Meeting Minutes: Plumbing Board

Date:	October 8, 2018
Time:	9:30 a.m.
Minutes by:	Lyndy Logan
Location:	Minnesota Room, Department of Labor and Industry 443 Lafayette Road No., St. Paul, MN 55117-4344

Members

Jeff Brown – via teleconference
Richard Becker
Michael Dryke – via teleconference
Kent Erickson – via teleconference
John Flagg
Mike Herman
Rick Jacobs (Chair)
Justin Parizek
Phillip Sterner (Secretary)
Cathy Tran (DLI Commissioner's Designee)
David Weum (DOH Commissioner's Designee)

Members Absent

Tom Andresen
David Wagner

DLI Staff & Visitors

Suzanne Todnem (Gen. Counsel, DLI)
Lyndy Logan (DLI)
Jim Peterson (DLI)
Kara Topper (DLI)
Adam Hanson (ABC)
David Radziej (Metro PHCC)
Mike Johnson (J-Berd)
Gary Schick (City of Rochester)
Matt Marciniak (IAPMO)
Tom Johnson (Johnson Risk Solutions)
Joel Hipp (Hobart)
Tom McCarthy (Plumbers Local 34)
Jami Neiber (Scott County)

1. Call to Order

The meeting was called to order by Chair Jacobs at 9:34 a.m. Roll call was taken by Jacobs and a quorum was declared with 9 of 12 voting members, and one non-voting member, present in person or via teleconference.

2. Approval of meeting agenda

A motion was made by Herman, seconded by Flagg, to approve the agenda as presented. The roll call vote was unanimous with 9 votes in favor; the motion carried.

3. Regular Business

Approval of expense reports – Jacobs approved the expenses as presented.

4. Special Business

A. Review Request For Interpretation submitted by Thomas Johnson, Johnson Risk Solutions, regarding 4714.0603.2 and table – See Attachment A

Initial Dispute: Johnson claimed that MN DLI Plumbing inspector Gary Topp and Supervisor Cathy Tran claim Hobart's (ITW Hobart and their new CLeN line of ANSI NSF Std 3 listed) dishwashers do not comply with MR4714.0603.2. Mr. Johnson claims that this listed appliance complies with MN rules, and AVB pursuant to ASSE Standard 1001 - 2017 as referenced in the appliance meeting ANSI NSF Standard 3 listing documentation.

Joel Hipp, Engineer, Hobart Corporation ("Hobart") (manufacturer of commercial dishwashers), addressed the Board. Hipp reviewed Hobart's traditional control valve design leading into a vacuum breaker (page 5 of Attachment A). The UPC Section Table 603.2 states "no valve downstream". Hipp argued that a valve was added to the T of the new design 4 inches downstream from the vacuum breaker but it is not a control valve; it is a supplementary fill valve that allows more water to flow through the vacuum breaker and fill up the tank faster. Hipp stated that it eliminates the extra vacuum breaker. Hipp stated his understanding of options DLI suggested: that they have three choices – go to the Plumbing Board for a Final Interpretation, modify their design to add an RPZ, or use alternate methods of equivalency. Hipp stated that Tran explained to him that they were unable to do the AMM according to 301.2 because it would be in direct violation of the wording of the code. Hipp stated they paid $1,100 to add an RPZ to their installation of an appliance listed by NSF. Hipp said they realized that the ASSE code and the Plumbing Codes were written 50 years ago when a valve downstream would plug up the vacuum breaker and does not allow for this technology which is the equivalent to the code. Hipp stated he petitioned to have the ASSE standard updated and in 2017 it was updated to remove the wording that states "no valve downstream." Hipp stated they are now working on updating the UPC – it is not updated yet but it is in process. He understands that the Minnesota code is still working on the 2012 UPC.

Phil Sterner joined the meeting at 9:45 resulting in 10 voting members present in person or via teleconference.

Johnson, in the RFI form submitted, stated*:*

1. *There are no valves downstream from the AVB that can affect the operation of the AVB, whether a leg is plugged or not.*
2. *The [sic] "no valves downstream",[sic] statement is made in the reference table header and is not intended to be enforceable criteria, but rather general guidance.*
3. *When installed pursuant to the machines listings and instructions, there is no reasonable risk for back pressure or back siphonage, thereby complying with the intent of the rule and negating Mr. Topps suggestion of adding additional back flow prevention, upstream and external from the listed appliance.*

Johnson addressed the Board, summarizing Attachment A. Johnson stated that one of the key attributes of the system is that it is an optimization. Hobart was able to reduce

the use of materials using a fill valve. The design is a solenoid fill valve allowing both valves to open and fill the dishwasher tank faster. If you are open to atmosphere, then the hazard of back siphonage is not possible. The model code writing bodies agree with Hobart's design.

Board discussion: Tran asked if at any time a chemical dispenser or injection system be connected to an assembly. Hipp said yes, this is a standard practice for chemical dispensers to be injected after the vacuum breaker and if a separate water supply connection is used they have to have backflow water protection on their water supply. This does not have any effect at all on the operation of Hobart's system in terms of the design of the dishwasher. Johnson said that would be an after-market add-on and would be independent of the listed assembly. Tran asked if Hobart has had any past experience with the two nozzles having calcium and chemical build-up and Hipp said no, because if so the dishwasher would stop, there would be no flow. Hipp said their design has 5 or 6 nozzles on the upper arm and 5 or 6 nozzles on the lower arm and in his 38 years' experience, he has never heard of any of the nozzles getting completely clogged. There wouldn't be any final rinse or sanitation. The health inspectors would know this and operators would certainly notice this.

Todnem reminded the Board that this is not approval or disapproval of a product or product configuration; it is a code interpretation discussion.

Jacobs said the RFI is for the Minnesota Plumbing Code, Chapter 4714.0603.2 and the table – not the 2015 or 2018 UPC, not the ICC, nor any other codes. The MN Plumbing Code is very specific as it states that there shall be no valves on the downstream side of the atmospheric vacuum breaker. The code would not allow the installation as presented. Weum said he could see it being allowed if you took the footnotes in the table to override what it says about installation but if the footnotes are in addition to the table, then no valves are allowed downstream and the installation would not be allowed. Mr. Johnson agreed that the Code states no valves downstream but argued that the intent of the code is different. The footnotes state that the AVB should not be subjected to operating pressure for more than 12 hours in a 24-hour period and that listing and manufacturer's installation instructions must be followed. Todnem pointed out that the footnotes cannot be interpreted in a way that contradicts t-he code language. Becker stated that the code is clear in that it does not allow valves downstream of the atmospheric vacuum breaker. Even with the footnotes referring to deck mounted and equipment mounted, which still requires compliance with their listing which is ASSE 1001-2008, it does not allow valves downstream.

Johnson said there are hundreds of schools in Minnesota using this same assembly with thousands nationwide. None of these have been tagged by other jurisdictions. Focus was redirected to the interpretation at issue.

Hipp said that the 2008 version of ASSE 1001 does NOT allow valves downstream but the 2017 version does but he understands that the Plumbing Code references the 2008

version. Jacobs confirmed that the ASSE 1001-2008 is the correct version in the Minnesota Plumbing Code.

Johnson stated that the dishwasher at issue meets the intent of the Code because it is a fill valve. Todnem opined that the language is clear and there is nothing to interpret. Todnem stated that in the context raised by Johnson, is Johnson asking "no valve" to be interpreted; if so, the question would be does the Code language mean "no valves" or "some valves," and if it means some valves, which valves.

Johnson said it is within the Board's authority to decide that Hobart's product meets the intent of the rule and that public health and safety are not compromised. The design is not shutting off the flow of downstream from the valve. It is in the stream of flow that there is no shutoff downstream. It is a fill valve on the "T." Johnson argued it is an alternate method and means. Todnem clarified that section 301.2, alternate methods section in the Plumbing Code, specifically states alternate methods are allowed "unless prohibited by this code or by law." Todnem again reminded the Board they are interpreting the language in the table and not approving or disapproving a plumbing device or appliance. In regards to an alternate method, the alternate method cannot contradict the Plumbing Code.

Peterson clarified that an RPZ is not required for this installation.

A motion was made by Becker, seconded by Flagg, to make the interpretation that in Table 603.2 of the Minnesota Plumbing Code, no valves allowed downstream of the Atmospheric Vacuum Breaker in accordance with ASSE 1001-2008. The majority of the roll call vote was 9 votes in favor and 1 opposed (Sterner); the motion carried.

Todnem clarified that the Chair would issue a Final Interpretation reflecting the Board's motion.

5. Announcements

Next regularly scheduled meetings in 2018 – all meetings will be held at 9:30 a.m. in the Minnesota Room.

A. October 16, 2018

6. Adjournment

A motion was made by Sterner, seconded by Flagg, to adjourn the meeting at 10:18 a.m. The vote was unanimous with 10 votes in favor of the motion; the motion passed.

Respectfully submitted,

Phil Sterner

Phil Sterner, Board Secretary

Plumbing Board
c/o Department of Labor and Industry
443 Lafayette Road North
St. Paul, MN 55155-4344
www.dli.mn.gov

Reset

Attachment A

Plumbing Board
Request for Interpretation

PRINT IN INK or TYPE

NAME OF SUBMITTER	Rule(s) to be interpreted (e.g., 4714.0330)
Thomas Johnson	4714.0603.2

The Minnesota Plumbing Code (MN Rules, Chapter 4714) is available at www.dli.mn.gov/CCLD/PlumbingCode.asp
Has a request for interpretation been submitted to Department of Labor and Industry (DLI) staff, either as a verbal request or a written request? ☑ Yes ☐ No
If "No," contact DLI staff at 651-284-5187. The DLI is responsible for administration and interpretation of the Minnesota Plumbing Code, and all requests must be processed and provided a DLI interpretation before being referred to the Plumbing Board. This form is intended to be used to request an interpretation from the Plumbing Board only as a resolution of dispute with DLI interpretation.

CODE/RULE to be interpreted:	NAME OF DLI employee gave interpretation:	DATE interpretation originally requested:
4714.0603.2 and its table	Gary Topp, Cathy tran, Jim Lungstr	August 23rd, 2018

Provide a copy of the DLI interpretation with this request (a copy must be provided as reference).

Is there a local dispute with an Inspector of other official?	If Yes, state the name or type of official
☐ Yes ☑ No	Its a Statewide issue (public schools)

State the circumstances of the initial dispute:

MN DLI plumbing inspector Gary Topp and Supervisor Cathy Tran claim my client's (ITW Hobart and their new CLeN line of ANSI NSF Std 3 listed) dishwashers do not comply with MR4714.0603.2 and wrote the attached denials and related memos. as rationale for denying approval of said dish washing equipment at Perham Public Schools. after the initial denial, three more denials were made for the same modelm of

Explain why you disagree with the interpretation given to you by DLI staff:

1. There are no valves downstream from the AVB that can effect the operation of the AVB, whether a leg is plugged or not.
2. The"no valves downstream", statement is made in the reference table header and is not intended to be enforceable criteria, but rather general guidance.

What is your interpretation of the language:

Valves that control the AVB are not allowed downstream from the AVB. Other valves - are just fine.

List any other information you would like the Board to consider:

This is an ANSI NSF Std 3 commercial dishwasher. The ANSI NSF Std 3 test method makes a normative reference to the current version of ASSE 1001.

MN DLI has the authority to agree with our assessment of the situation and allow installation of this

Information regarding submitting this form:

- Submit any supporting documentation to be considered electronically to DLI.CCLDBOARDS@state.mn.us. Once your Request For Interpretation form has been received, it will be assigned a file number. Please reference this file number on any correspondence and supplemental submissions.

Information for presentation to the Board.

- You will be notified with the date of the Board Meeting in which your Request For Interpretation will be heard.
- Limit presentations to 5 minutes or less.
- Be prepared to answer questions regarding the Code, the circumstances that led to the dispute and please bring copies of any documentation.

What you can do if you disagree with the Board's determination:

- You may appeal the Board's determination pursuant to Minn. Stat. Chapter 14.

RFI File No. PB-0098	Date Received by DLI	Dated Received by Board	Date of Board Meeting Attachment A
Title of RFI	By:		

This material can be made available in different forms, such as large print, Braille or on a tape. To request, call 1-800-342-5354 (DIAL-DLI) Voice or TDD (651) 297-4198.

Submitted by:

NAME	FIRM NAME	
Thomas Johnson	Johnson Risk Solutions, LLC	
ADDRESS	CITY	STATE ZIP CODE
1408 Northland Dr. 406	Mendota Heights	MN 55120

PHONE	SIGNATURE (original or electronic)	DATE
651-587-0418	THOMAS JOHNSON	9/5/18

For assistance or questions on completing this form, please call 651-284-5898 or 651-284-5889.

Mailing address:

Plumbing Board
c/o Department of Labor and Industry
443 Lafayette Road North
St. Paul, MN 55155-4344

From:	Tom Johnson
To:	Logan, Lyndy (DLI); Tran, Cathy (DLI)
Cc:	Lungstrom, Jim (DLI); James Peterson; Topp, Gary (DLI); Peterson, Ken (DLI); Joel Hipp
Subject:	Re: MN DLI"s denial of Hobarts series of CLeN model dish machine denial at Oltman Middle School in Cottage Grove /SD 833, and elsewhere in MN public schools
Date:	Sunday, October 07, 2018 10:02:57 AM
Attachments:	392154A6-0BAF-444C-B4DA-4273A6ED45E0.png

Hi Lyndy and Cathy,

In addition to the materials originally submitted, Hobart has since received a favorable interpretation from IAPMO in this matter (below).

We look forward to a successful resolution of our appeal tomorrow morning at 9:30am in the Minnesota Room at MN DLI's facility.

Thank you.

Sincerely,

Thomas Johnson
Chief manager, Principal
Johnson Risk Solutions, LLC
"Best practices for reasonable standards of care"
1408 Northland Dr. #406
Mendota Heights, MN 55120
dir: 651-203-2462 cell: 651-587-0418
http://www.jrsrisk.com
https://www.linkedin.com/pub/tom-johnson/4/42a/379

From: Doug Kirk <
Sent: Friday, September 07, 2018 10:42 AM
To: Joel Hipp
Subject: Request for Clarification (UPC 18-101)

Joel,

This is the response to your request for clarification on the Uniform Plumbing Code. The question(s) considered was (were):

Among other installation requirements for atmospheric vacuum breakers (AVB) it states, "no valve downstream". If this is to prevent backpressure on the AVB, is the intent of the code met when the valve is located in a downstream branch of the AVB where the valve cannot cause backpressure?

Comment:
The 2017 ASSE 1001 standard has been revised to remove the requirement that "the device shall be installed downstream of the last control valve". It was replaced with, "the device shall

have its outlet open to atmosphere", since this has always been the intent of the provision. Additional supporting information is attached.
http://forms.iapmo.org/iapmo/interpretations/files/code_2461_VacuumBreaker-InformalCodeRequest-2018.pdf

The UPC Answers & Analysis Committee answered as follows:
Table 603.2 of the 2015 Uniform Plumbing Code specifically prohibits the installation of valves downstream of an Atmospheric Vacuum Breakers (AVB). This requirement is to prevent the AVB from being subjected to constant working pressure from the water supply by closing a valve. With no downstream manual or mechanical valve to prevent the water pressure from dissipating after the operation of the rinse cycle, the AVB as shown in the attached drawing would be sufficient backflow protection. The AVB must be installed a minimum of 6 inches or listed distance above all downstream piping and the flood level rim of the receptor.
Note. Alteration of this configuration in the field or the installation of aftermarket chemical dispensers for sanitation purposes may require additional backflow protection.

Sincerely,
Bruce Pfeiffer
Chair UPC Answers & Analysis Committee

Request processed by,

Doug Kirk, Technical Services Supervisor

4755 East Philadelphia St
Ontario, CA 91761-2816
E-mail:
Web: http://www.iapmo.org

Disclaimer - This email and any files transmitted with it are confidential and contain privileged or copyrighted information. You must not present this message to another party without first gaining permission from the sender. If you are not the intended recipient, you must not copy, print, distribute or use this email or the information contained in it for any purpose other than to notify us.

If you received this email in error, please notify the sender immediately and delete this email from your system. We do not guarantee that this email is free from viruses or any other defects although due care has been taken to minimize the risk.

Logan, Lyndy (DLI)

Subject: Request for Clarification (UPC 18-101)

From: Joel Hipp
Sent: Monday, September 10, 2018 3:08 PM
To: Tom Johnson
Subject: FW: Request for Clarification (UPC 18-101)

Tom,
I just read this email from last Friday. We now have a UPC Answers and Analysis Committee response that confirms our position. Please include this with your submittal.

From: Doug Kirk
Sent: Friday, September 07, 2018 10:42 AM
To: Joel Hipp
Subject: Request for Clarification (UPC 18-101)

Joel,

This is the response to your request for clarification on the Uniform Plumbing Code. The question(s) considered was (were):

Among other installation requirements for atmospheric vacuum breakers (AVB) it states, "no valve downstream". If this is to prevent backpressure on the AVB, is the intent of the code met when the valve is located in a downstream branch of the AVB where the valve cannot cause backpressure?

Comment:
The 2017 ASSE 1001 standard has been revised to remove the requirement that "the device shall be installed downstream of the last control valve". It was replaced with, "the device shall have its outlet open to atmosphere", since this has always been the intent of the provision. Additional supporting information is attached.
http://forms.iapmo.org/iapmo/interpretations/files/code_2461_VacuumBreaker-InformalCodeRequest-2018.pdf

The UPC Answers & Analysis Committee answered as follows:
Table 603.2 of the 2015 Uniform Plumbing Code specifically prohibits the installation of valves downstream of an Atmospheric Vacuum Breakers (AVB). This requirement is to prevent the AVB from being subjected to constant working pressure from the water supply by closing a valve. With no downstream manual or mechanical valve to prevent the water pressure from dissipating after the operation of the rinse cycle, the AVB as shown in the attached drawing would be sufficient backflow protection. The AVB must be installed a minimum of 6 inches or listed distance above all downstream piping and the flood level rim of the receptor.
Note. Alteration of this configuration in the field or the installation of aftermarket chemical dispensers for sanitation purposes may require additional backflow protection.

Sincerely,

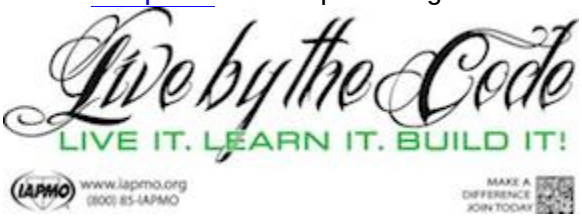
Bruce Pfeiffer
Chair UPC Answers & Analysis Committee

Request processed by,

Doug Kirk, Technical Services Supervisor

4755 East Philadelphia St
Ontario, CA 91761-2816

Web: http://www.iapmo.org



Disclaimer - This email and any files transmitted with it are confidential and contain privileged or copyrighted information. You must not present this message to another party without first gaining permission from the sender. If you are not the intended recipient, you must not copy, print, distribute or use this email or the information contained in it for any purpose other than to notify us.

If you received this email in error, please notify the sender immediately and delete this email from your system. We do not guarantee that this email is free from viruses or any other defects although due care has been taken to minimize the risk.

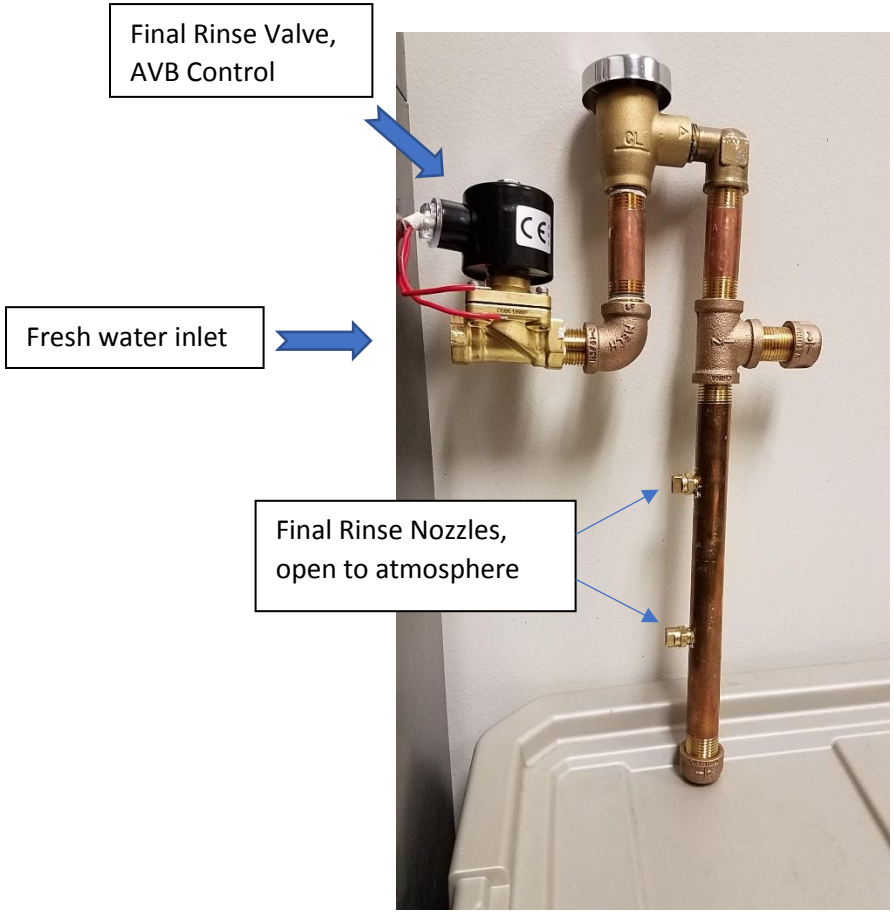


Figure 1 - Traditional Design

Figure 2 - New Design

NSF International
789 N. Dixboro Rd. Ann Arbor, MI 48105, USA
1-800.NSF.MARK | +1-734.769.8010 | www.nsf.org

Live Safer™

TEST REPORT

Send To: 22582
Mr. Jeremy Luyt
2875 East Bay Shore Road
P.O. Box 278
Owen Sound, Ontario N4K 5P5
Canada

Facility: 22582
PMI Food Equipment Group Canada
2875 East Bayshore Road
Box 278
Owen Sound ON N4K 5P5
Canada

Result	**Pass**	Report Date	01-FEB-2017

Customer Name	Hobart Corporation
Tested To	003-2012 - NSF/ANSI 03
Description	CL44eN with pot/pan mode activated | Hot Water Sanitizing Conveyor Dishmachine with Pot/Pan Mode
Test Type	Qualification
Job Number	J-00250300
Project Number	W0390633
Project Manager	Tyler Acree

Thank you for having your product tested by NSF International.

