) bottles or the equivalent shall be inoculated with the
E. coli / SBDW suspension. Each bottle shall be inoculated in succession by filling the bottle with the suspension and then pouring the contents into the next bottle . The lip of each emptied bottle shall be dipped 1 in (2.54 cm) into a container of the suspension.

d) The inoculated bottles shall be air-dried for 10 ± 2 min before the test run. The bottles shall be placed upside down in the bottle washer rack. The rack shall be delineated into sections as shown in Figure 8. In addition, the bottles shall be loaded in accordance with the manufacturer's instructions, including aligning the bottle with the adjacent wash and rinse nozzles, if applicable, to facilitate optimum washing and rinsing.

> For rackless conveyor machine designs, the bottles shall be arranged directly on the conveyor in the same configuration shown in Figure 8.

e) The bottles shall be run through the sanitizing rinse portion of the machine cycle under one of the conditions in the manufacturer's specifications.

f) Immediately upon removal from the machine, each section of bottles shall be sampled by swabbing all interior surfaces of the three bottles with a single sterile cotton swab. The cotton swab shall be placed into a vial (containing 5 mL of sterile neutralizing buffer) corresponding to the section in which the bottles were placed. Samples shall be handled aseptically. Analysis shall be initiated within 15 min of sampling. If analysis cannot be performed within 15 min, the swabs shall be refrigerated at 4 ± 2 °C (39 ± 2 °F) for a maximum of 24 h.

g) These procedures shall be repeated for two additional trials to make a total of 36 bottles in 12 sections. The swab samples shall be enumerated using the violet red bile (VRB) agar pour plate method.

h) Positive control

Three of the inoculated bottles shall be randomly selected as positive controls. All interior surfaces of the three control bottles shall be swabbed with a single cotton swab after inoculation and the required drying period. The cotton swab shall be placed in a vial with 5 mL sterile neutralizing buffer and enumerated (CFU/mL) by the VRB agar pour plate method.

i) Negative control

Individual negative control samples shall be collected from a bottle that has not been inoculated, the VRB agar, the swab, the SBDW, and the pipette used. Enumeration shall be by the VRB agar pour plate method.

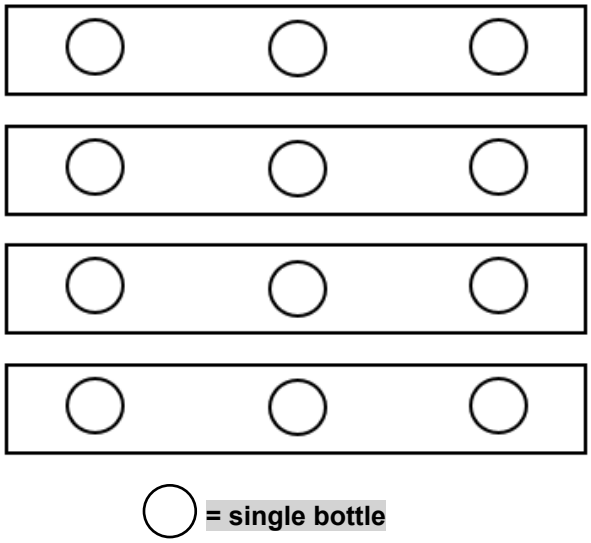

Figure 8
Test pattern for the bacteriological swab test for chemical sanitizing bottle washing machines

6.2.7.3 Acceptance criteria

For each of the 12 zones, R shall be ≥ 5.0:

$$R = \log_{10} (N_i/N_f)$$

where:

N_i = initial inoculum density (CFU/mL)
N_f = number of CFU/mL recovered in each section of each rack

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

— This pattern is for a standard bottle washing rack. Similar patterns shall be used for different sizes and configurations.

Rationale: text added to detail hot water and chemical sanitizing test methods specifically written for bottle washing machines. Accommodation must be made for machines that do not hold the same number of bottles as a conventional glass rack. Also, statement added to allow test bottle to be effectively washed in machine that is not necessarily designed to wash that size or shape of bottle.

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7 Manufacturer's specifications

The requirements in this section pertain to the manufacturer's specifications for proper operation of the machine. These specifications are necessary to ensure that the machine may be operated as intended and

as tested for performance. This section establishes acceptable ranges for some operational parameters (e.g., wash and rinse temperatures, rinse pressures, chemical concentrations). For other parameters, there are no restrictions on the values the manufacturer specifies (e.g., cycle times, conveyor speeds).

7.1 Hot water sanitizing machines

7.1.1 The manufacturer of hot water sanitizing machines shall specify the following on a permanently attached data plate or label:

— the minimum temperature of wash water in the tank (unless numerically indicated at a location adjacent to the temperature indicating device); and

— the minimum temperature of pumped rinse in the tank, if applicable (unless numerically indicated at a location adjacent to the temperature indicating device); and

— the minimum temperature of the final sanitizing rinse at the spray arm manifold (unless numerically indicated at a location adjacent to the temperature indicating device); and

— the minimum and maximum pressure in the final sanitizing rinse line with the rinse in operation (not required for machines that do not have a pressure gauge, per Section 5.16); and

— the minimum wash and final sanitizing rinse cycle times (stationary rack machines only); and

— the maximum conveyor speed (conveyor machines only).

7.1.2 The manufacturer's specifications for hot water sanitizing dishwashing machines shall conform to the values shown in Table 7.1.