Please contact your Project Manager if you have any questions or concerns pertaining to this report.

Report Authorization **Date** 01-FEB-2017

Paul Anderson - Director, Engineering Laboratory

This report shall not be reproduced, except in its entirety, without the written approval of NSF. This report does not represent NSF Certification or authorization to use the NSF Mark. Authorization to use the NSF Mark is limited to products appearing in the Company's Official NSF Listing (www.nsf.org). The results relate only to those items tested, in the condition received at the laboratory.

General Information

Standard: 003-2012 - NSF/ANSI 03

Family Code: ZC

Performance Standard: 003

Performance Standard Year: 2012

Physical Description of Sample: Hot Water Sanitizing Conveyor Dishmachine with Pot/Pan Mode

Product Name / Model Number: CL44eN with pot/pan mode activated

Test Description: Hot Water Conveyor Pot and Pan Washer

Sample Id: **S-0001334161**
Description: CL44eN with pot/pan mode activated | Hot Water Sanitizing Conveyor Dishmachine with Pot/Pan Mode
Sampled Date: 01/27/2017
Received Date: 01/27/2017

Testing Parameter	Result	Units
Engineering Lab		
Warewashing Device - Conveyor Speed Test		
Run 1: Time to completion	0.663	minutes
Run 1: Distance	3.67	ft
Run 2: Time to completion	0.662	minutes
Run 2: Distance	3.67	ft
Run 3: Time to completion	0.663	minutes
Run 3: Distance	3.67	ft
Run 4: Time to completion	0.662	minutes
Run 4: Distance	3.67	ft
Run 5: Time to completion	0.663	minutes
Run 5: Distance	3.67	ft
Average time to completion (T)	0.663	minutes
Average distance (D)	3.67	ft
Actual conveyor speed = D/T	5.54	ft/min
Racks/dishes per hour	207	
Required max.conveyor speed	5.6	ft/min
Actual conveyor speed	5.54	ft/min
Deviation	1	percent
CONVEYOR SPEED TEST	PASS	
Water Consumption Test		
Laboratory Temperature	71	degrees F
Incoming water pressure	20	psi
Water connection size	0.5	inches
Method used to determine machine fill ra	Catch and weigh	
Rinse Water Consumption	125.8	gph
Water Fill Rate	2.097	gpm
WATER CONSUMPTION TEST	COMPLETE	
Std 3 Soil Removal Pot and Pan Washers		
Soiled dinnerware conditioned at	200	degrees F
Soiled dinnerware conditioned at RH	27	percent
Soiled dinnerware conditioned for	1	hours
Voltage	240	
Phase	3	
Rack Size	20" X 20"	
Req. soil (pie filling) removal (all)	ALL	
Actual soil (pie filling) removal (Y/N)	Yes	
Soil Removal Test	Pass	
Std 3 Accumulation - Heat Unit Equivalents - Pot and Pan Washers		

This report shall not be reproduced, except in its entirety, without the written approval of NSF. This report does not represent NSF Certification or authorization to use the NSF Mark. Authorization to use the NSF Mark is limited to products appearing in the Company's Official NSF Listing (www.nsf.org). The results relate only to those items tested, in the condition received at the laboratory.

Sample Id: **S-0001334161**

Testing Parameter	Result	Units
Engineering Lab (Continued)		
Required Heat Unit Equivalents (minimum)	3600	
Actual Heat Unit Equivalents	3696	
Heat Unit Equivalent Test	Pass	

This report shall not be reproduced, except in its entirety, without the written approval of NSF. This report does not represent NSF Certification or authorization to use the NSF Mark. Authorization to use the NSF Mark is limited to products appearing in the Company's Official NSF Listing (www.nsf.org). The results relate only to those items tested, in the condition received at the laboratory.

Testing Laboratories:

	Id	Address
All work performed at: →	FT_WT_TST	Manufacturer Testing The testing reported herein occured at a manufacturers offsite location by the manufacturer.

References to Testing Procedures:

NSF Reference	Parameter / Test Description
P2026	Warewashing Device - Conveyor Speed Test
P2029	Water Consumption Test
P2100	Std 3 Soil Removal Pot and Pan Washers
P2101	Std 3 Accumulation - Heat Unit Equivalents - Pot and Pan Washers

Test descriptions preceded by an asterisk "*" indicate that testing has been performed per NSF International requirements but is not within its scope of accreditation.

This report shall not be reproduced, except in its entirety, without the written approval of NSF. This report does not represent NSF Certification or authorization to use the NSF Mark. Authorization to use the NSF Mark is limited to products appearing in the Company's Official NSF Listing (www.nsf.org). The results relate only to those items tested, in the condition received at the laboratory.

HOBART

Proud supporter of you.™

August 23, 2018

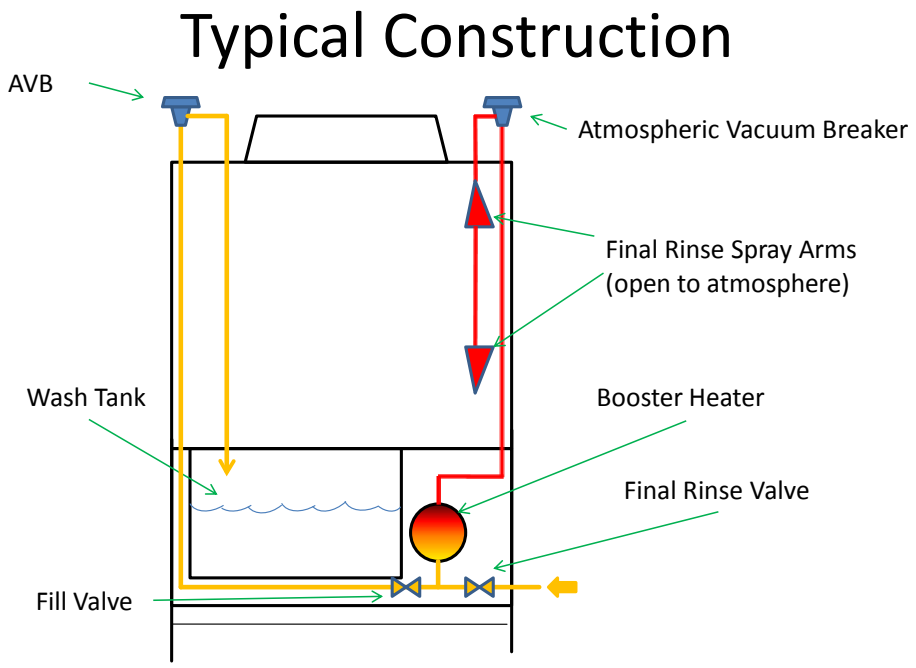
Gary Topp,
Minnesota Department of Labor & Industry

Subject: Hobart CLe Series Backflow Protection

Dear Mr. Topp,

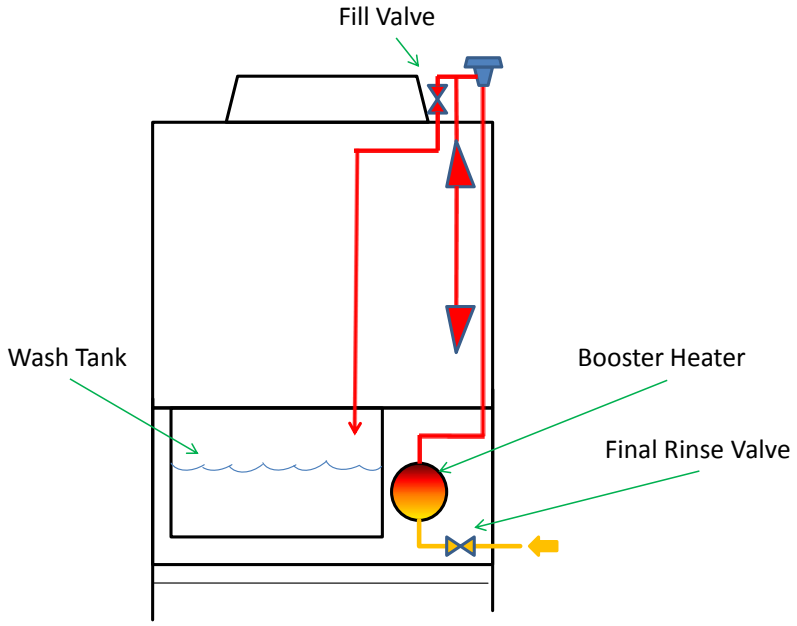
Thank you for taking the time to talk to me last evening. I have had an opportunity to collect some of the information regarding the design of the final rinse/fill plumbing for our CLeN series commercial conveyor dishmachines and the evolution of the standards and codes in recent years.

Design:



Typical construction designs include a final rinse control valve upstream from the AVB which is always open to atmospheric pressure.

Fill Valve After AVB



New design retains the control valve (final rinse) upstream from the AVB. Valve located downstream from the AVB via "TEE" fitting is for filling the tank, not AVB control. Thus, AVB is still always open to atmosphere.

Background:

The NSF Certified Hobart CLe series commercial dishwashers have been produced by Hobart since May 2008. The 2017 NSF standard 3 for Commercial Warewashing Equipment requires backflow protection as follows:

5.9 Plumbing Connections

5.9.2 Water inlets intended to be connected to a water supply system under pressure shall be equipped with at least one of the following backflow prevention devices:

- an air gap, installed in accordance with ANSI/ASSE 1004, Commercial Dishwashing Machines, located on the outside of the machine, above the overflow rim, and protected against suds, spray, splash and flooding, at least twice the diameter of the water supply inlet but not less than 1.0 in (25 mm); or

- a vacuum breaker that complies with ANSI/ASSE 1001, *Atmospheric Type Vacuum Breakers* (for intermittent pressure conditions), and is installed in accordance with ANSI/ASSE 1004.

The requirements in ASSE 1001 have been updated recently. The 2008 revision stated that the vacuum breaker "shall be installed downstream of the last control valve". The 2017 version replaced that wording with, "the device shall have its outlet open to atmosphere". These excerpts are shown below.

2008 ASSE 1001 standard:

1.1 Application

This standard applies to atmospheric type vacuum breakers (herein referred to as the "device") that are single pipe-applied (does not apply to tank ball cocks or similar devices that depend on float operated valves to control flow). The purpose of these devices is to provide protection of the potable water supply against pollutants or contaminants that enter the system due to backsiphonage through the outlet. Under backsiphonage conditions, a small amount of water is permitted to exit through the air ports.

The device shall:

1) Be installed downstream of the last control valve;
2) Not be subjected to backpressure;
3) Not be subjected to more than twelve (12) hours of continuous water pressure; and
4) Be installed with its critical level (CL) not less than 6.0 inches (152.4 mm) above the flood level rim of the fixture or appliances served; or deck mounted/equipment mounted atmospheric vacuum breakers shall be installed in accordance with the manufacturer's instructions, with its critical level (CL) not less than 1.0 inch (25.4 mm) above the flood level rim of the fixture or appliance served.

2017 ASSE 1001 standard:

1.1 Application

This standard applies to atmospheric type vacuum breakers (herein referred to as the "device") that are single pipe-applied, flushometer-applied, or integrally-applied (does not apply to water closet tank ballcocks or similar devices that depend on float-operated valves to control flow). The purpose of these devices is to provide protection of the potable water supply against pollutants or contaminants that enter the system due to backsiphonage through the outlet. Under backsiphonage conditions, a small amount of water is permitted to exit through the air ports.

The device shall:

1) Have its outlet open to atmosphere;
2) Not be subjected to backpressure;
3) Not be subjected to more than twelve (12) hours of continuous water pressure; and
4) Be installed with its critical level (CL) not less than 6.0 inches (152.4 mm) above the flood level rim of the fixture or appliances served; or deck mounted/equipment mounted atmospheric vacuum breakers shall be installed in accordance with the manufacturer's instructions, with its critical level (CL) not less than 1.0 inch (25.4 mm) above the flood level rim of the fixture or appliance served.

The commentary sections of the 2015 International Plumbing Code state that valves cannot be located downstream from an AVB. It goes on to state that this will subject the device to backpressure, which is the intent of the code. However, The CLeN design does not subject the AVB to backpressure, thus meeting the intent of the code.

2015 IPC Commentary:

If the vacuum breaker is below the flood level rim, it is subject to pressure from the fixture or outlet piping because of the static head (see commentary, Section 608.13.6). Valves cannot be located downstream from an atmospheric vacuum breaker. A downstream valve will subject the device to backpressure, thereby causing damage or impaired operation. All valves or controlling devices must be located upstream of the device. Valves may be downstream only where a pressure vacuum breaker is installed (see Commentary Figure 608.15.4).

This cannot happen with Hobarts design

The 2018 IPC has no restrictions on valves downstream from an AVB. It does state that the AVB must meet ASSE 1001. The CLeN design does meet the 2017 version of ASSE 1001. Therefore, it meets the requirements of the 2018 IPC.

In support of our claim, please see the email below from ICC in 2011 that confirms that this design meets the intent of the IPC.

Joel Hipp

From: Fred Grable [fgrable@iccsafe.org]
Sent: Friday, March 25, 2011 3:57 PM
To: joel.hipp@hobartcorp.com
Cc: Lee Clifton; Lis Valdemarsen
Subject: RE: 09 IPC 409.2 & 608.13.6 (FG)

Joel,

The arrangement protects the potable water supply that connects to the dishwasher so Section 409.2 is met. If the atmospheric vacuum breaker complies with ASSE 1001 or CSA B64.1.1, then Section 608.13.6 is met. Because the outlet of the AVB does not a valve arrangement that would block all flow from the AVB, this should meet the requirements of the standards for the AVB as well as the manufacturer's installation instructions for the AVB.

If you need further information or have questions on the above, please contact me directly by email or telephone.

This opinion is based on the information which you have provided. We have made no independent effort to verify the accuracy of this information nor have we conducted a review beyond the scope of your question. As this opinion is only advisory, the final decision is the responsibility of the designated authority charged with the administration and enforcement of this code.

Respectfully,

Fred Grable, P.E.
Staff Engineer
Chicago District Office
International Code Council

The Minnesota Plumbing Code sections shown below state that an AVB can only be installed on the discharge side of the last control valve. Since the AVB control valve on our design is located before the AVB (non-control, fill valve is located after the "T" and after the AVB), we meet the intent of the Minnesota code. In addition, the second bullet in the Minnesota code states that there must be no possibility of back pressure. This is the actual intent of the requirement, which our design meets.

2016 Minnesota Plumbing Code:

Subp. 115. **Vacuum breaker, nonpressure type (atmospheric).** "Nonpressure type vacuum breaker" means a vacuum breaker which is not designed to be subjected to static line pressure.

4715.2100 BACKFLOW PREVENTERS.

A. Atmospheric vacuum breaker (AVB):

(1) must be installed at least six inches above spill line (see special requirements in part 4715.2150);

(2) no possibility of back pressure permitted;

(3) only permitted on discharge side of last control valve; and

(4) no more than eight hours of continuous line pressure permitted.

Below is an email from NSF confirming the design meets the requirements of NSF 3.

"Campbell, Kelli"
<KCampbell@nsf.org>
10/03/2006 02:15 PM

To "'Joel Hipp'" <Joel.Hipp@hobartcorp.com>
cc
Subject RE: Booster Piping Confirmation

H Joel-

I reviewed your schematic and photos and agree that the location of this valve in relation to the vacuum breaker meets the intent of the requirements. Due to the nature of the way this valve is plumbed, its location will not inhibit the functionality of the vacuum breaker and is therefore acceptable.

If you need any further information, please feel free to contact me.

Kelli M. Campbell
NSF International
Certification Project Manager
Food Equipment Program
Voice- 734-827-6854
Fax - 734-827-7725
E-Mail - KCampbell@nsf.org
Web- www.nsf.org

As a final piece of evidence that this design does meet the intent of the code, I have included below a copy of an email from the plan review supervisor in Maricopa County where this exact same issue was raised.

ML

Michael Lagrow - ENVX <MLagrow@mail.maricopa.gov> | Brown, Jeremy; Bill Francis - ENVX; Joel Hipp; + 5 | 8/3/

RE: Installation of NSF-3 Dish Machine

You forwarded this message on 4/24/2013 9:39 AM.

Mr. Brown,

Thank you for your timely response. As the NSF Codes & Regulatory Manager we will accept your position regarding the Hobart dish washing machine as approved and meeting the ASSE 1001 standard for the vacuum breaker and also meeting the NSF 3 standard solely based your email below. I will consider this issue resolved at this point.

Regards,

Michael LaGrow
Maricopa County Environmental Services
Plan Review Supervisor - West
623-939-5788 x 206 Message
602-506-6862 Fax
602-506-6980 Inspection Request
www.maricopa.gov/envsvc

Working with our community to ensure a safe and healthy environment

From: Brown, Jeremy [mailto:Brown@nsf.org]
Sent: Wednesday, August 03, 2011 9:16 AM
To: Michael Lagrow - ENVX; Bill Francis - ENVX
Cc: Grimes, Ronald; Kohler, Mike
Subject: Installation of NSF-3 Dish Machine

In April, Mr. Francis called to inquire about the installation of a dish machine installed within Maricopa County indicating that the unit was installed with the solenoid valve installed downstream of the ASSE 1001 vacuum breaker. I had confirmed to you based my understanding at that time that a unit installed in this way would not meet application requirements of ASSE 1001 or NSF-3. Traditionally, control valve downstream of the AVB are prohibited because the outlet needs to be open to the atmosphere.

NSF has been provided further information from Joel Hipp of Hobart which demonstrates that this arrangement does meet ASSE 1001 and NSF-3. The attached correspondence between Hobart and ICC explains the situation well. Basically, Hobart's design has a tee installed between the AVB and the control valve, and the tee is open to atmosphere. This ensures that there is not continuous pressure on the AVB. During our conversation in April, I did not fully understand this innovation in the design. NSF has certified products with this type of arrangement and after our further review; we confirm that this arrangement does meet ASSE 1001 and NSF 3.

We truly appreciate and find tremendous value in your raising this issue with us and encourage any questions or comments on NSF certified equipment. I apologize that we did not reach a more timely resolution of this issue. If you have any questions, feel free to contact me.

Regards,

Jeremy Brown
Codes & Regulatory Manager
NSF International
789 N. Dixboro Rd.
Ann Arbor, MI 48105
USA

The overwhelming amount of evidence I have provided should allow you to accept the Hobart CLeN series commercial dishwasher designs in the State of Minnesota, without modification.

If you have questions or require additional information, please don't hesitate to contact me.

Sincerely,

Joel F. Hipp
Foodservice Agency Approval Engineer
(937) 332-2836
fax 332-2624

copies to:
File (Vacuum Breaker – CLeN-2018)

SECTION 00 01 01
TITLE PAGE

SPECIFICATIONS FOR
COMPLETE CONSTRUCTION

2018 Oltman New Middle School Bid Package #3 Building Enclosures and Finishes

Independent School District # 833 Cottage Grove, Minnesota

ARCHITECTS REGO + YOUNGQUIST
Planning Architecture Interiors

CONSTRUCTION MANAGER

KRAUS-ANDERSON

Commission No. 2108

Date: March 17, 2017

Bids Due: Thursday, April 13, 2017 at 2:00 pm

Pre-Bid Meeting: Tuesday, April 4, 2017 at 11:00 am

7601 Wayzata Boulevard, St. Louis Park, MN 55426 Phone 952-544-8941 Fax 952-544-0585 ARYarch.com

SECTION 00 11 00

ADVERTISEMENT FOR BIDS

1.01 INTRODUCTORY INFORMATION

A. From: Kraus-Anderson Construction Company acting on behalf of South Washington County Schools – ISD #833 (Owner).

B. Project: 2018 Oltman New Middle School – Bid Package #3 Building Enclosure and Finishes

C. Key Dates:
   1. **Pre-Bid Conference: April 4, 2017 at 11:00 AM.**
      a. Location: South Washington County Schools ISD 833 District Office
         7362 E. Point Douglas Road S.
         Cottage Grove, MN 55016
   2. **Bid Package #3 Bid Due Date: Thursday April 13, 2017, at 2:00 PM local time.**
   3. Cut Off Date for Questions and Interpretations Bid Package #2: Wednesday April 5, 2017 at 4:00 PM.

D. Method of Delivery: Kraus-Anderson Construction Company has been selected as an Agency Construction Manager by South Washington County Schools to administer the construction of the 2018 Oltman New Middle School.
   1. This Bid Package #3 consists of Building Enclosure, Building Finishes, Mechanical, Electrical and Misc. Site Work for the 2018 Oltman Middle School.

E. Work Included in this Offering: We are presently soliciting for multiple prime competitive bids for the following portions of work as defined herein.
   1. Bid Package #3 as defined in Section 00 24 00

F. Bid Date and Location: Sealed bids will be received at
   1. District Service Center, South Washington County Schools-ISD #833, 7362 East Point Douglas Road S, Cottage Grove, MN 55016 then publicly opened and read aloud. Bids will be received until 2:00 PM local time on Thursday April 13, 2017 for Bid Package #3.

G. Bid Security: Each bid shall be accompanied by Bid Security in form of certified check, cashier's check or bid bond in amount of five (5) percent of Base Bid submitted, made payable to Owner, as guarantee that Bidder will, if awarded, enter into Contract in accordance with Contract Documents and submitted Bid.

1.02 QUESTIONS SHALL BE SUBMITTED TO

A. Questions shall be submitted to Kraus-Anderson Construction Company at the address below on or before the Date indicated above.

Mark VanderBloomer
Kraus-Anderson Construction Company
8625 Rendova Street N.E.
P. O. Box 158
Circle Pines, MN 55014
Phone: 763-786-7711
mark.vanderbloomer@krausanderson.com

1.03 AVAILABILITY OF BIDDING DOCUMENTS

B. Location for Review and Examination: Bidding Documents (Project Manual, Drawings, and other Contract Documents) are available at the locations indicated below for review and examination:

1. Offices of the Construction Manager
   Kraus-Anderson Construction Company
   8625 Rendova Street N.E.
   P. O. Box 158
   Circle Pines, MN 55014
   Phone: 763-786-7711

2. Builder's Exchanges and Planrooms:

Minnesota Builders Exchange 1123 Glenwood Avenue Minneapolis, MN 55405 Telephone: 612-381-2620	MEDA 250 Second Avenue South, #106 Minneapolis, MN 55401 Telephone: 612-259-6561
Isqft & AGC of MN Planroom 525 Park Street #110 St. Paul, MN 55103 Telephone: 800-364-2059	CMD Group/Reed Construction Data 2000 Clearwater Drive Oak Brook, IL 60523 Telephone: 800-936-6385
Builders Exchange of Rochester 108 Elton Hills Lane NW Rochester, MN 55901 Phone: 507-282-6531	Builders Exchange of Mankato 75 Navaho Avenue, Suite 2 Mankato, MN 56001 Phone: 507-387-2002
Builders Exchange of St. Cloud 110 – 6th Avenue South St.Cloud, MN 56302 Phone: 320-252-5832	Mid-Minnesota Builders Exchange 2104 Highway 12 East Willmar, MN 56201 Phone: 320-235-0300

C. Procurement of Documents for Bidders on Prime Contracts:
   1. Obtain Bidding Documents through www.isqft.com. Please contact Anne Schiller at 763-792-3693 or anne.schiller@krausanderson.com to receive an invite.

D. Examination of Documents: Bidder shall carefully examine entire content of Bidding Documents to become thoroughly familiar with the documents and project requirements. Refer to Instructions to Bidders for additional requirements.

E. Examination of the Site: Bidders shall make arrangements with the Construction Manager to visit the project site to obtain first-hand knowledge of existing conditions, including existing utilities and services, obstacles which may be encountered and all other conditions relative to the Work to be performed

1.03 OTHER CONDITIONS

A. Time of Completion: Refer to Section 01 32 10 - Bids shall reflect all costs necessary to meet this schedule requirement.

B. Owner's Right to Reject Bids: Owner reserves the right to reject a Bid which is in any way incomplete or irregular or to waive informalities or irregularities in a Bid received, and accept a Bid, which in the Owner's judgment is in the Owner's best interests.

C. Additional Compensation: Contractors shall not receive extra payments for conditions which can be determined by examining the site and the Contract Documents.

SECTION 00 21 00
INSTRUCTION TO BIDDERS

1.01 INTRODUCTORY INFORMATION

A. **Request for Sealed Bids:** In accordance with the Advertisement for Bids, Kraus-Anderson Construction Company, on behalf of the Owner is requesting the following:
   1. Lump Sum Proposal for the Work Scope Categories identified in Section 00 24 00 and on your Bid Form.

B. **Submit Bids to:** Bids will be received as stated in the Advertisement for Bids – Section 01 11 10.

C. **Bidding Documents:** Bidding Documents include the Advertisement for Bids, Instructions to Bidders, Bid Forms and other documents identified within Project Manual and other Contract Documents indicated herein, including Drawings, Specifications and Addenda issued prior to execution of the Contract.

D. **Definitions:** Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201 or in other Contract Documents are applicable to the Bidding Documents.

1.02 AVAILABILITY OF BIDDING DOCUMENTS

A. **Availability of Documents:** Refer to Advertisement for Bid for additional information regarding availability and procurement of Bidding Documents.
   1. Bidding documents are on file at the offices of the Construction Manager.
   2. Builder's Exchanges and Planrooms:

Minnesota Builders Exchange
1123 Glenwood Avenue
Minneapolis, MN 55405
Telephone: 612-381-2620

MEDA
250 Second Avenue South, #106
Minneapolis, MN 55401
Telephone: 612-259-6561

Isqft & AGC of MN Planroom
525 Park Street #110
St. Paul, MN 55103
Telephone: 800-364-2059

CMD Group/Reed Construction Data
2000 Clearwater Drive
Oak Brook, IL 60523
Telephone: 800-936-6385

Builders Exchange of Rochester
108 Elton Hills Lane NW
Rochester, MN 55901
Phone: 507-282-6531

Builders Exchange of Mankato
75 Navaho Avenue, Suite 2
Mankato, MN 56001
Phone: 507-387-2002

Builders Exchange of St. Cloud
110 – 6th Avenue South
St.Cloud, MN 56302
Phone: 320-252-5832

Mid-Minnesota Builders Exchange
2104 Highway 12 East
Willmar, MN 56201
Phone: 320-235-0300

B. **Procurement of Documents for Bidders on Prime Contracts:**
   1. Obtain Bidding Documents through www.isqft.com. Please contact Anne Schiller at 763-792-3693 or anne.schiller@krausanderson.com to receive an invite.

C. **Addenda:** Registered document holders will receive copies of Addenda including attachments corresponding to documents obtained via the same method as original documents.

1.03 EXAMINATION OF BIDDING DOCUMENTS

A. **Examination of Documents:** Bidder shall carefully examine entire content of Bidding Documents to become thoroughly familiar with the documents and project requirements.

B. **Bidder's Representation:** Bidder by making a Bid represents that:
   1. Bidder has read and understands Bidding Documents and the Bid is made in accordance therewith.
   2. Bidder has read and understands Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, for other portions of Project, being bid concurrently or presently under construction.
   3. Bidder has visited the Site, become familiar with local conditions under which the Work is to be performed and has correlated Bidder's personal observations with the requirements of proposed Contract Documents.

4. Bid is based upon the materials, equipment and systems required by Bidding Documents without exception.

C. **Interpretations or Corrections of Bidding Documents:** Bidder shall carefully study and compare Bidding Documents with each other and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions and shall at once report to Architect and Kraus-Anderson errors, inconsistencies or ambiguities discovered.
   1. Bidders requiring clarification or interpretation of Bidding Documents shall make a request via email to Mark VanderBloomer at Kraus-Anderson Construction Company in accordance with the limitations indicated in the Advertisement for Bids.
   2. It is the Bidder's responsibility to bring discrepancies, ambiguities, omissions, or matters in need of clarification to the attention of the Architect for interpretation and decision. If there is a discrepancy that is unclarified prior to the Bid, the Contractor shall be responsible for the more stringent interpretation of the unclarified condition.
   3. Interpretations, corrections or changes of Bidding Documents will be made by Addendum. Interpretations, corrections and changes of Bidding Documents made in any other manner will not be binding and Bidders shall not rely upon them.

D. **Substitutions and Requests for Prior Approvals:** Materials, products and equipment described in Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.
   1. Substitution Procedures: Detailed procedures and limitations for submitting requests of substitution for both before and after award of Contract are explained in Section 00 43 25. Requests not complying with requirements of Section 00 43 25 will be rejected.
   2. Substitution Request Form: Requests submitted without a properly completed and signed Substitution Request Form, will not be evaluated.
   3. Burden of proof of the merit of the proposed substitution is upon the proposer. Architect's decision of approval or disapproval of a proposed substitution shall be final.
   4. If Architect approves proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not reply upon approvals made in any other manner.

E. **Addenda** will be issued to registered document holders.
   1. Copies of Addenda will be made available for inspection wherever Bidding Documents are on file.
   2. Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued and the Bidder shall acknowledge their receipt in the Bid.

1.04 BIDDING PROCEDURES

A. **Pre-Bid Conference:** A Pre-bid Conference will be conducted on as defined in the Advertisement for Bid. Refer to Section 00 1110 for details.
   1. Attendance is strongly recommended for Prime Contractor Bidders.

B. **Form and Style of Bids:** Submit **Sealed Bids** on forms identical to the Bid Form (Section 004100) included with Bidding Documents.
   Submit Bid in duplicate on the prescribed forms.
   1. Submit bid in duplicate on the prescribed form, which is furnished with the specification, with full name and address of the bidder.
   2. All blanks on the bid form shall be filled in by typewriter or manually in ink.
      a. Express sums in both words and figures, and in cases of discrepancy between the two, the amount written in words shall govern.
      b. The signer of the Bid shall initial alterations and erasures.
      c. All Alternates shall be bid. If no change in the Base Bid is required, enter No Change.
   3. Each copy of the Bid shall include legal name of Bidder and a statement that Bidder is a sole proprietor, partnership, corporation or other legal entity. Each copy shall be signed by the person or persons legally authorized to bind Bidder to a contract.
      a. Corporation shall further give the state of incorporation and have the corporate seal affixed.
      b. Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority bind the Bidder.
   4. Sign in longhand, executed by a principal duly authorized to enter into an agreement. If a bidder is a co-partnership, then signatures on the bid shall be by an authorized member of the firm, with names and addresses of each member of partnership.

5. Base Bids and Alternate Bids shall be stated both in writing and in figures. In all cases, written and numerical figures must agree; otherwise at Owner's option, it shall be cause for rejection of bid. Complete form without interlineations, alteration, or erasure.
6. Submit alternate prices (bid) for either increasing or decreasing the cost as called for on bid form and Description of Alternates. Submit a bid for all alternates, except those which may be denoted as optional.
7. Do not stipulate any other conditions, alternates or qualifications. Owner will not accept any condition not contained in specifications or other documents.
8. Submit bid in a sealed envelope bearing (on the outside) name of the bidder, address, name of the Project and Bid Package for which bid is submitted. If forwarded by mail or other means of delivery, sealed envelope containing the bid must be enclosed in another envelope addressed as specified.

C. **Bid Security – Execution of Contract:** With each bid, submit a certified check or cashier's check on a solvent bank, or bid bond, equal to five percent (5%) of amount of maximum bid submitted (including additive alternates) and made payable without recourse to the Owner
   1. For bid bonds, form may be surety's standard form or AIA Form A-310, duly executed by the bidder as principal, issued by a corporate surety company authorized to do business in the State where the project is located, with copy of Power of Attorney attached, as well as proper acknowledgments.
   2. Bid security in form of certified or cashier's check will be returned to all but the three lowest bidders within ten (10) days after opening of bids.
   3. Bid security shall be forfeited to Owner as liquidated damages in the event bidder is awarded a Contract and he fails or refuses to execute the Agreement and furnish specified bond within ten (10) days after award, provided Agreement is ready for signature. If Agreement has not been prepared within ten (10) days, Contractor shall have two (2) days after its preparation for execution.

D. **Modification or Withdrawal of Bids:** Bid may not be modified, withdrawn or canceled by Bidder during a **60 day period** following the date of receipt of Bids, and each Bidder so agrees in submitting a Bid.
   1. Prior to time and date designated for receipt of Bids, Bid submitted may be modified or withdrawn by notice to party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of Bidder
      a. A change shall be so worded as not to reveal the amount of the original Bid.
   2. Withdrawn Bids may be resubmitted up to date and time designated for receipt of Bids provided they are then fully in conformance with these Instructions to Bidders.

1.05 CONSIDERATION OF BIDS

A. **Bid Opening:** Bids received by the date and time indicated in the Advertisement for Bids – Section 00 1100 will be publicly opened and read aloud.

B. **Qualifications of Bidders:** Owner may make such investigations as he deems necessary to determine the ability and responsibility of the bidder to perform the work, and any bidder shall furnish to Owner all such information and data for this purpose, as the Owner may request.

1. Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the Work contemplated therein.
2. The following may be required of the lowest responsible bidder in determining an award, including, but not limited to: (1) proof of financial responsibility, (2) quality of similar work, (3) amount of experience with similar projects, (4) facilities, personnel and equipment, (5) reputation for performance, and (6) ability to complete the work within specified time.
3. Owner reserves the right to reject any Bid where there is reasonable doubt as to the qualifications of the bidder.
4. **Responsible Contractor**: Minnesota Statute § 16C.285, all provisions of which are incorporated herein by reference and made applicable to this solicitation, requires that all construction contracts that are awarded through a solicitation issued on or after January 1, 2015 may only be awarded to a "responsible contractor." The term "responsible contractor" as used in this solicitation has the same meaning as the term has in Minn. Stat. §16C.285, subd. 3. In order to qualify as a "responsible contractor", the contractor or subcontractor, for its portion of the project, must meet the minimum criteria as set forth in Minn. Stat. § 16C.285, subd. 3.
   a. All responses to this solicitation must include a signed statement under oath by an owner or officer of the contractor verifying compliance with each of the minimum criteria in Minn. Stat. § 16C.285, subd. 3. This requirement is met by completing and submitting the Responsible Contractor Affidavit of Compliance ("Compliance Affidavit"), which is attached to the Bid Form (Section 004100) as Attachment A.
   b. Any prime contractor or subcontractor that fails to submit its Compliance Affidavit or meet the minimum criteria in Minn. Stat. § 16C.285, subd. 3, is not a responsible contractor and will not be eligible to be awarded a contract or perform work on the project. Any prime contractor or subcontractor that makes any false statement under oath regarding compliance with the minimum criteria in Minn. Stat. § 16C.285, subd. 3 will not be eligible to be awarded a contract and any such false statement may result in termination of a contract awarded to the contractor.
   c. The prime contractor or subcontractor must also include in its Compliance Affidavit a list of its first-tier subcontractors that it intends to retain for work on the project. Prior to execution of a construction contract, and as a condition precedent to the execution of a construction contract, the apparent successful prime contractor shall submit a supplemental verification under oath confirming compliance with Minn. Stat. § 16C.285, subd. 3, clause (7) ("Supplemental Compliance Affidavit"), using Attachment A-2 to the Compliance Affidavit. The prime contractor or subcontractor must obtain a Compliance Affidavit from all first-tier subcontractors listed on the contractor's Compliance Affidavit or Supplemental Compliance Affidavit. The prime contractor shall submit copies of all Compliance Statements obtained from all subcontractors of any tier to the Owner upon request.
   d. If a prime contractor or any subcontractor retains additional subcontractors on the project after submitting its Compliance Affidavit and Supplemental Compliance Affidavit, the contractor shall obtain a Compliance Affidavit from each additional subcontractor and shall submit a supplemental verification, using Attachment A-3 to the Compliance Affidavit, within 14 days of retaining the additional subcontractors, in accordance with Minnesota Statute § 16C.285, subd. 3. This requirement applies during the solicitation process and continues through the term of any awarded contract.

C. **Acceptance of Bid – Award of Contract:** Owner reserves the right to (1) accept bidder's Base Bid only, (2) accept any one or more of bidder's Alternate Bids, in any order regardless of the order in which they were listed, (3) reject all Bids, (4) award contract based on his investigation of bidders, as well as acceptance of alternates, all of which Owner deems to be in his best interest, (5) waive informalities or minor irregularities in bids and waive minor irregularities or discrepancies in bidding procedure.

D. **Prime Contractor's Subcontracts and Suppliers:** Proposed subcontractors are subject to Owner's, Construction Manager's and Architect's acceptance. The right of rejection may be exercised when there is reasonable doubt the subcontractor (supplier) will be able to satisfactorily perform work under the Contract, as specified under Article 5.2 of General Conditions and Supplementary Conditions.

E. **Alternates:** Owner shall have the right to accept Alternates and Unit Prices in any order or combination and to determine the lowest responsible Bidder on the basis of the sum of the Base Bid and Alternates that are accepted.

F. **Rejection of Bids:** Owner shall have the right to reject any or all Bids, and to waive informalities or irregularities in a Bid.

1.06 POST BID – PRE-AWARD INFORMATION AND SUBMITTAL REQUIREMENTS

A. **Contractor's Qualification Statement:** Bidders to whom award of a Contract is under consideration shall submit to the Owner via Kraus-Anderson Construction Company, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement.

B. **Certificate of Insurance:** Bidder shall submit to Owner via Kraus-Anderson satisfaction supporting data confirming their ability to furnish a Certificate of Insurance in accordance with the project requirements.

C. **Subcontractor List:** Submit names of proposed subcontractors and material suppliers, including:
   1. Names of manufacturers, products and the suppliers.
   2. Names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for principal portions of the Work.
   3. Organize lists by Specification Section number
   4. Self-Performed Work: Designation of the Work to be performed with Bidder's own forces.
   5. Prior to the award of Contract, Owner via Kraus-Anderson will notify Bidder in writing if Owner, Architect, or Kraus-Anderson Construction Company after due investigation, has reasonable objection to a person or entity proposed by the Bidder.
   6. If Owner, Architect, or Kraus-Anderson Construction Company has reasonable objection to a proposed person or entity, Bidder may, at Bidder's option, (1) withdraw Bid, or (2) submit an acceptable substitute person or entity with an adjustment in Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution.
   7. Owner may accept the adjusted bid price or disqualify Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited, if applicable.
   8. Persons and entities proposed by the Bidder and to whom Owner, Architect, or Kraus-Anderson Construction Company have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of Owner, Architect, or Kraus-Anderson Construction Company.

1.07 BOND REQUIREMENTS

A. **Performance and Payment Bonds:** Upon notification of award of Contract, Contractor shall provide AIA A312 Performance and Payment Bonds in the amount of 100% of Contract Sum in accordance with General Conditions of the Contract.

B. **Timing of Bonds:** Bidder shall deliver the required bonds as requested by the Construction Manager, which may require bonds to be delivered prior to the execution date of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, Bidder shall, prior to commencement of Work, submit evidence satisfactory to Owner that such bonds will be furnished and delivered in accordance with this paragraph.

-- End --

SECTION 00 24 00

LIST OF WORK SCOPES

PART 1 - GENERAL

1.01 SUMMARY

A. **Section Includes:**
   1. Summary of Work Scope packages currently being bid.
   2. Summary of Contracts previously awarded.
   3. Outline of potential future packages.

1.02 WORK SCOPE BEING BID IN THIS PACKAGE

A. Kraus-Anderson Construction Company is soliciting competitive **"Lump Sum Bids"** for the portions of work as defined herein.
   1. Work Scope categories have been constructed to follow CSI 2004 MasterFormat specification sections, however individual Work Scope Categories may contain work described in more than one specification section.
   2. Local custom and trade union jurisdictional settlements do not control the scope of work included in Work Scope Categories.
      a. When a potential jurisdictional dispute or similar interruption of construction activities is identified, effected contractors shall promptly negotiate a reasonable settlement to avoid or minimize interruption and delays.
   3. Unless otherwise indicated, Work Scope Categories include a complete section of Work, including but not limited to labor, materials, equipment, scaffolding, hoisting, applicable permits and taxes as required by the Contract Documents.

B. By submitting a Bid, bidder acknowledges they have review all Contract Documents, including previously issued documents and have anticipated, based on information provided impact of future Work as it affects their Work Scope.