Table 7.1
Specification requirements for hot water sanitizing machines

	Minimum wash temperature	Minimum pumped rinse temperature	Minimum sanitizing rinse temperature	Maximum sanitizing rinse temperature
stationary rack / single temp.	165 °F (74 °C)	N/A	165 °F (74 °C)	195 °F (90 °C)
stationary rack / dual temp.	150 °F (66 °C)	N/A	180 °F (82 °C)	195 °F (90 °C)
single tank conveyor	160 °F (71 °C)	N/A	180 °F (82 °C)	195 °F (90 °C)
multiple tank conveyor	150 °F (66 °C)	160 °F (71 °C)	180 °F (82 °C)	195 °F (90 °C)

7.1.3 If a heating device is required in the auxiliary rinse tank to meet the performance requirements in Section 6, the minimum temperature specified by the manufacturer shall be included on a permanently attached data plate or label or numerically indicated at the temperature-indicating device.

7.1.4 The maximum and minimum rinse line pressure specified by the manufacturer shall be between 5 and 30 psi (34 to 207 kPa).

7.2 Chemical sanitizing machines

7.2.1 The manufacturer of a chemical sanitizing machine shall specify the following on the machine data plate or label:

— the minimum temperature of wash water in the tank (unless numerically indicated at a location adjacent to the temperature indicating device); and

— the minimum temperature of pumped rinse in the tank, if applicable (unless numerically indicated at a location adjacent to the temperature indicating device); and

— the minimum temperature of the chemical sanitizing rinse (unless numerically indicated at a location adjacent to the temperature indicating device); and

— type of chemical sanitizer and minimum concentration in the chemical sanitizing rinse; and

— the maximum and minimum pressure in the chemical sanitizing rinse line with the rinse in operation (not required for machines with a pumped final sanitizing rinse); and

— the minimum wash and chemical sanitizing rinse cycle times (stationary rack machines only); and

— the maximum conveyor speed (conveyor machines only).

7.2.2 The manufacturer's specification for the minimum wash water temperature shall be 120 °F (49 °C) or greater.

7.2.3 The type of chemical sanitizing solution specified by the manufacturer shall be among those listed in 40 CFR § 180.940.**Error! Bookmark not defined.** The recommended use concentrations shall comply with Table 6.1. Recommended use concentrations of sanitizers not included in Table 6.1 shall comply with part (a) of 40 CFR §180.940,**Error! Bookmark not defined.** or shall comply with the registered use label applicable to the authority having jurisdiction, such as EPA or Health Canada.

7.2.4 The maximum and minimum rinse line pressure specified by the manufacturer shall be within 5 to 30 psi (34 to 207 kPa).

7.2.5 The manufacturer's specifications for the temperature and concentration of the final sanitizing rinse shall conform to the values shown in Table 6.1 for the applicable type of sanitizer.

7.2.6 For glasswashing machines that use a chlorine sanitizing solution, the minimum sanitizing rinse temperature specified by the manufacturer shall be at least 75 °F (24 °C).

7.3 Equipment labeling

Equipment labels shall be clearly visible to the user after the installation of the equipment.

7.3.1 Combination equipment

Warewashing machines that are intended for use as both a dishwashing machine and a pot, pan, and utensil washing machine, and that have passed all applicable performance tests of Sections 6.1 and 6.2, shall have a permanently attached label that states the following, or equivalent:

"This equipment is intended for the washing and sanitizing of dishes and glassware as well as pots, pans, and utensils."

7.3.2 Warewashing machines that are intended for use as both a dishwashing machine and a bottle washing machine, and that have passed all applicable performance tests of Sections 6.1 and 6.2, shall have a permanently attached label that states the following, or equivalent:

"This equipment is intended for the washing and sanitizing of bottles as well as dishes and glassware."

7.3.3 Warewashing machines that are intended for use as both a pot, pan and utensil machine and a bottle washing machine, and that have passed all applicable performance tests of Sections 6.1 and 6.2, shall have a permanently attached label that states the following, or equivalent:

"This equipment is intended for the washing and sanitizing of bottles as well as pots, pans and utensils."

Rationale: provides marking requirements for combination machines that have been evaluated to these requirement

7.3.2 Pot, pan, and utensil washing machines

Warewashing machines that are intended for use only as a pot, pan, and utensil washing machine, and that have passed the applicable performance tests of Section 6.1.3, and either Section 6.2.3 or 6.2.4, shall have a permanently attached label that states the following, or equivalent:

"This equipment is intended for the washing and sanitizing of pots, pans, and utensils."

7.3.3 Bottle washing machines

7.3.3.1 When the bottle washing capabilities are only functional when a machine is equipped with a specific modification and/or is operated in a specific operational cycle, there shall be a permanent marking on the machine indicating the accessory and cycle selection, as applicable.

7.3.3.2 Machines designed to wash bottles by adding or replacing components such as wash and rinse arms or racks, shall include a marking on the product with details of the components required for the conversion, as well as extended minimum wash and rinse times, if applicable. The instructions for the conversion may be in the instruction manual or online through a website or QR code.

7.3.3.3 Warewashing machines that are intended for use only as bottle washing machines, and that have passed the applicable performance tests of Section 6.1.4, and either Section 6.2.6 or 6.2.7, shall have a permanently attached label that states the following, or equivalent:

"This equipment is intended for the washing and sanitizing of bottles."

Rationale: provides marking requirements and any special operational parameters required for dedicated machines that have been evaluated to these requirements.