C. **Division 3- Concrete**
   1. Work Scope 3-A: Concrete Package

D. **Division 4-Masonry**
   1. Work Scope 4-A: Masonry

E. **Division 5- Metals**
   1. Work Scope 5-C: Miscellaneous Metals (Mat' Only)
   2. Work Scope 5-D: Miscellaneous Metals Install

F. **Division 6- Wood, Plastics, and Composites**
   1. Work Scope 6-A: Carpentry

G. **Division 7- Thermal and Moisture Protection**
   1. Work Scope 7-D: Metal Panel Package
   2. Work Scope 7-E: Modified Bituminous Roofing Package
   3. Work Scope 7-H: Caulking and Sealant Package

H. **Division 8- Openings**
   1. Work Scope 8-A: Doors, Frames & Hardware
   2. Work Scope 8-C: FRP Doors
   3. Work Scope 8-D: Aluminum Curtainwall & Entrances
   4. Work Scope 8-E: Translucent Wall and Roof Assemblies
   5. Work Scope 8-I: Overhead Door Package
   6. Work Scope 8-J: Coiling Door Package

I. **Division 9- Finishes**
   1. Work Scope 9-A: Drywall Package
   2. Work Scope 9-B: Tile Package
   3. Work Scope 9-C: Acoustical Treatment Package
   4. Work Scope 9-D: Wood Flooring Package
   5. Work Scope 9-E: Resilient & Carpet Flooring Package
   6. Work Scope 9-F: Terrazzo Package

7. Work Scope 9-G: Synthetic Sport Floor Package
8. Work Scope 9-K: Painting

J. **Division 10- Specialties**
1. Work Scope 10-A: Corridor Lockers
2. Work Scope 10-B: Athletic Lockers
3. Work Scope 10-D: Paired Glass Wall Panels

K. **Division 11- Equipment**
1. Work Scope 11-D: Food Service Equipment
2. Work Scope 11-H: Theatrical Rigging Equipment
3. Work Scope 11-I: Gym Equipment
4. Work Scope 11-J: Scoreboard
5. Work Scope 11-L: Orchestra Shell Enclosure

L. **Division 12-Furnishings**
1. Work Scope 12-C: Educational Casework
2. Work Scope 12-D: Musical Instrument Cabinets
3. Work Scope 12-E: Auditorium Seating
4. Work Scope 12-F: Folding Bleachers

M. **Division 13- Special Construction**
1. Work Scope 13-A: Pool
2. Work Scope 13-D: Sound Isolation Rooms

N. **Division 14- Conveying Equipment**
1. Work Scope 14-B: Vertical Wheelchair Lifts Package

O. **Division 20 – Mechanical**
1. Work Scope 20-A: Combined Mechanical
2. Work Scope 20-B: Testing, Adjusting and Balancing

P. **Division 21- Fire Suppression**
1. Work Scope 21-A: Fire Suppression

Q. **Division 26 – Electrical**
1. Work Scope 26-A: Electrical Package

R. **Division 32- Exterior Improvements**
1. Work Scope 32-A: Asphalt Paving
2. Work Scope 32-B: Exterior Concrete
3. Work Scope 32-F: Irrigation and Landscape Package

PART 2 – PREVIOUSLY AWARDED WORK SCOPES

BP-1

A. **Division 31 - Earthwork**
1. Work Scope 31-A: Earthwork

B. **Division 33- Utilities**
1. Work Scope 33-A: Utilities

BP-2

C. **Division 3- Concrete**
1. Work Scope 3-A: Concrete Package
2. Work Scope 3-B: Precast Concrete Plank/Double Tee Package
3. Work Scope 3-C: Precast Wall Panel Package

D. **Division 5- Metals**
1. Work Scope 5-A: Structural Steel Supply
2. *Work Scope 5-B: Structural Steel Erection*

E. **Division 14-Conveying Systems**

SECTION 00 43 25
SUBSTITUTION REQUEST FORM

TO: Architects Rego + Youngquist, Inc.

PROJECT: 2018 Oltman New Middle School-Bid Package #3 – Building Enclosures and Finishes

SPECIFIED ITEM: _____

SECTION: _____ DESCRIPTION: _____

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____
(Note: only one substitution per form.)

Attached description includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents which the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on the drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on the other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted By: _____

_____
Signature

_____
Firm

_____
Address

_____

_____

_____
Date

_____
Telephone

_____
Fax

For Use By The Design Consultant:

☐ Approved ☐ Approved as Noted
☐ Rejected ☐ Received too late for consideration

The approval given is subject to final approval of shop drawings and conformance to the intent of the specifications and drawings.

_____
By

_____
Title

_____
Date

_____
Remarks

_____

Attachments: _____

MINNESOTA DEPARTMENT OF LABOR AND INDUSTRY PREVAILING WAGES FOR STATE FUNDED CONSTRUCTION PROJECTS

THIS NOTICE MUST BE POSTED ON THE JOBSITE IN A CONSPICUOUS PLACE

Construction Type: Commercial

County Number: 82

County Name: WASHINGTON

Effective: 2016-12-27 Revised: 2017-03-06

This project is covered by Minnesota prevailing wage statutes. Wage rates listed below are the minimum hourly rates to be paid on this project.

All hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be paid at a rate of one and one half (1 1/2) times the basic hourly rate.

Violations should be reported to:

Department of Labor and Industry
Prevailing Wage Section
443 Lafayette Road N
St Paul, MN 55155
(651) 284-5091
DLI.PrevWage@state.mn.us

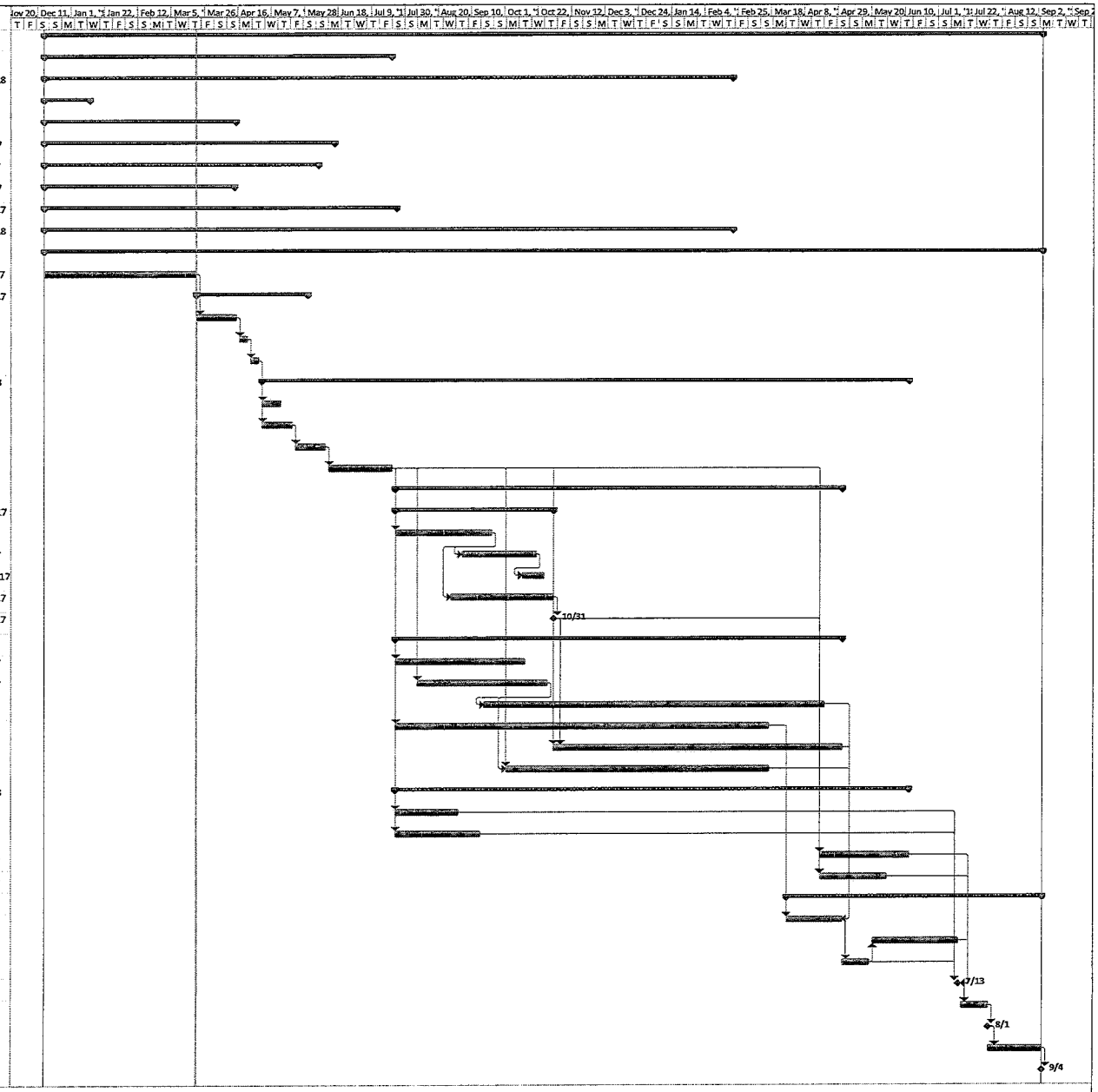
* Indicates that adjacent county rates were used for the labor class listed.

County: WASHINGTON (82)

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
LABORERS (101 - 112) (SPECIAL CRAFTS 701 - 730)					
101	LABORER, COMMON (GENERAL LABOR WORK)	2016-12-27	32.41	17.44	49.85
		2017-05-01	33.26	18.54	51.80
102	LABORER, SKILLED (ASSISTING SKILLED CRAFT JOURNEYMAN)	2016-12-27	32.41	17.44	49.85

715	PAINTERS (INCLUDING HAND BRUSHED, HAND SPRAYED, AND THE TAPING OF PAVEMENT MARKINGS)	2016-12-27	36.75	19.39	56.14
		2017-05-01	38.55	19.39	57.94
716*	PILEDRIVER (INCLUDING VIBRATORY DRIVER OR EXTRACTOR FOR PILING AND SHEETING OPERATIONS)	2016-12-27	36.85	18.39	55.24
717	PIPEFITTERS . STEAMFITTERS	2016-12-27	44.06	24.83	68.89
718	PLASTERERS	2016-12-27	32.99	21.52	54.51
		2017-06-01	34.94	21.52	56.46
719	PLUMBERS	2016-12-27	44.52	21.43	65.95
		2017-05-01	46.52	21.43	67.95
720	ROOFER	2016-12-27	34.94	15.94	50.88
		2017-05-01	35.94	15.94	51.88
721	SHEET METAL WORKERS	2016-12-27	40.88	25.10	65.98
722	SPRINKLER FITTERS	2016-12-27	42.78	24.20	66.98
		2017-06-01	45.78	23.20	68.98
723*	TERRAZZO WORKERS	2016-12-27	37.58	16.83	54.41
724	TILE SETTERS	2016-12-27	29.65	22.44	52.09
725	TILE FINISHERS	2016-12-27	25.48	17.18	42.66
726	DRYWALL TAPER	2016-12-27	31.17	22.22	53.39
		2017-05-01	32.97	22.22	55.19
727	WIRING SYSTEM TECHNICIAN	2016-12-27	36.90	14.97	51.87
		2017-07-01	37.82	14.97	52.79

ID	Task Mode	Task Name	Duration	Start	Finish
1		**Oltman**	**449 days**	**Thu 12/15/16**	**Tue 9/4/18**
2		**Bid Package 1 -Balance of Work**	**157 days**	**Thu 12/15/16**	**Fri 7/21/17**
13		**Bid Package 2**	**310 days**	**Thu 12/15/16**	**Wed 2/21/18**
14		**Contracts/Permits**	**21 days**	**Thu 12/15/16**	**Fri 1/13/17**
18		**WS-3A Concrete Package**	**87 days**	**Thu 12/15/16**	**Fri 4/14/17**
29		**WS-3B Precast Plank**	**131 days**	**Thu 12/15/16**	**Thu 6/15/17**
40		**WS-3C Precast Panels**	**123 days**	**Thu 12/15/16**	**Mon 6/5/17**
48		**WS-5A Structural Steel**	**86 days**	**Thu 12/15/16**	**Thu 4/13/17**
53		**WS-5B Steel Erection**	**158 days**	**Thu 12/15/16**	**Mon 7/24/17**
67		**WS-14A Elevator Package**	**310 days**	**Thu 12/15/16**	**Wed 2/21/18**
73		**Bid Package 3**	**449 days**	**Thu 12/15/16**	**Tue 9/4/18**
74		Documents	68 days	Thu 12/15/16	Mon 3/20/17
75		**Permits**	**50 days**	**Tue 3/21/17**	**Mon 5/29/17**
79		Bidding	19 days	Tue 3/21/17	Fri 4/14/17
80		Review / approve Bids	5 days	Mon 4/17/17	Fri 4/21/17
81		Award	5 days	Mon 4/24/17	Fri 4/28/17
82		**WS-XX**	**292 days**	**Mon 5/1/17**	**Tue 6/12/18**
83		Contract Submittals	10 days	Mon 5/1/17	Fri 5/12/17
84		Submittals	15 days	Mon 5/1/17	Fri 5/19/17
85		Submittal Review	15 days	Mon 5/22/17	Fri 6/9/17
86		Fabrication	30 days	Mon 6/12/17	Fri 7/21/17
87		**Install**	**202 days**	**Mon 7/24/17**	**Tue 5/1/18**
88		**Shell**	**72 days**	**Mon 7/24/17**	**Tue 10/31/17**
89		Exterior walls	45 days	Mon 7/24/17	Fri 9/22/17
90		Glass & Glazing	35 days	Mon 9/4/17	Fri 10/20/17
91		Exterior Doors	10 days	Thu 10/12/17	Wed 10/25/17
92		Roof	47 days	Mon 8/28/17	Tue 10/31/17
93		Enclosure	0 days	Tue 10/31/17	Tue 10/31/17
94		**Interior Construction**	**202 days**	**Mon 7/24/17**	**Tue 5/1/18**
95		Underground	60 days	Mon 7/24/17	Fri 10/13/17
96		SOG	60 days	Mon 8/7/17	Fri 10/27/17
97		Classrooms/Commons	155 days	Mon 9/18/17	Fri 4/20/18
98		Pool Area	170 days	Mon 7/24/17	Fri 3/16/18
99		Theater	130 days	Wed 11/1/17	Tue 5/1/18
100		Kitchen/cafeteria	120 days	Mon 10/2/17	Fri 3/16/18
101		**Site**	**232 days**	**Mon 7/24/17**	**Tue 6/12/18**
102		Paving	30 days	Mon 7/24/17	Fri 9/1/17
103		Landscaping Site	40 days	Mon 7/24/17	Fri 9/15/17
104		Landscaping Building	40 days	Wed 4/18/18	Tue 6/12/18
105		Site Specialties	30 days	Wed 4/18/18	Tue 5/29/18
106		**Closeout**	**115 days**	**Wed 3/28/18**	**Tue 9/4/18**
107		Construction Clean	25 days	Wed 3/28/18	Tue 5/1/18
108		Start-up/Balancing/Commissioning	40 days	Mon 5/21/18	Fri 7/13/18
109		Final Clean	13 days	Wed 5/2/18	Fri 5/18/18
110		Substantial Completion	0 days	Fri 7/13/18	Fri 7/13/18
111		Punchlist	13 days	Mon 7/16/18	Wed 8/1/18
112		Final Completion	0 days	Wed 8/1/18	Wed 8/1/18
113		Owner FFE/Programming/Tech	24 days	Thu 8/2/18	Tue 9/4/18
114		First Day of School	0 days	Tue 9/4/18	Tue 9/4/18



Project: Oltman BP-3
Date: Tue 3/21/17

Task		Summary		External Milestone		Inactive Summary		Manual Summary Rollup		Finish-only	
Split		Project Summary		Inactive Task		Manual Task		Manual Summary		Deadline	
Milestone		External Tasks		Inactive Milestone		Duration-only		Start-only		Progress	

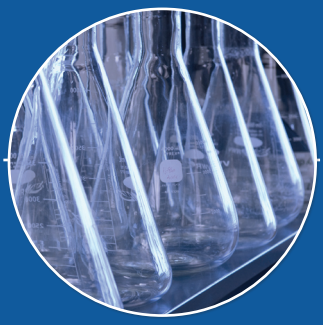
Attachment A

Attachment A

NSF International Standard /
American National Standard

NSF/ANSI 3 - 2017

Commercial Warewashing Equipment



NSF International, an independent, not-for-profit, non-governmental organization, is dedicated to being the leading global provider of public health and safety-based risk management solutions while serving the interests of all stakeholders.

This Standard is subject to revision.
Contact NSF to confirm this revision is current.

Users of this Standard may request clarifications and interpretations, or propose revisions by contacting:

Chair, Joint Committee on Food Equipment
c/o NSF International
789 North Dixboro Road, P.O. Box 130140
Ann Arbor, Michigan 48113-0140 USA
Phone: (734) 769-8010 Telex: 753215 NSF INTL
FAX: (734) 769-0109 E-mail: info@nsf.org
Web: http://www.nsf.org

NSF/ANSI 3-2017

NSF International Standard/
American National Standard
for Food Equipment –

Commercial warewashing equipment

Standard Developer

NSF International

NSF International

Designated as an ANSI Standard
April 11, 2017
American National Standards Institute

Recommended for Adoption by
The NSF Joint Committee on Food Equipment
The NSF Council of Public Health Consultants

Adopted by
The NSF Board of Directors
May 1953

Revised April 1965
Revised November 1977
Revised June 1982
Revised July 1996
Revised May 2001
Revised April 2003
Revised November 2005
Revised March 2007
Revised April 2008
Revised April 2009
Revised November 2010
Revised August 2012
Revised April 2017

Published by

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

For ordering copies or for making inquiries with regard to this Standard, please reference the designation "NSF/ANSI 3 – 2017."

Copyright 2017 NSF International

Previous Editions © 2012, 2010, 2009, 2008, 2007, 2005, 2003, 2001, 1996, 1982, 1977, 1965

Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from NSF International.

Printed in the United States of America.

Disclaimers[1]

NSF, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of NSF represent its professional judgment. NSF shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. NSF shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

NSF Standards provide basic criteria to promote sanitation and protection of the public health. Provisions for mechanical and electrical safety have not been included in this Standard because governmental agencies or other national standards-setting organizations provide safety requirement.

Participation in NSF Standards development activities by regulatory agency representatives (federal, local, state) shall not constitute their agency's endorsement of NSF or any of its Standards.

Preference is given to the use of performance criteria measurable by examination or testing in NSF Standards development when such performance criteria may reasonably be used in lieu of design, materials, or construction criteria.

The illustrations, if provided, are intended to assist in understanding their adjacent standard requirements. However, the illustrations may not include ***all*** requirements for a specific product or unit, nor do they show the only method of fabricating such arrangements. Such partial drawings shall not be used to justify improper or incomplete design and construction.

Unless otherwise referenced, the annexes are not considered an integral part of NSF Standards. The annexes are provided as general guidelines to the manufacturer, regulatory agency, user, or certifying organization.

[1] The information contained in this Disclaimer 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 Disclaimer 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.

This page is intentionally left blank.

Contents

1 General 1
1.1 Purpose 1
1.2 Scope 1
1.3 Alternate materials, design, and construction 1
1.4 Measurement 1

2 Normative references 1

3 Definitions 2

4 Materials 2
4.1 Corrosion resistance 2
4.2 Smoothness and cleanability 2
4.3 Coatings 3
4.4 Solder 3
4.5 Copper water lines 3

5 Design and construction 3
5.1 General sanitation 3
5.2 Joints and seams 3
5.3 Reinforcing and framing 3
5.4 Inspection and maintenance panels 4
5.5 Louvers 4
5.6 Equipment mounting 4
5.7 Legs and feet 4
5.8 Temperature indicating devices 5
5.9 Plumbing connections 5
5.10 Thermostatic control 6
5.11 Separation of residual food waste 6
5.12 Pumps 6
5.13 Spray assemblies 6
5.14 Racks 6
5.15 Sanitizing rinse 7
5.16 Pressure gauges 7
5.17 Condensers and blowers 7
5.18 Curtains and similar devices 7
5.19 Rinse aid, detergent, and chemical sanitizer feeders 7
5.20 Additional design and construction requirements for specific machine designs 8

6 Performance 9
6.1 Soil removal 10
6.2 Sanitization efficacy 14
6.3 Thermostat differential 20

7 Manufacturer's specifications 20
7.1 Hot water sanitizing machines 20
7.2 Chemical sanitizing machines 21
7.3 Equipment labeling 22
7.4 Manufacturer's instructions 22

8 Warewashing equipment provided with a security package 22
8.1 General 22
8.2 Special tools 22
8.3 Fastening methods 22

8.4 Drawers 23
8.5 Labeling 23

9 Warewashing equipment for use in marine environments 23
9.1 Materials 23
9.2 Design and construction 23

Annex A Heat Unit Equivalent (HUE) values corresponding to temperature in degrees Fahrenheit 25

Annex B Ingredients for pie filling 27

Annex C Food Equipment Joint Committee 29

Foreword[2]

The purpose of this Standard is to establish minimum public health and sanitation requirements for the materials, design, construction, and performance of commercial spray-type dishwashing, glasswashing, and pot, pan, and utensil washing machines.

The Standard covers commercial dishwashing, glasswashing, and pot, pan, and utensil washing machines that wash their contents by applying sprays of detergent solutions and sanitize their contents by applying either hot water sprays or chemical sanitizing solutions. Both stationary rack and conveyor machines are covered by the scope of this Standard. All equipment previously covered by NSF 26 – 1980: *Pot, pan, and utensil commercial spray-type washing machines* is also covered by the scope of this Standard.

This edition of the Standard contains the following revision:

Issue 12

This revision updated normative references in section 2 and revised language in section 5.9.2.

The figure titles in this edition have also been updated to maintain consistency with other NSF Standards:

Previous edition of NSF/ANSI 3	Current edition of NSF/ANSI 3
Figure 6.1	Figure 1
Figure 6.2	Figure 2
Figure 6.3	Figure 3
Figure 6.4	Figure 4
Figure 6.5	Figure 5

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 or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

This page is intentionally left blank.

NSF/ANSI Standard
for Food Equipment

Commercial warewashing equipment

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.

1.2 Scope

This Standard applies to commercial dishwashing, glasswashing, 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 therein. This Standard is not intended to restrict new unit 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, equipment that incorporates alternate materials, design, or construction may be acceptable when such equipment meets the intent of the applicable requirements herein.

1.4 Measurement

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

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]

ANSI/ASSE 1001 – 2008. *Atmospheric Type Vacuum Breakers*[4]

[3] U. S. Government Printing Office, Washington, DC 20402. <www.gpo.gov>.

[4] ASSE International 18927 Hickory Creek Drive, Suite 220 Mokena, Illinois 60448. <www.asse-plumbing.org>.

ANSI/ASSE.1004 – 2008. *Backflow Prevention Requirements for Commercial Dishwashing Machines*[4]

APHA, *Standard Methods for the Examination of Dairy Products*, seventeenth edition[5]

APHA, *Standard Methods for the Examination of Water and Wastewater,* 22nd edition[5]

IAPMO – *Uniform Plumbing Code* 2015[6]

ICC – *International Plumbing Code* 2015[7]

IEEE/ASTM SI 10 – 2010. *American National Standard for Metric Practice*[8]

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

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

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 ensure that the materials used in the manufacture of warewashing machines resist wear and penetration by vermin (insulation in sealed, non-food zone enclosures is exempt) and are unaffected by detergents, sanitizers, and other substances present in the intended use environment.

4.1 Corrosion resistance

Exposed surfaces shall be corrosion-resistant in the intended use environment. Surfaces, other than interior surfaces exposed to wash and rinse water, may be rendered corrosion-resistant by the application of a coating or coatings. Coatings conforming to NSF/ANSI 51, as applied, may be used to render a material corrosion resistant.

> NOTE — Materials that are worked (e.g., bent, cut, sheared, extruded, drawn) during equipment manufacture may require additional treatment following fabrication in order to render them corrosion-resistant.

4.2 Smoothness and cleanability

Exposed surfaces shall be smooth and easily cleanable. Interior surfaces repeatedly exposed to wash water, rinse water, or both are not required to be smooth.

[5] American Public Health Association, 800 I Street, NW, Washington, DC 20001. <www.apha.org>.

[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>.

4.3 Coatings

4.3.1 Coatings containing lead as an intentional ingredient shall not be used. Coatings with an unintentional lead content (lead impurity) greater than 0.06% shall not be used.

4.3.2 Coatings shall resist cracking and chipping under use conditions.

4.4 Solder

Solder containing lead as an intentional ingredient shall not be used on surfaces in contact with wash water or rinse water.

4.5 Copper water lines

Copper water lines shall not pass through a machine tank. They shall not be used in any recirculating system or be in contact with solutions of detergents, chemical sanitizers, or other chemicals. Copper water lines are exempt from the corrosion resistance requirement in 4.1.

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

5.1.2 Surfaces exposed to wash water, rinse water, routine splashes, spills, or other soiling shall be readily accessible and easily cleanable. Additional access openings shall be provided when the installation of a machine would otherwise prevent these surfaces from being readily accessible and easily cleanable. Valves and pipes shall not obstruct access openings or interfere with cleaning.

5.1.3 Equipment parts and components that require removal for routine equipment operation or cleaning shall be readily removable.

> NOTE — Safety devices required by federal, state, or local regulations are not required to be readily removable.

5.2 Joints and seams

5.2.1 Permanent joints and seams in a tank shall be sealed and smooth. Tanks shall be of integral construction or integrally welded.

5.2.2 Permanent joints and seams, other than those in the tank, shall be sealed. Joints made by overlapping sheets of metal shall not create upward-facing horizontal ledges.

5.2.3 Permanent joints and seams that result from the installation of functional parts, baffles, and accessories, or from the joining of machine components, shall be readily accessible and easily cleanable.

5.3 Reinforcing and framing

5.3.1 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.

5.3.2 Horizontal surfaces of reinforcing and framing members and gussets shall not be located where debris may accumulate.

5.3.3 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.

5.4 Inspection and maintenance panels

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

5.5 Louvers

5.5.1 Louvers that may be subject to overhead splashes, spills, and drips shall be of a deflecting design, or they shall be readily removable and the space immediately behind the louver easily cleanable.

5.5.2 If electrical safety requirements prohibit the use of readily removable louvers, then such louvers need only be removable.

5.5.3 Louvers shall be deburred and shall have spaces large enough to allow for easy cleaning.

5.5.4 Screening on louvered openings, if provided, shall be 16 mesh (16 strands per 1.0 in [25 mm]) or greater and removable.

5.6 Equipment mounting

5.6.1 To facilitate cleaning of areas underneath the machine, the main structure of the machine shall be elevated on legs that provide a clearance of at least 6 in (150 mm) between it and the floor. Necessary piping, gas burner enclosures, and service connections (for water supply, drainage, electrical, steam, or gas service) may be present in the clearance space. Horizontal piping and gas burner enclosures shall be at least 4 in (100 mm) above the floor.

NOTE — Where practical, service connections should be located so that horizontal pipes, conduits, and wires can be installed at least 6 in (150 mm) above the floor.

5.6.2 Under-counter machines shall be exempt from the requirements in 5.3.1 if they are designed to be sealed to the floor upon installation or to be moved from under the counter to facilitate inspection, service, and cleaning. Machines designed to be sealed to the floor shall have a removable panel that provides access to service connections and areas requiring cleaning. On machines designed to be moved from under the counter, service connections shall be capable of being disconnected without the use of tools, or shall be of sufficient length and flexibility to permit the machine to be moved for cleaning.

5.7 Legs and feet

5.7.1 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.

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

5.7.3 If the outer dimension of a leg exceeds the outer dimension of its foot by ½ in (0.5 in, 13 mm) or more in the same plane, then the foot shall extend at least 1.0 in (25 mm) below the leg at the minimum adjustment.

5.7.4 Hollow sections between leg and foot shall be closed. Legs and feet shall have no exposed threads

at the maximum adjustment.

5.7.5 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.

5.8 Temperature indicating devices

5.8.1 Each machine tank, other than a prewash tank, shall be equipped with a clearly visible temperature indicating device that measures and displays the temperature of the water in the tank. A temperature indicating device shall also be provided to measure and display the temperature of the sanitizing rinse water as it enters the rinse spray arm or manifold. Temperature indicating devices are not required on auxiliary rinse tanks unless a heating device is required in this compartment for the equipment to meet the performance requirements in 6 of this Standard. Temperature indicating devices are not required on post-sanitizing rinse water lines.

5.8.2 Required temperature indicating devices shall have a sealed design. The devices shall be located so as to protect them from breakage. Each device shall have an accuracy of ± 3 °F (± 1.5 °C) in the intended range of water temperatures. Temperature increments of no greater than 2 °F (1 °C) shall be indicated in the intended range of water temperatures. Graduated dial displays shall be at least 1 ¾ in (1.75 in, 44 mm) in diameter. Displays on temperature indicating devices shall be clear and easily readable.

5.8.3 Minimum water temperatures or appropriate temperature ranges specified by the manufacturer shall be marked or otherwise indicated at the location of each temperature indicating device.

5.8.4 Temperature-indicating devices (thermometers) shall be clear and easily readable.

5.8.5 Shaded areas (or safe zones) may be used in conjunction with the required temperature increments only if the shaded area does not extend beyond the maximum or minimum temperature requirements for the unit on which it is installed.

5.9 Plumbing connections

5.9.1 Water and waste piping and connections shall comply with the International Plumbing Code[7], International Code Council (ICC) or the Uniform Plumbing Code[6], International Association of Plumbing and Mechanical Officials (IAPMO).

5.9.2 Water inlets intended to be connected to a water supply system under pressure shall be equipped with at least one of the following backflow prevention devices:

— an air gap, installed in accordance with ANSI/ASSE 1004[4], Commercial Dishwashing Machines, located on the outside of the machine, above the overflow rim, and protected against suds, spray, splash and flooding, at least twice the diameter of the water supply inlet but not less than 1.0 in (25 mm); or

— a vacuum breaker that complies with ANSI/ASSE 1001[4], *Atmospheric Type Vacuum Breakers* (for intermittent pressure conditions), and is installed in accordance with ANSI/ASSE 1004[4].

5.9.3 Water piping located upstream of the backflow protection required in 5.9.2 shall not pass through a machine tank or hood where its outer surface may be contacted by sprays or tank water.

5.9.4 Water and steam valves shall be located so that they do not become submerged during machine operation.

5.10 Thermostatic control

5.10.1 Wash tanks, pumped rinse tanks, and auxiliary rinse tanks designed to heat water shall be equipped with a temperature regulator (thermostat) for maintaining the proper water temperature in the tank. Temperature regulators are not required on stationary rack machines that discharge the washwater to waste following each washing cycle. Temperature regulators are not required on auxiliary rinse tanks unless a heating device is required in this compartment for the equipment to meet the performance requirements in 6 of this Standard.

5.10.2 The temperature regulator shall have a maximum differential of 15 °F (8 °C). The differential of the temperature regulator shall be verified by the performance test in 6.3 of this Standard.

5.11 Separation of residual food waste

5.11.1 Machines shall have a readily accessible and readily removable scrap tray, basket, screen, strainer, or similar device through which all water to be recirculated shall pass. The minor dimensions of the openings in and around the device through which water passes shall be smaller than the minor dimensions of the openings on the wash, pumped rinse, or auxiliary rinse spray assemblies so that these openings do not become obstructed.

5.11.2 Prewashing units shall have a readily accessible and readily removable scrap tray, basket, screen, strainer, or similar device through which all water shall pass after food waste is flushed from the wares. Prewashing units that do not recirculate water and are equipped to grind food waste and discharge it to a sewer are exempt from this requirement.

5.11.3 Granular machines are exempt from the requirements of 5.11.1.

5.12 Pumps

Pump motors shall be open, drip-proof, or totally enclosed.

5.13 Spray assemblies

5.13.1 Spray assemblies, including auxiliary rinse assemblies, shall be readily removable and easily cleanable, or shall be easily cleanable while in place. Final sanitizing rinse spray assemblies or components shall be removable for deliming, descaling, and similar maintenance.

5.13.2 Slot and jet openings on all spray assemblies shall be adequate in size and number to deliver the spray volume and pressure necessary to meet the performance requirements in this Standard. The openings shall be sized to prevent clogging.

5.13.3 Spray assemblies shall be located and directed so that the spray is distributed over all wares in the wash or rinse area. Spray assemblies shall be designed to ensure that they are reassembled in the proper alignment.

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 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 4.3.

5.15 Sanitizing rinse

5.15.1 The water supply to a sanitizing rinse, post-sanitizing rinse and/or components of either shall be from a potable source and shall not contain recycled water from previous machine cycles.

5.15.2 A water line strainer with a removable screen shall be provided upstream of any electrically operated solenoid control valve in the sanitizing rinse supply line and the post-sanitizing rinse supply line, when provided.

5.15.3 A hot water or chemical sanitizing dishmachine provided with a post sanitizing rinse system shall be provided with a method to allow the operator to deactivate the post sanitizing rinse without the use of tools. In addition, the machine shall be provided with a method of clearly indicating to the operator whether or not the post sanitizing rinse is activated. For chemical sanitizing machines, there shall be a marking on the machine that instructs the operator how to measure the chemical sanitizer concentration.

5.16 Pressure gauges

Warewashing machines that utilize line pressure sanitizing rinses shall be provided with a pressure gauge or similar device that measures and displays the line pressure of the sanitizing rinse. The pressure gauge may be upstream or downstream of the control valve (i.e., solenoid valve) in the sanitizing rinse line. The gauge shall have increments of 1 psi (7 kPa) or smaller and shall be accurate to ± 2 psi (± 14 kPa) in the 15-25 psi (103-172 kPa) range. The display of the pressure shall be clearly visible to the operator of the machine. If the gauge is located upstream of the control valve, it shall be mounted in an accessible valve with a ¼ in Iron Pipe Size connection (IPS).

A pressure gauge is not required for non-recirculating pumped sanitizing rinses, recirculated sanitizing rinses, post-sanitizing rinses, or auxiliary rinses.

5.17 Condensers and blowers

5.17.1 Condensers and blowers shall be designed and located so that condensate cannot drain onto the rack or conveyor areas.

5.17.2 Condenser filters and baffles shall be easily cleanable or disposable.

5.18 Curtains and similar devices

Curtains and similar devices used to shield water sprays shall be readily removable. Their markings or design shall clearly indicate their proper location and use.

5.19 Rinse aid, detergent, and chemical sanitizer feeders

5.19.1 Rinse aid, detergent, and chemical sanitizer feeders provided by the manufacturer shall conform to the requirements in NSF/ANSI 29.

5.19.2 Chemical sanitizer feeders provided by the manufacturer shall be capable of maintaining the machine manufacturer's minimum sanitizer concentration in the final sanitizing rinse.

5.19.3 If a detergent feeder and/or a chemical sanitizer feeder is not provided by the manufacturer on the dishmachine, the manufacturer shall include the following statement, or equivalent, in the operating manual:

> "This machine must be operated with an automatic detergent feeder and, if applicable, an automatic chemical sanitizer feeder, including a visual means to verify that detergents and sanitizers are delivered or a visual or audible alarm to signal if detergents and sanitizers are not available for delivery to the respective washing and sanitizing systems. Please see instructions for electrical and plumbing connections located in this manual and in the feeder equipment manual."

5.19.4 If a sanitizing feeder is not provided by the manufacturer of a chemical sanitizing dishmachine, the manufacturer shall specify the type and concentration of chemical sanitizer, appropriate sanitizer feed rate (mL/min), feed time (s), and necessary electrical requirements. This information must be displayed in a visible location on the machine on a permanently attached data plate. Electrical requirements may be on the inside of an enclosure or in the instruction manual.

5.19.5 Detergent and chemical sanitizing feeders shall include:

— a visual means to verify that detergents and sanitizers are delivered; or

— a visual or audible alarm to signal if detergents and sanitizers are not being delivered to the respective washing and sanitizing systems.

NOTE — Some examples of systems that meet the intent of this requirement are a flow indicator, flashing light, buzzer, and a visible open-air delivery system that shows the operator that the chemicals are no longer being dispensed.

5.20 Additional design and construction requirements for specific machine designs

5.20.1 Stationary rack machines

5.20.1.1 Stationary rack machines shall be equipped with automatic timing controls to ensure that all wares are exposed to the wash and sanitizing rinse sprays for the minimum times specified by the manufacturer.

5.20.1.2 Unless designed to retain wash water for use in the next cycle, stationary rack machines shall completely drain and flush wash water from the tank and piping system before they are refilled for the final sanitizing rinse.

NOTE — The volume of water and the time needed to drain, flush, and fill the tank between cycles will depend on the design of the machine.

5.20.1.3 Machines that discharge the wash water to waste following each wash cycle (dump-type machines) shall be designed and constructed so that the necessary volume of water is furnished in the fill cycle to ensure proper wash and rinse function. A visible minimum/maximum water level indicator or other means of verifying that the water is maintained at the intended level shall be provided.

5.20.2 Conveyor machines

5.20.2.1 Conveyor speed shall be controlled automatically to ensure that all racks are exposed to the wash and sanitizing rinse sprays for no less than the minimum times specified by the manufacturer.

5.20.2.2 Conveyors shall be designed and constructed to minimize the obstruction and masking of sprays. Conveyors on which dishes are placed directly (no rack) shall be designed to support dishes in an upright or inclined position.

5.20.2.3 Internal angles on conveyor tables shall have minimum continuous radii of ⅛ in (0.13 in, 3 mm). Lesser radii may be present when necessary to ensure the proper functioning of devices used to guide or control the conveyor.

5.20.2.4 Joints and seams formed by conveyor table backsplashes shall be sealed. There shall be no exposed threads on the operating side of a backsplash.

5.20.2.5 Conveyor machines shall be equipped with baffles, curtains, adequate spacing, or other means to minimize internal cross-contamination of the wash and rinse solutions.

5.20.2.6 Carousel (closed-loop) conveyor machines that have access doors located behind the dish table shall have a minimum clearance of 1.5 ft (46 cm) between the doors and the inside edge of the dish table.

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) on dual sanitizing mode machines shall meet the requirements in both 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.

6 Performance

Equipment performance tests shall be performed with the equipment operating at its lowest operational settings and shortest cycle times. All sanitizing efficacy tests shall be performed according to the following:

— 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 > 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 ≤ 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

6.1.1 Dishwashing machines

6.1.1.1 Performance requirement

When operated in accordance with the manufacturer's instructions, dishwashing machines shall render dishes free of soil and detergents.

6.1.1.2 Test method

The soil removal efficacy of dishwashing machines shall be evaluated by observing the machine's ability to remove a dry coating of buttermilk from the surfaces of dinner plates and glasses. Prior to the test, a coating of buttermilk (1% milkfat) shall be applied to the top surface of glazed china dinner plates (diameter: 9 in [225 mm]) and the outer lips and interior surfaces of Libbey #618[9] milk glasses (8 oz) or the equivalent. The soiled plates and glasses 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 plates and glasses shall be arranged in the racks or directly on the conveyor according to the test patterns shown in figure 1 for the specific machine design.

[9] Libbey, Inc., 300 Madison Ave., Fourth Floor, Toledo, OH 43604. <www.libby.com>.

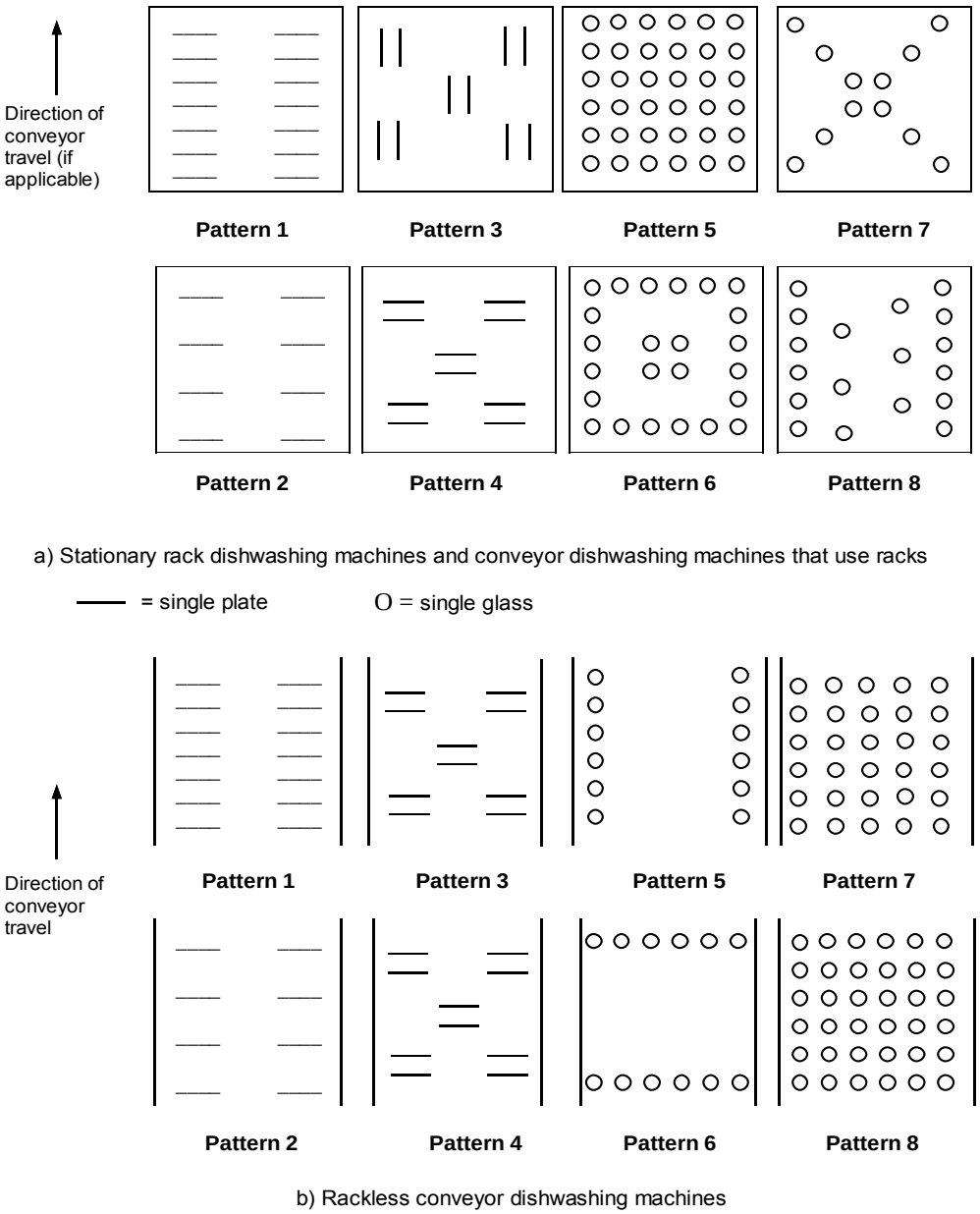


Figure 1 – Test patterns for the soil removal test for dishwashing machines

Up to two trials of each test pattern shall be subjected to a complete dishwashing machine cycle in accordance with the manufacturer's instructions. The surfaces of the plates and glasses shall be visually inspected for any remaining buttermilk or detergent.

NOTE — If a machine or a section of a machine is designed specifically for washing trays only (i.e., tray washer), soiled trays may be used in place of soiled plates and glasses, as appropriate, when testing the machine or section of the machine.

6.1.1.3 Acceptance criteria

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

6.1.2 Glasswashing machines

6.1.2.1 Performance requirement

When operated in accordance with manufacturer's instructions, glasswashing machines shall render glassware free of soil and detergents.

6.1.2.2 Test method

The soil removal efficacy of glasswashing machines shall be evaluated by observing the machine's ability to remove a dry coating of buttermilk on the surface of glasses. A coating of buttermilk (1% milkfat) shall be applied to the outer lips and interior surfaces of Libbey #618[7] milk glasses (8 oz) or the equivalent. The soiled glasses 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 glasses shall be arranged in the racks or directly on the conveyor according to the test patterns shown in figure 2 for the specific machine design. Up to two trials of each test pattern shall be subjected to a complete dishwashing machine cycle in accordance with the manufacturer's instructions. The surfaces of the glasses shall be visually inspected for any remaining buttermilk or detergent.

6.1.2.3 Acceptance criteria

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

6.1.3 Pot, pan, and utensil washing machines

6.1.3.1 Performance requirement

When operated in accordance with manufacturer's instructions, pot, pan, and utensil washing machines shall render pots, pans, and utensils free of soil and detergents.

6.1.3.2 Test method

The soil removal efficacy of pot, pan, and utensil washing machines shall be evaluated by observing the machine's ability to remove a baked coating of pie filling from the surface of cookware. Pie filling prepared in accordance with the directions in annex B shall be evenly applied to the interior surfaces of four 1/6 size stainless steel hotel pans and one stainless steel stock pot. The dimensions of the stock pot shall be such that it encompasses as much of the rack area as possible without overlapping the pans (see figure 3). The pie filling shall also be applied to the exterior surface and rim of each container to at least 1.0 in (25 mm) below the rim exterior. To ensure even application, the test containers may be filled and emptied to soil the interior surfaces and then dipped inverted into pie filling to soil the exteriors and rims.

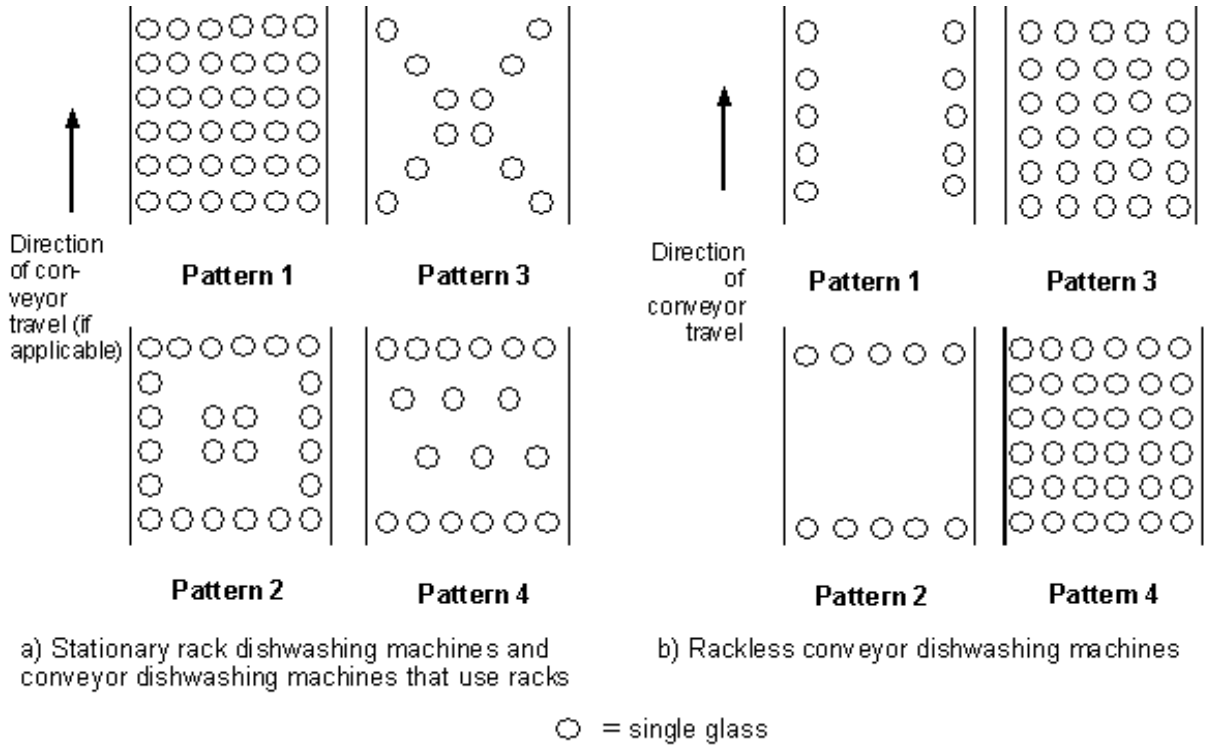


Figure 2 – Test patterns for the soil removal test for glasswashing machines

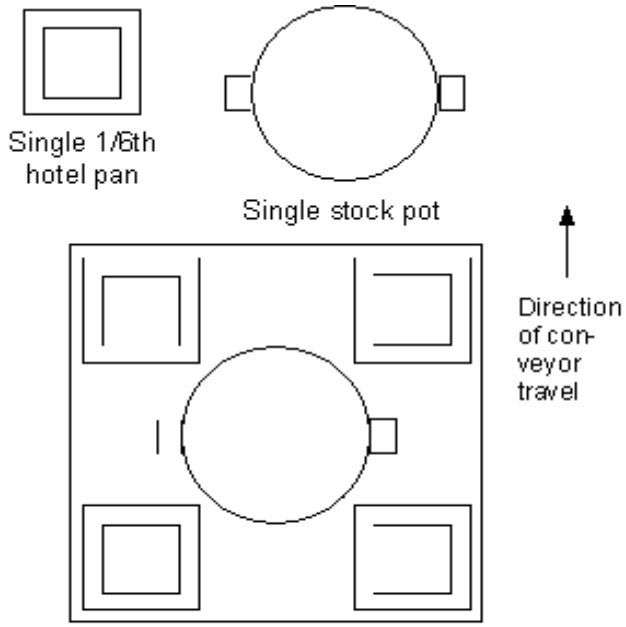


Figure 3 – Test pattern for the soil removal test for pot, pan, and utensil washing machines

During the application of the pie filling soil, the temperature of the pie filling shall not be allowed to drop below 160 °F (71 °C). The soiled pans and pot shall be placed inverted on a rack in a 200 ± 2 °F (93 ± 1 °C) oven and baked for 1 h. The pans and pot shall be allowed to cool to room temperature. The

pot shall be placed inverted in the geometric center, and each of the four pans shall be placed inverted in a different corner, of a standard rack, as illustrated in figure 3. For testing of rackless conveyor machines, the pot and pans shall be arranged directly on the conveyor in positions corresponding to the prescribed rack positions. The arranged pot and pans shall be subjected to a complete washing machine cycle in accordance with the manufacturer's instructions. The surfaces of the pot and pans shall be visually inspected for any remaining pie filling.

NOTE — If a machine cannot accommodate pans and pots with the dimensions specified in the method, alternately sized pans and pots may be used. The standard soil shall be applied in the same manner. The configuration of the pans and pot may also be modified, if necessary, but should cover as much of the rack area as possible.

6.1.3.3 Acceptance criteria

The surfaces of each of the four pans and the stock pot shall be free of visible soil and detergent. The presence of soil or detergent on any of the pots and pans following a given trial is not grounds for rejection unless soil or detergent is also present following a second, separate trial.

6.2 Sanitization efficacy

NOTE — Warewashing machines that include an auxiliary rinse system shall meet the applicable performance tests of this section with the auxiliary rinse system operating as intended. Warewashing machines that include a post-sanitizing rinse shall meet the applicable performance tests of this section with the post-sanitizing rinse operating as intended and deactivated.

6.2.1 Hot water sanitizing dishwashing machines

6.2.1.1 Performance requirement

To ensure adequate sanitization, the complete cycle of hot water sanitizing machines shall deliver a minimum of 3600 heat unit equivalents (HUE) at the surface of dishes.

6.2.1.2 Test method

The HUE delivered by a hot water sanitizing machine shall be quantified by continuous monitoring of the temperature at the surface of a dinner plate over the course of a complete machine cycle. 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 dishrack containing a single dinner plate at one of the three locations shown in figure 4 shall be subjected to one complete machine cycle.

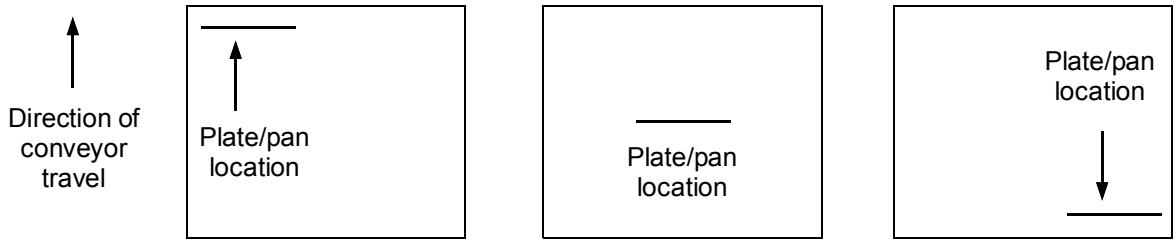


Figure 4 – Plate and pan location for determining the heat unit equivalents delivered by a hot water sanitizing dishwashing machine or a hot water sanitizing pot, pan and utensil machine

A single empty rack may be run through a complete cycle just prior to the test rack. The temperature at the plate surface shall be monitored by a calibrated thermocouple attached at the center of the plate. The thermocouple shall have an accuracy of ± 1 °F (± 0.5 °C). This test shall be repeated for the two remaining

plate locations indicated in figure 4. For testing of rackless conveyor machines, the plates shall be placed on the conveyor at locations corresponding to those on the rack in figure 4.

For stationary rack machines, plate 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, plate temperatures shall be recorded at intervals of 1 s from the time the plate enters the machine until 10 s after the plate 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 plate location shall be based on the information in annex A.

NOTE — If a machine or a section of a machine is designed specifically for washing trays only, trays may be used in place of plates, as appropriate, for testing of the machine or section of the machine.

6.2.1.3 Acceptance criteria

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

6.2.2 Chemical sanitizing dishwashing and glasswashing machines

6.2.2.1 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 7.2.6 for an exception to this requirement.

6.2.2.2 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)[10] 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 x 10^6 colony forming units per mL (cfu/mL).

[10] American Type Culture Collection, 12301 Parklawn Dr., Rockville, MD 20852. <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) Thirty-five Libbey #618[7] milk glasses (8 oz) or the equivalent shall be inoculated with the *E. coli*/SBDW suspension. Each glass shall be inoculated in succession, by filling the glass with the suspension and then pouring the contents into the next glass. The lip of each emptied glass shall be dipped 1 in (2.54 cm) into a container of the suspension.

d) The inoculated glasses shall be air-dried for 10 ± 2 min before the test run. The glasses shall be placed upside down in a standard 20 in × 20 in (50.8 cm x 50.8 cm) dishrack. The rack shall be delineated into sections as shown in figure 5.

NOTE — For rackless conveyor machine designs, the glasses shall be arranged directly on the conveyor in the same configuration shown in figure 5.

e) The glasses 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 glasses shall be sampled by swabbing all interior surfaces of the five glasses 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 glasses 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 105 glasses in 21 sections. The swab samples shall be enumerated using the Violet Red Bile (VRB) agar pour plate method.

h) Positive control

Five of the inoculated glasses shall be randomly selected as positive controls. All interior surfaces of the five control glasses 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.

Negative control

Individual negative control samples shall be collected from a glass 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.

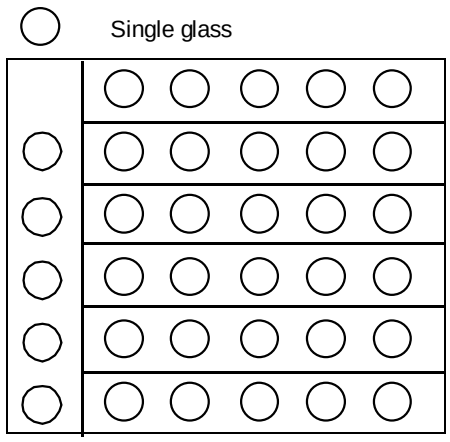


Figure 5 – Test pattern for the bacteriological swab test for chemical sanitizing dishwashing and glass washing machines

6.2.2.3 Acceptance criteria

For each of the 21 zones, R shall be greater than or equal to 5.0, where:

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

and

N_i = Initial inoculum density (CFU/mL)

N_f = The number of CFU/mL recovered in each section of each rack.

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

NOTE — This pattern is for a standard (20 × 20 in [50.8 x 50.8 cm]) rack. Similar patterns shall be used for different sizes and configurations.

6.2.3 Hot water sanitizing pot, pan, and utensil washing machines

6.2.3.1 Performance requirement

To ensure adequate sanitization, the complete cycle of hot water sanitizing machines shall deliver a minimum of 3600 HUE at the surface of pots, pans, and utensils.

6.2.3.2 Test method

The HUE delivered by hot water sanitizing machines shall be quantified by continuous monitoring of the temperature at the surface of an 8 × 12 in (20 x 30 cm) stainless steel sheet pan over the course of a complete machine cycle. 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 dishrack containing a single sheet pan at one of the three locations shown in figure 4 shall be subjected to one complete machine cycle. A single empty rack may be run through a complete cycle just prior to the test rack. The temperature at the pan surface shall be monitored by a calibrated thermocouple attached at the center of the sheet pan. The thermocouple shall have an accuracy of ± 1 °F (± 0.5 °C). This test shall be repeated for the two remaining pan locations indicated in figure 4. During testing of rackless conveyor machines, the pans shall be placed on the conveyor at locations corresponding to those on the rack in figure 4.

For stationary rack machines, pan 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 the cycle completion). For conveyor machines, pan temperatures shall be recorded at intervals of 1 s from the time the pan enters the machine until 10 s after the pan 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 plate location shall be based on the information in Annex A.

6.2.3.3 Acceptance criteria

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

6.2.4 Chemical sanitizing pot, pan, and utensil washing machines

6.2.4.1 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 pots, pans, and utensils.

Sanitization efficacy testing shall not be required if a machine uses a chlorine sanitizing solution and 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 the minimum temperature and free chlorine concentration specified for the final sanitizing rinse (see table 6.1) is also maintained in the pumped rinse.

6.2.4.2 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 *E. coli* (ATCC #11229)[8] 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).

An aliquot of the suspension shall be aseptically removed. The 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) Four $^1/_6$ size hotel pans (6 in depth) and one stainless steel stock pot shall be inoculated with the *E. coli*/SBDW suspension. The dimensions of the stock pot shall be such that it encompasses as much of the rack area as possible without overlapping the pans (see figure 3). Each pan shall be inoculated in turn, by filling the container with the suspension and then pouring the contents into the next container. The pot shall be inoculated in a similar manner by pouring the suspension into the pot and then maneuvering the pot at an angle so that all interior surfaces contact the suspension. The lip of each emptied pan or pot shall be dipped 1 in (2.54 cm) into a container of the suspension.

d) The inoculated pans and pot shall be air-dried for 10 ± 2 min before the test run. The pans and pot shall be placed upside down on the machine’s dishrack in an “X” configuration with one pan in each of

the four corners and the pot in the center (figure 3).

NOTE — For rackless conveyor machine designs, the pans and pot shall be arranged directly on the conveyor in the same configuration shown in figure 3.

e) The pans and pot shall be run through the sanitizing rinse portion of the machine cycle under one of the specified conditions.

f) Immediately upon removal from the machine, each pan and pot shall be sampled by swabbing all interior surfaces of the container with a single sterile sponge as described below:

1) Moisten a sterile sponge with 10 mL of sterile phosphated buffered dilution water (PBDW). The sterile sponge shall be handled aseptically using either sterile crucible tongs, or sterile or sanitized rubber or plastic gloves.

2) Sample the surface by vigorously rubbing the sponge over the designated area, (an area of several square meters may be efficiently swabbed). If the surface is flat, the rinse solution may be applied directly to the surface and then taken up into the sponge by the rubbing action. After sampling, introduce the sponge into a sterile plastic bag and transport it immediately to the laboratory for processing. If processing cannot be performed within 15 min, the sponge shall be refrigerated at 4 ± 2 °C (39 ± 2 °F) for a maximum of 24 h.

3) For quantitative analyses, add 90 mL of PBDW to the bag containing the sponge. Then vigorously massage the sponge with the PBDW for 1 min. Remove portions of the PBDW from the bag, plate on the desired medium, and incubate under appropriate conditions.

4) Calculate the numbers of microorganisms per unit of surface area on the basis of the area swabbed, the amount of PBDW used, and the size of the sample plated. For example, if 50 colonies are obtained from a - mL sample derived from a sponge in 100 ml of PBDW (initial 10 mL plus 90 mL addition) that swabbed 1 m^2, the aerobic plate count / m^2 shall be 5,000.

g) Each swabbed container shall be considered as one data set.

h) These procedures shall be repeated for two additional trials to make a total of 15 separate swab samples representing 12 pans and 3 pots.

i) Positive control

One of the inoculated containers from each rack tested shall be randomly selected and sampled as a positive control. The three positive control containers shall be sampled using the same sponge swab method in 6.2.4.2f).

Negative control

Individual negative control samples shall be collected from a pan that has not been inoculated.

6.2.4.3 Acceptance criteria

For each of the 15 samples, R shall be greater than or equal to 5.0, where:

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

N_i = Initial inoculum density (CFU/mL)

N_f = The number of CFU/mL recovered from each container from each rack.

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

6.3 Thermostat differential

6.3.1 Test method

To verify the thermostat differential, the water temperature shall be monitored at 5-min intervals at a location no more than ½ in (0.5 in, 13 mm) from the thermostat-sensing bulb. The thermostat shall be allowed to cycle (turn on and off) at least three times while the machine pumps are turned off. The differential shall be calculated by subtracting the average of the three low temperatures (measured when the heater is off) from the average of the three high temperatures (measured when the thermostat is on).

6.3.2 Acceptance criteria

The temperature regulator shall have a maximum differential no greater than 15 °F (8 °C).

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:

— 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 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 temp.	Minimum pumped rinse temp.	Minimum sanitizing rinse temp.	Maximum sanitizing rinse temp.
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 6, the minimum temperature specified by the manufacturer shall be included on a permanently attached data plate 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:

— 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[3].

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 6.1 and 6.2, shall have a permanently attached label that states, “This equipment is intended for the washing and sanitizing of dishes and glassware as well as pots, pans, and utensils” or equivalent.

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 6.1.3 and either 6.2.3 or 6.2.4, shall have a permanently attached label that states, “This equipment is intended for the washing and sanitizing of pots, pans, and utensils” or equivalent.

7.4 Manufacturer’s instructions

7.4.1 Commercial warewasher operating instructions or other literature provided by the manufacturer shall not recommend that detergents or sanitizers be manually added to the machine.

7.4.2 For granular warewashing machines, manufacturer’s instructions shall specify the type of granule intended for use in the machine.

8 Warewashing equipment provided with a security package

The requirements and exemptions contained in this section are for warewashing equipment specifically designated for use in environments where security is a concern, such as correctional facilities, mental health facilities, and some schools. These requirements are intended to ensure that warewashing equipment in these environments is designed and manufactured so that it may be operated, cleaned, and maintained in a sanitary manner without creating an additional security risk for the end users. Unless otherwise specified, the requirements in the other sections of this Standard shall also apply to warewashing equipment provided with a security package.

8.1 General

Warewashing equipment provided with a security package may require the removal of security fasteners and other devices in order to be inspected, serviced, maintained, or cleaned. Some components may be made non-removable to meet security requirements.

8.2 Special tools

For warewashing equipment provided with a security package, the use of special tools is acceptable for components that are required to be removable or accessible.

8.3 Fastening methods

Security fasteners may be used on warewashing equipment provided with a security package.

8.4 Drawers

Drawers and drawer pan assemblies in food equipment provided with a security package are not required to be readily removable. Drawers and drawer pan assemblies that are removable are acceptable.

8.5 Labeling

Warewashing equipment provided with a security package shall have a permanent, conspicuous label stating, “Intended for use only in environments where security is a concern.”

9 Warewashing equipment for use in marine environments

The requirements contained in this section pertain to warewashing equipment specifically designated for use aboard marine vessels. These requirements are intended to ensure that marine food equipment is designed and manufactured so that it may be operated, cleaned, and maintained in a sanitary manner under shipboard conditions. In most cases, the requirements in this section serve to modify or expand on the requirements contained in other sections of this Standard. Unless otherwise specified, the requirements in the other sections of this Standard shall also apply to marine warewashing equipment.

9.1 Materials

9.1.1 Corrosion resistance

9.1.1.1 Coatings, including metallic coatings such as zinc (galvanized), zinc alloys, and chrome plating, shall not be used to render exposed materials corrosion-resistant except on hinges, latches, and similar replaceable hardware.

9.1.1.2 Structural metal used in the fabrication of equipment, including panels, enclosures, and reinforcing and framing members, shall be AISI[11] Type 304 or Type 316 stainless steel. Type 316 stainless steel shall be used on equipment designed for outdoor (weatherdeck) use.

9.1.1.3 Fasteners shall be AISI[11] Type 304 or Type 316 stainless steel.

9.2 Design and construction

9.2.1 Reinforcing and framing members

Hollow sections of reinforcing and framing members, including vertical channels, shall be closed at each end. Seams wider than $^{1}/_{32}$ in (0.03 in, 0.8 mm) that are formed by reinforcing and framing members shall be sealed.

9.2.2 Doors

Double panel doors shall be seamless or shall have all seams sealed.

[11] American Iron and Steel Institute, 25 Massachusetts, Ave., NW, Suite 800, Washington, DC 20001 <www.aisi.org>.

This page is intentionally left blank.

Annex A
(normative)

Heat Unit Equivalent (HUE) values corresponding to temperature in degrees Fahrenheit

Temperature	HUE value		Temperature	HUE value
143.0	1.0		160.9 --	116.7
143.5 --	1.1		161.0 --	119.9
144.0 --	1.3		161.1 --	123.1
144.5 --	1.5		161.2 --	126.4
145.0 --	1.7		161.3 --	129.8
145.5 --	2.0		161.4 --	133.3
146.0 --	2.2		161.5 --	136.9
146.5 --	2.5		161.6 --	140.6
147.0 --	2.9		161.7 --	144.4
147.5 --	3.3		161.8 --	148.2
148.0 --	3.8		161.9 --	152.2
148.5 --	4.3		162.0 --	156.3
149.0 --	4.9		162.1 --	160.5
149.5 --	5.7		162.2 --	164.9
150.0 --	6.5		162.3 --	169.3
150.5 --	7.4		162.4 --	173.9
151.0 --	8.4		162.5 --	178.5
151.5 --	9.6		162.6 --	183.3
152.0 --	11.0		162.7 --	188.3
152.5 --	12.5		162.8 --	193.3
153.0 --	14.3		162.9 --	198.6
153.5 --	16.4		163.0 --	203.9
154.0 --	18.7		163.1 --	209.4
154.5 --	21.3		163.2 --	215.0
155.0 --	24.4		163.3 --	220.8
155.5 --	27.8		163.4 --	226.8
156.0 --	31.8		163.5 --	232.9
156.5 --	36.3		163.6 --	239.1
157.0 --	41.4		163.7 --	245.6
157.5 --	47.3		163.8 --	252.2
158.0 --	54.0		163.9 --	259.0
158.5 --	61.7		164.0 --	265.9
159.0 --	70.5		164.1 --	273.1
159.5 --	80.5		164.2 --	280.4
160.0 --	91.9		164.3 --	288.0
160.1 --	94.4		164.4 --	295.7
160.2 --	96.9		164.5 --	303.7
160.3 --	99.5		164.6 --	311.9
160.4 --	102.2		164.7 --	320.3
160.5 --	105.0		164.8 --	328.9
160.6 --	107.8		164.9 --	337.7
160.7 --	110.7		165.0[1]	346.8
160.8 --	113.7			

[1] The maximum number of HUE cannot exceed 346.8 for any single point.

This page is intentionally left blank.

Annex B
(normative)

Ingredients for pie filling

The pie filling shall be prepared as follows:

B.1 Use the following ingredients:

— 10 cups (2.4 L) water;
— 10 cups (2,052 g) sugar;
— 2½ cups (361 g) cornstarch; and
— 10-20 drops food coloring.

B.2 Mix water and cornstarch together in heavy stock pot. After cornstarch is thoroughly mixed in, add sugar. Stir mixture while heating to a boil. When mixture thickens to smooth, even consistency, remove from heat. Stir in food coloring as needed to aid in visual detection of soil.

This page is intentionally left blank.

Annex C[12]
(informative)

Food Equipment Joint Committee[13]

Name	Company / organization	Interest category
Northcutt, Kirk	Auto-Chlor System	Industry
Perez, Michael[1]	Baring Industries	User
Tackitt, Steve	Barry-Eaton District Health Department	Public health / regulatory
Petersen Jr., James	C.i.i. Food Service Design	User
Bortolotti, Stefano	Carpigiani	Industry
Rodriguez, Luis, M.S.	CDC Vessel Sanitation Program	Public health / regulatory
Gagliardi, Tony[1]	Consultant - Public Health/Regulatory	Public health / regulatory
Burton-Zick, Sara[1]	DuPage County Health Department	Public health / regulatory
Liggans, Girvin	Food and Drug Administration	Public health / regulatory
Hall, Jon	Glastender Inc	Industry
Scanlon, John[1]	Hatco Corp.	Industry
Hipp, Joel[1]	Hobart Corp.	Industry
Schaefer, Stephen	Hoshizaki America, Inc.	Industry
Sickles, Willard[1] P.E.,	InterMetro Industries Corp.	Industry
Coffman, Roger	Lake County Health Dept.	Public health / regulatory
Hurst, Bryan, REHS, CP-FS	Lincoln-Lancaster Co. Health Department	Public health / regulatory
Brasseur, Eric	Little Caesars Enterprises	User
Bhatt, Swati	Los Angeles County	Public health / regulatory
Negandhi, Dipak[1], P.E	Manitowoc Foodservice	Industry
Carotenuto, Anthony	Navy and Marine Corps Public Health Center	User
Dyer, Randy	Nestle	User
Kohler, Mike[1]	NSF International	User
Leonard, James MPH, LEHP	Princess Cruises	User
Johnson, Tom	Qlean Tech Enterprises	User
Samarya-Timm, Michéle	Somerset County Department of Health	Public health / regulatory
Klouse, Paul, REHS, CP-FS	Southern Nevada Health District	Public health / regulatory
Brandt, Rex[1]	Taylor Co.	Industry
Maxon, Gary	The Delfield Co.	Industry
McNeil, Thomas, RS	U.S. Army	User
Brania, Jonathan[1]	UL LLC	User
Brady, Jim[1]	Wawa, Inc.	User

Standards Development Liaison: Al Rose

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

[1]Committee or task group chair

[12] 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.

[13] Food Equipment Joint Committee members on the date of publication - subject to change 4/12/2017

This page is intentionally left blank.

Standards[14]

The following standards established and adopted by NSF as minimum voluntary consensus standards are used internationally:

2 Food equipment
3 Commercial warewashing equipment
4 Commercial cooking, rethermalization, and powered hot food holding and transport equipment
5 Water heaters, hot water supply boilers, and heat recovery equipment
6 Dispensing freezers
7 Commercial refrigerators and freezers
8 Commercial powered food preparation equipment
12 Automatic ice making equipment
13 Refuse processors and processing systems
14 Plastics piping system components and related materials
18 Manual food and beverage dispensing equipment
20 Commercial bulk milk dispensing equipment
21 Thermoplastic refuse containers
24 Plumbing system components for recreational vehicles
25 Vending machines for food and beverages
29 Detergent and chemical feeders for commercial spray-type dishwashing machines
35 High pressure decorative laminates (HPDL) for surfacing food service equipment
36 Dinnerware
37 Air curtains for entranceways in food and food service establishments
40 Residential wastewater treatment systems
41 Non-liquid saturated treatment systems
42 Drinking water treatment units – Aesthetic effects
44 Residential cation exchange water softeners
46 Evaluation of components and devices used in wastewater treatment systems
49 Biosafety cabinetry: Design, construction, performance, and field certification
50 Equipment for swimming pools, spas, hot tubs, and other recreational water facilities
51 Food equipment materials
52 Supplemental flooring
53 Drinking water treatment units – Health effects
55 Ultraviolet microbiological water treatment systems
58 Reverse osmosis drinking water treatment systems
59 Mobile food carts
60 Drinking water treatment chemicals – Health effects
61 Drinking water system components – Health effects
62 Drinking water distillation systems
140 Sustainable carpet assessment
169 Special purpose food equipment and devices
170 Glossary of food equipment terminology
173 Dietary supplements
177 Shower filtration systems – Aesthetic effects
184 Residential dishwashers
222 Ozone generators
223 Conformity assessment requirements for certification bodies that certify products pursuant to NSF/ANSI 60: Drinking water treatment chemicals – health effects
240 Drainfield trench product sizing for gravity dispersal onsite wastewater treatment and dispersal systems
245 Wastewater treatment systems - nitrogen reduction
305 Personal care products containing organic ingredients
321 Goldenseal root (Hydrasitis canadensis)
330 Glossary of drinking water treatment unit terminology
332 Sustainability assessment for resilient floor coverings
336 Sustainability assessment for commercial furnishings fabric
342 Sustainability assessment for wallcovering products
347 Sustainability assessment for single ply roofing membranes
350 Onsite residential and commercial water reuse treatment systems
350-1 Onsite residential and commercial greywater treatment systems for subsurface discharge
355 Greener chemicals and processes information
358-1 Polyethylene pipe and fittings for water-based ground-source “geothermal” heat pump systems
358-2 Polypropylene pipe and fittings for water-based ground-source “geothermal” heat pump systems
359 Valves for crosslinked polyethylene (PEX) water distribution tubing systems
360 Wastewater treatment systems – Field performance verification
363 Good Manufacturing Practices (GMP) for Pharmaceutical Excipients
372 Drinking water treatment system components – Lead content
401 Drinking water treatment units - Emerging compounds / incidental contaminants
416 Sustainability Assessment for Water Treatment Chemical Products
418 Residential wastewater effluent filters longevity testing
419 Public Drinking Water Equipment Performance – Filtration
14159-1 Hygiene requirements for the design of meat and poultry processing equipment
14159-2 Hygiene requirements for the design of hand held tools used in meat and poultry processing equipment
14159-3 Hygiene requirements for the design of mechanical belt conveyors used in meat and poultry processing equipment

[14] The information contained in this Standards page 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 Standards page 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.

SPES HOMINUM

***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.*

Attachment A

ASSE Standard #1001-2017

ASSE Board Approved: November 2016
ANSI Approved: April 2017

ICS Codes: 23 060 99
91 140 60

ASSE International

Performance Requirements for

Atmospheric Type Vacuum Breakers

An American National Standard

General Information

Neither this standard, nor any portion thereof, may be reproduced without the written consent of ASSE International.

No product may be said to be listed by ASSE unless the manufacturer has applied to ASSE International, had its product tested by an official ASSE recognized independent laboratory according to the applicable standard, passed the tests, and had its documentation reviewed and approved by the consensus ASSE Seal Control Board. Having completed the aforementioned, the manufacturer may display the ASSE Seal on the product.

Instructions for receiving the authorization to display the seal are available from the ASSE International office. Organizations wishing to adopt or list any ASSE standard should print the ASSE standard number on the cover page first in equal or larger type to that of the adopting or listing organization.

ASSE International
Mokena, Illinois
Copyright © 2017, 2008, 2002, 1993, 1990, 1988, 1980, 1970, 1962
All rights reserved.

Foreword

This foreword shall not be considered a part of the standard; however, it is offered to provide background information.

ASSE standards are developed in the interest of consumer safety. ASSE considers product performance standards to be of great value in the development of improved plumbing systems.

To accomplish this, ASSE, through its Product Standards Committee, encourages manufacturers to assist in the development of performance and testing procedures. Realizing the need for a uniform standard that manufacturers and laboratory personnel could use in testing and evaluating the performance of anti-siphon vacuum breakers installed in potable water supply systems, ASSE formed a committee to develop such a standard in 1958. The committee consisted of directors and personnel of plumbing testing laboratories in Chicago, Detroit and Los Angeles, as well as a representative of the Bureau of Water Register of the New York City Department of Water Supply. Through the Product Standards Committee, with the cooperation of interested manufacturers, a standard was developed – Performance Requirements and Test Methods for Atmospheric Type, Anti-Siphon Devices.

At the 1962 ASSE Annual Meeting in Little Rock, Ark., the work of the committee culminated in the acceptance of the standard, which was assigned the official number ASSE 1001.

This 2017 revision of the standard has added performance criteria specific to vacuum breakers intended specifically for flushometer applications and for those intended to be integral to other plumbing devices. In those cases, flushometers and integral-type devices shall have standards associated with their function covering certain sections in ASSE 1001, e.g. ASSE 1037/ASME A112.19.1037/CSA B125.37-2015 covers flushometers, ASME A112.18.1/CSA B125.1 covers plumbing supply fittings, and ASME A112.4.2/CSA B45.16 covers personal hygiene devices.

The working group that developed this standard revision was set up within the framework of the ASSE International Product Standards Committee. Recognition is made of the time volunteered by members of this working group and of the support of manufacturers, who also participated in the meetings for this standard.

This standard does not imply ASSE's endorsement of a product that conforms to these requirements.

Compliance with this standard does not imply acceptance by any code body.

It is recommended that these devices be installed consistent with local codes by qualified and trained professionals.

This standard was promulgated in accordance with procedures developed by the American National Standards Institute (ANSI).

ASSE Vacuum Breaker Standards

ASSE Standard Number	Standard Name	Typical Use	Highlights
1001	Atmospheric Type Vacuum Breakers	• Faucet with hose thread spout • Water closet fill valve	Prevents Backsiphonage: • Outlet is open to atmosphere • Not subjected to backpressure • Not be subjected to more than twelve (12) hours of continuous water pressure
1011	Hose Connection Vacuum Breakers	• Hose connections, such as hose bib, wall hydrant, yard hydrant	• Prevents backflow by use of a SINGLE CHECK valve • Prevents backsiphonage by use of AIR PORTS • Prevents backpressure by use of check valve and relief of backpressure through air ports. i.e. relieves pressure in the hose. • Non-removable and non-testable
1020	Pressure Vacuum Breakers	• Irrigation systems • Industrial processes	Prevents Backsiphonage: • Uses a SINGLE CHECK • Not subjected to backpressure • Can be subjected to continuous water pressure in excess of twelve (12) hours
1052	Hose Connection Backflow Preventers	• Hose connections, such as hose bib, wall hydrant, yard hydrant	Same as a 1011 device except there are two check valves. One check valve holds the pressure in the hose. The Intermediate chamber between check vales becomes atmospheric. Device is non-removable but is testable.
1056	Spill Resistant Vacuum Breakers	• Indoor plumbing assemblies • Medical equipment	Same as 1020 but does not spill water when pressurized.

Standard No.	Dual Check	Air Ports	Backflow	Backsiphonage	Backpressure	Frost Free	Removable	Testable	High Hazard
1001	N	Y	N	Y	N	N	Y	N	Y
1011	N	Y	Y	Y	Y	N	N	N	Y
1020	N	Y	N	Y	N	N	Y	Y	Y
1052	Y	Y	Y	Y	Y	N	N	Y	Y
1056	N	Y	N	Y	N	N	Y	Y	Y

2017 Product Standards Committee

Edward J. Lyczko, Chairperson
Cleveland Clinic – Retiree
Cleveland, OH

William Briggs, Jr.
MGJ Associates
New York, NY

Terry Burger
NSF International
Ypsilanti, MI

William Chapin
Professional Code Consulting, LLC
Cullman, AL

Mark Fish
Zurn Industries, LLC
Cary, NC

Ron George
Plumb-Tech Design & Consulting Services, LLC
Newport, MI

Daniel Gleiberman
Sloan
Los Angeles, CA

John F. Higdon, P.E.
Apollo Valves / Conbraco Industries, Inc.
Matthews, NC

Gary Howard
Illinois Plumbing Inspector – Retiree
LaGrange, IL

Conrad L. Jahrling (non-voting)
ASSE International
Chicago, IL

Chuck Lott
Precision Plumbing Products
Portland, OR

Peter Marzec
United Association of Plumbers and Pipefitters
Pearl River, NY

Thomas Pitcherello
State of New Jersey
Bordentown, NJ

Daniel Rademacher
Plumbing Code and Design Consulting
Butte, MT

Shabbir Rawalpindiwala
Kohler Company
Kohler, WI

Billy Smith
American Society of Plumbing Engineers (ASPE)
Montgomery, AL

Tsan-Liang Su, PhD
Stevens Institute of Technology
Hoboken, NJ

Vacuum Breaker Working Group

William Chapin, Chairperson
Professional Code Consulting, LLC
Cullman, AL

Mike Boehk
Legend Valve
Shelby Township, MI

Matt Brizzee
Conbraco Industries, Inc.
Matthews, NC

Robert Burnham
Zurn Industries
Erie, PA

Fernando Fernandez
TOTO
Ontario, CA

Daniel Gleiberman
Sloan
Los Angeles, CA

Larry Himmelblau
Chicago Faucet Co.
Lisle, IL

Joel Hipp
Hobart - ITW
Troy, OH

Herb Hoeptner
Hoeptner Preferred Products
Gilroy, CA

Conrad L. Jahrling (non-voting)
ASSE International
Chicago, IL

Jerry McDanal
J.R. Smith
Montgomery, AL

Brad Noll
Zurn Industries
Paso Robles, CA

Shabbir Rawalpindiwala
Kohler Company
Kohler, WI

Table of Contents

Section I **1**
1.0 General 1
1.1 Application 1
1.2 Scope 1
1.3 Limitations on Design 2
1.3 Referenced Standards 2

Section II **3**
2.0 Test Specimens 3
2.1 Samples Submitted for Test 3
2.2 Samples Tested 3
2.3 Drawings 3
2.4 Rejection 3

Section III **4**
3.0 Performance Requirements and Compliance Testing 4
3.1 Deterioration at Extremes of Manufacturer's Temperature and Pressure Range Test 4
Figure 1 5
Table 1 5
3.2 Allowable Pressure Loss at Rated Flow Test 6
Table 2 6
3.3 Examination of Air Inlet Shield 6
3.4 Air Flow Test 7
Figure 2 7
Figure 3A 8
Figure 3B 8
3.5 Backsiphonage Test 8
Table 3 9
Figure 4 9
Figure 5 9
Figure 6 9
Figure 7 10
3.6 Evaluation of Female Threaded Connections 11
3.7 Hydrostatic Test of the Complete Device 11

Section IV **12**
4.0 Detailed Requirements 12
4.1 Materials 12
4.2 Pipe Threads 12
4.3 Markings 12
4.4 Installation and Maintenance Instructions 13

Section V **14**
5.0 Definitions 14

Performance Requirements for Atmospheric Type Vacuum Breakers

Section I

1.0 General

1.1 Application

This standard applies to atmospheric type vacuum breakers (herein referred to as the "device") that are single pipe-applied, flushometer-applied, or integrally-applied (does not apply to water closet tank ballcocks or similar devices that depend on float-operated valves to control flow). The purpose of these devices is to provide protection of the potable water supply against pollutants or contaminants that enter the system due to backsiphonage through the outlet. Under backsiphonage conditions, a small amount of water is permitted to exit through the air ports.

The device shall:
1) Have its outlet open to atmosphere;
2) Not be subjected to backpressure;
3) Not be subjected to more than twelve (12) hours of continuous water pressure; and
4) Be installed with its critical level (CL) not less than 6.0 inches (152.4 mm) above the flood level rim of the fixture or appliances served; or deck mounted/equipment mounted atmospheric vacuum breakers shall be installed in accordance with the manufacturer's instructions, with its critical level (CL) not less than 1.0 inch (25.4 mm) above the flood level rim of the fixture or appliance served.

1.2 Scope

1.2.1 Description

Vacuum breakers shall be classified in two general types:
- Atmospheric type, as described herein
- Pressure type (See ASSE Standard 1020, *Performance Requirements for Pressure Vacuum Breaker Assembly*, and ASSE Standard 1056, *Spill Resistant Vacuum Breakers*)

The atmospheric type design shall consist of:
a) A check valve member
b) An air inlet valve that is closed when the check valve member is open, and normally open when the check valve member is normally closed.

The atmospheric type design can be further classified into three categories, depending on use:
1) Pipe-applied
2) Flushometer-applied
3) Integrally-applied

Devices shall include an air inlet shield.

1.2.2 Sizes

Pipe-applied vacuum breaker assembly inlet and outlet pipe sizes shall range from ⅛ NPT to 4 NPT (3 mm to 100 mm). Flushometer-applied and integrally-applied vacuum breaker assemblies' inlet and outlet sizes are determined based on the smallest fitting they are designed to be installed to.

1.2.3 Working Pressure

Devices shall be designed to operate within a working pressure of 8.0 psi (55 kPa) to a minimum of 125.0 psi (861.9 kPa).

1.2.4 Temperature Range

a) Devices limited to cold water service shall operate within a range from 33 °F +2.0 °F, –0 °F to 110 °F +0 °F, –2.0 °F (0.56 °C +1.1 °C, –0 °C to 43.3 °C +0 °C, –1.1 °C).
b) Devices intended for hot or cold water service shall operate within a range from 33 °F +2.0 °F, –0 °F to 180.0 °F +0 °F, –2.0 °F (0.56 °C +1.1 °C, –0 °C to 82.2 °C +0 °C, –1.1 °C) or to the manufacturer's specifications, whichever is greater.

1.3 Limitation on Design

1.3.1 Threaded Connections for Pipe-Applied Devices

Female pipe threaded connections shall be so constructed to prevent pipe penetrations from restricting flow through the devices or interfering with working parts.

1.4 Referenced Standards

References to industry standards shall mean to the stated editions of the standards.

- ASME B1.20.1-2013, *Pipe Threads, General Purpose, Inch*
- ASME B1.20.3–1976, *Dryseal Pipe Threads, Inch*
- ASSE 1037-2015 / ASME A112.1037-2015 / CSA B125.37-15, *Performance Requirements for Pressurized Flushing Devices*
- ISA 75.02.01 (rev. 08), *Control Valve Capacity Test Procedures*
- ISO 1219-1:2012, *Fluid power systems and components – Graphical symbols and circuit diagrams – Part 1: Graphical symbols for conventional use and data-processing applications*

Section II

2.0 Test Specimens

2.1 Samples Submitted for Test

Three (3) devices of each size and model shall be submitted by the manufacturer.

2.2 Samples Tested

The testing agency shall select one (1) of each size and model for full test. Tests shall be performed in the order listed on one (1) device.

2.3 Drawings

Assembly drawings, installation drawings, and other data that is needed to enable a testing agency to determine compliance with this standard shall accompany devices submitted for examination and performance tests.

2.4 Rejection

Failure of one (1) device shall result in a rejection of that size and model.

Section III

3.0 Performance Requirements and Compliance Testing

3.1 Deterioration at Extremes of Manufacturer's Temperature and Pressure Range Test

3.1.1 Purpose

The purpose of this test is to ensure the device continues to function after exposure to manufacturer's extremes of temperature and pressure for pipe-applied and flushometer-applied devices.

3.1.2 Procedure

Cold water devices shall be tested at 110 °F +0 °F, –2.0 °F (43.3 °C +0 °C, –1.1 °C) or the manufacturer's maximum rated temperature, whichever is greater; and at 33 °F +2.0 °F, –0 °F (0.56 °C +1.1 °C, –0 °C). Hot water devices shall be tested at 180 °F +0 °F, –2.0 °F (82.2 °C +0 °C, –1.1 °C) or the manufacturer's maximum rated temperature, whichever is greater; and at 33 °F +2.0 °F, –0 °F (0.56 °C +1.1 °C, –0 °C).

Install the device per Figure 1 with a pump capable of circulating water at the flow rates listed in Table 1 through the test setup. This test shall be performed at the manufacturer's maximum rated pressure for both cold and hot water devices. For cold water devices, water at a temperature of 110 °F +0 °F, –2.0 °F (43.3 °C +0 °C, –1.1 °C) or the manufacturer's maximum rated temperature, whichever is greater, shall be circulated through the device for eight (8) hours per day for a total of ten (10) days (total of eighty (80) hours). For hot water devices, water at a temperature of 180 °F +0 °F, –2.0 °F (82.2 °C +0 °C, –1.1 °C) or the manufacturer's maximum rated temperature, whichever is greater, shall be circulated through the device for eight (8) hours per day for a total of ten (10) days (total of eighty (80) hours). After each eight (8) hour test period, verify that the air inlet valve returns to its fully opened position when the system pressure is reduced to atmosphere.

Within one (1) minute of the conclusion of the final eight (8) hour test period, water maintained at 33 °F +2.0 °F, –0 °F (0.56 °C +1.1 °C, –0 °C) shall be circulated through the device for at least one (1) hour.

Next, water at ambient temperature shall be allowed to flow freely through the device. Close valve #2 and allow the water pressure in the test assembly to rise to 250.0 psi (1724 kPa) or two (2) times the manufacturer's maximum rated working pressure, whichever is greater. This pressure shall be maintained for five (5) minutes, during which time the device shall be examined for evidence of any leaks or structural deformation.

Figure 1

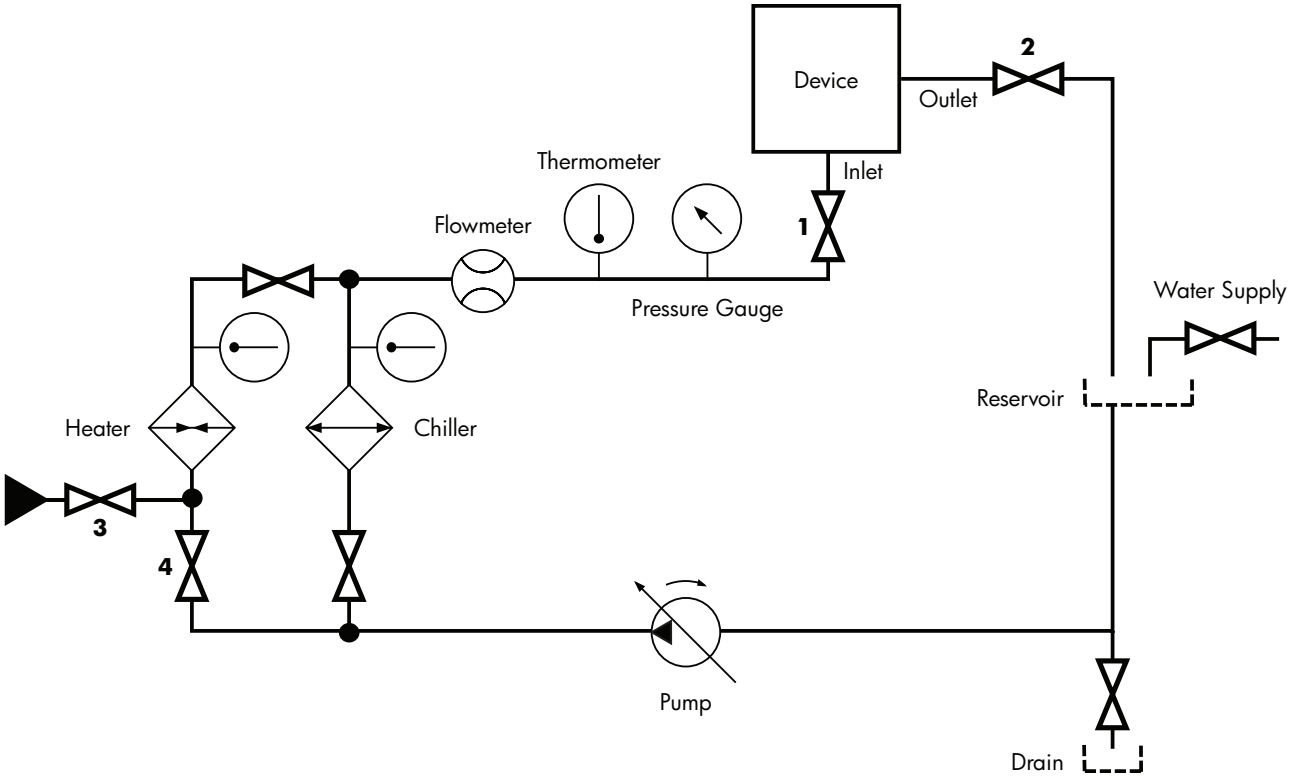


Table 1
Required Rate of Water Flow for Test Apparatus

Device Size		Required Rate of Water Flow	
NPT	DN (mm)	GPM	(L/s)
⅛	(3)	1.1	(0.070)
¼	(6)	1.1	(0.070)
⅜	(10)	2.3	(0.14)
½	(15)	3.6	(0.23)
¾	(20)	12.1	(0.763)
1	(25)	20.6	(1.30)
1 ¼	(32)	31.3	(1.96)
1 ½	(40)	44.4	(2.80)
2	(50)	77.0	(4.85)
2 ½	(65)	119.0	(7.507)
3	(75)	170.0	(10.72)
4	(100)	299.0	(18.86)

3.1.3 Criteria
Any leaks shall result in a rejection of the device.

3.2 Allowable Pressure Loss at Rated Flow Test

3.2.1 Purpose

The purpose of this test is to determine if the required water flow shown in Table 2 is obtained at or below the maximum allowable pressure loss of 10.0 psi (68.9 kPa).

Table 2
Required Rate of Water Flow

Device Size		Minimum Water Flow	
NPT	DN (mm)	GPM	(L/s)
⅛	(3)	1.5	(0.095)
¼	(6)	3.0	(0.18)
⅜	(10)	6.0	(0.38)
½	(15)	10.0	(0.632)
¾	(20)	17.0	(1.07)
1	(25)	27.0	(1.70)
1 ¼	(32)	45.0	(2.83)
1 ½	(40)	65.0	(4.10)
2	(50)	100.0	(6.308)
2 ½	(65)	150.0	(9.463)
3	(75)	250.0	(15.77)
4	(100)	400.0	(25.23)

3.2.2 Procedure

The test system shall be equipped with means of measuring the rate of flow through the device and indicating or recording pressures. Piezometers, if used, shall be installed in accordance with ISA 75.02. The supply system shall be capable of supplying a volume of cold water adequate to meet the flow requirements of the device on test while sustaining a steady inlet pressure of not less than 25.0 psi (172 kPa). See Table 2.

With the device installed per Figure 1, purge the air from the system and then close valve #2. Open valve #1 fully and gradually open valve #2 until the minimum required rate of flow is reached. Record the pressure drop.

3.2.3 Criteria

a) Pressure loss across the device greater than 10.0 psi (68.9 kPa) at flows stated in Table 2 shall result in a rejection of the device.
b) If the inner diameter of the smallest connection size is not listed in Table 2, perform a linear interpolation between the two nearest listed sizes to find the required minimum water flow. The criteria per 3.2.3.a shall apply.

3.3 Examination of Air Inlet Shield

3.3.1 Purpose

The purpose of this test is to ascertain compliance of the air inlet shield for pipe-applied and flushometer-applied devices. Integrally-applied devices shall be within the overall enclosure of the assembly with sufficient ventilation to pass Section 3.4.

3.3.2 Procedure

The air inlet shield shall be examined when the device is installed in the intended mounting position to determine if it extends down to the bottom of the lowest air inlet opening. Clearances between the shield and the body of the device shall be measured to determine if an unobstructed 3/16 inch (4.8 mm) air passageway is maintained between the inner lower edge of the shield and the lowest surface plane of the air ports.

3.3.3 Criteria

Failure of the air inlet shield to extend down to the bottom of the lowest air inlet opening, or failure to maintain a minimum distance of 3/16 inch (4.8 mm) between the shield and body of the device shall result in a rejection of the device.

3.4 Air Flow Test

3.4.1 Purpose

The purpose of this test is to ascertain the effective throughway area of the device in relation to the effective throughway area of the air inlet valve from the water inlet to the outlet.

3.4.2 Procedure

3.4.2.1 Install the device per Figure 2 in the normal operating position with the check or moving member of the device at the water inlet held fully open and the air inlet valve held closed. Connect the outlet of the device by means of a 12.0 inch (305 mm) length of piping of uniform inside diameter to a quick opening valve of the same size or larger, and then by means of a second 12.0 inch (305 mm) length of reamed corresponding sized piping to a vacuum tank. The vacuum tank shall be capable of providing at least a ten (10) seconds air flow (see Figure 3A or 3B). Dissipate the vacuum in the tank from 25 to 5.0 inches of mercury (85 to 17 kPa) through the check valve orifice by operating a quick opening valve (fully open in less than one (1) second). Record the amount of time needed to dissipate the vacuum.

Figure 2

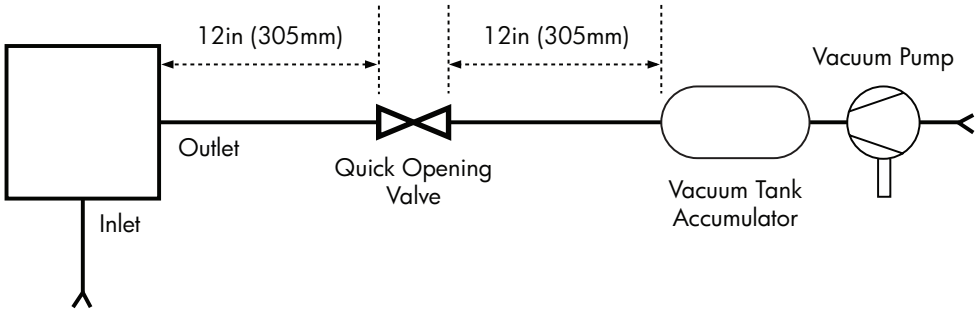


Figure 3A

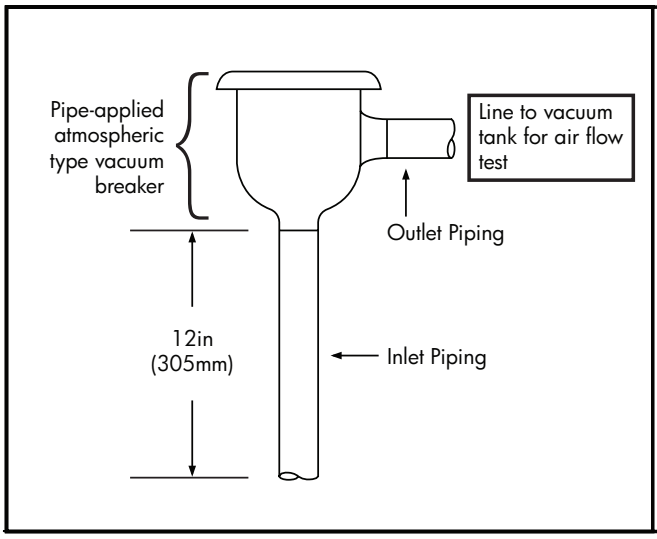
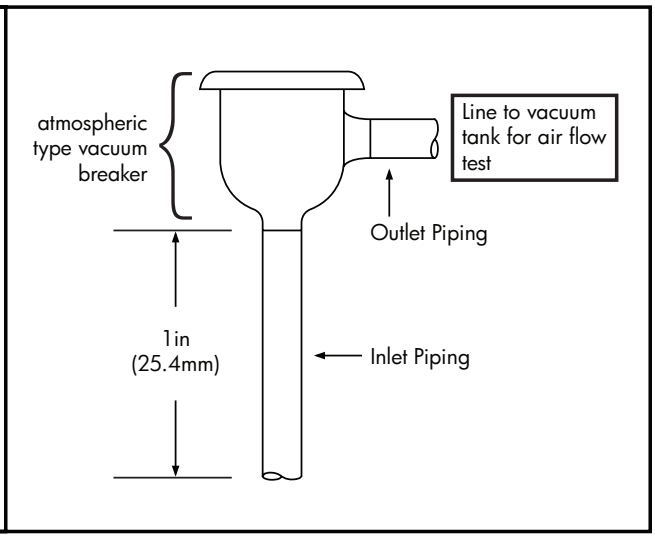


Figure 3B
Pipe-applied, Deck Mounted Devices Only



3.4.2.2 With the outlet still connected to the vacuum tank and the water inlet check held in a closed position, hold the air inlet valve open and dissipate the vacuum in the tank from 25 to 5.0 inches of mercury (85 to 17 kPa) in the same manner through the air port or ports, timing the operation.

3.4.3 Criteria
The time for Section 3.4.2.2 shall be equal to or less than Section 3.4.2.1 based on the average result of not less than three (3) test runs. Failure to meet this requirement shall result in a rejection of the device.

3.5 Backsiphonage Test

3.5.1 Purpose
The purpose of this test is to determine that when the device is subjected to a backsiphonage condition together with a fouled check valve, water shall not be allowed back into the inlet of the device.

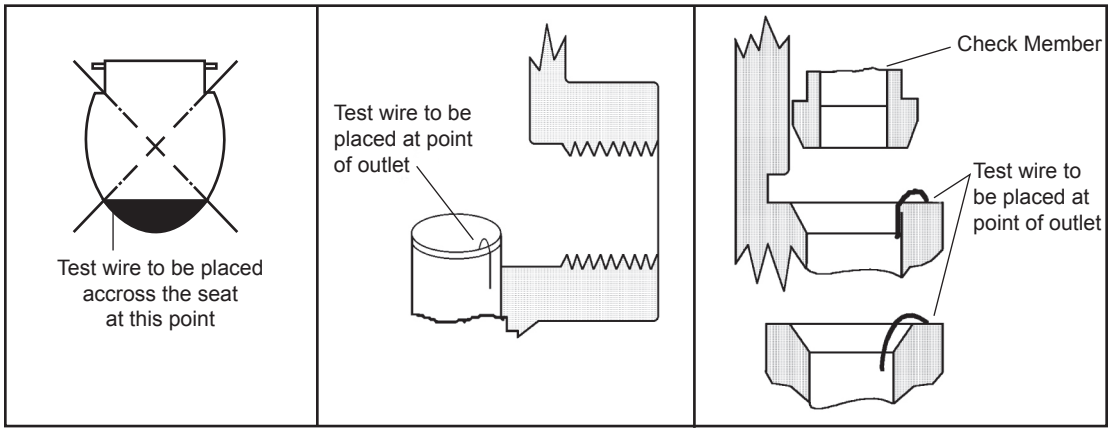
3.5.2 Procedure
Foul the check(s) or moving member(s) of the device and assembly to which the device may be coupled, by applying a wire to the seat(s). Wire sizes shall be, at a minimum, the size indicated in Table 3. Test wires shall be shaped or formed to fit the contour of the seat or tube. The shaped test wires shall be in conformance with Table 3.

Table 3
Wire Size for Fouling Check Member

Vacuum Breaker Size		Test Wire Diameter Size	
NPS (inch)	DN (mm)	inches	(mm)
⅛	(6)	0.032 - 0.034	(0.81 - 0.86)
¼	(8)	0.032 - 0.034	(0.81 - 0.86)
⅜	(10)	0.032 - 0.034	(0.81 - 0.86)
½	(15)	0.032 - 0.034	(0.81 - 0.86)
¾	(20)	0.040 - 0.042	(1.02 - 1.07)
1	(25)	0.048 - 0.050	(1.22 - 1.27)
1 ¼	(32)	0.056 - 0.059	(1.42 - 1.50)
1 ½	(40)	0.060 - 0.063	(1.52 - 1.60)
2	(50)	0.080 - 0.084	(2.03 - 2.13)
2 ½	(65)	0.096 - 0.110	(2.44 - 2.79)
3	(80)	0.112 - 0.128	(2.84 - 3.25)
4	(100)	0.144 - 0.151	(3.66 - 3.84)

This wire shall be placed in the lower quadrant of a suspended check(s) opposite the hinge(s) or point(s) of suspension. (See Figure 4 of this standard.) When testing a device in which the check member(s) is (are) not hinged, but moves vertically, the wire shall be placed in a single point of suspension of the seating area, on center line of the direction of the outlet port, as illustrated in Figures 5 and 6.

Figure 4 **Figure 5** **Figure 6**



The device shall be installed in its normal position. The check(s) member(s) shall be fouled with the proper size wire in the proper position or by defacement depending on the type of check member(s) and the inlet of the device connected to a vacuum line (see Figure 7).

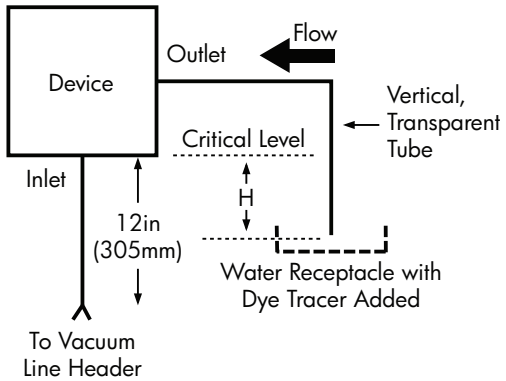
Inlet and outlet locations may vary, relative to Figure 7. Vacuum is at the inlet of the device. Dimension H shall be 1 inch for deck mounted and equipment mounted devices, and 6 inches for all other devices measured from the critical level of the device to the fluid level in the receptacle. The critical level shall be either the critical level mark, if present, or the bottom of the device. The vertical tube rising from the receptacle shall be transparent, ¾ inch to 1 inch (19.0mm to 25.4mm) in diameter, and having graduations of 1/16 inch (1.6mm). Alternatively to the graduations, a 6-inch (15.2cm) ruler may be fastened to the tube.

Vacuum tank capacity shall be adequate to provide at least a ten (10) second flow through the device during the air flow test.

A transparent sight tube shall be connected to the outlet of the device and the lower end of such tube submerged in water to within 6.0 inches (152.4 mm) of the CL point as marked on the device or the bottom of the device if the CL line is not marked on the device. For deck-mounted/equipment-mounted devices, a transparent "sight" tube shall be connected to the outlet of the device and the lower end of such tube submerged in water to within 1.0 inch (25.4 mm) of the bottom or CL point of the device.

Note: Fouling wires shall be permitted to cause leakage.

Figure 7



3.4.2.1 The following tests, a, b, and c, shall be repeated to obtain five (5) successive measurements under each set of conditions:

a) Instantly apply a constant vacuum of 25 inches of mercury (85 kPa) for a period of thirty (30) seconds.
b) Instantly apply intermittent vacuums of 2, 5, 10, 15, and 25 inches of mercury (7, 17, 34, 51, and 85 kPa). Each application shall be for five (5) seconds on and five (5) seconds off.
c) Slowly apply a vacuum increasing in increments of 3.4 inches of mercury (12 kPa) from 0 to 25 inches of mercury (0 to 85 kPa). Then slowly decrease the vacuum in increments of 3.4 inches of mercury (12 kPa) from 25 to 0 inches of mercury (85 kPa to 0 kPa).

In tests "a" through "c", vacuum levels are sea level values; at high altitudes, corrections shall be made so as to produce the same vacuum in terms of fractional parts of an atmosphere at the higher altitudes.

Observe the elevation to which the water surface rises in the transparent tube beneath the vacuum breaker in each test described in Section 3.5.2.1.

3.5.3 Criteria

a) Except for deck/equipment-mounted devices, a water rise in excess of 3.0 inches (76 mm) in any one of the observations shall result in a rejection of the device.
b) For deck/equipment-mounted devices, a water rise in excess of 1/2 inch (12.7 mm) in any one of the observations shall result in a rejection of the device.

3.6 Evaluation of Female Threaded Connections

3.6.1 Purpose

The purpose of this test is to determine that female pipe threaded connections are constructed to prevent pipe penetrations from restricting flow through the device or interfering with working parts.

3.6.2 Procedure

Teflon tape shall be applied to the threads of an iron pipe nipple. The nipple shall be hand-tightened into the device, then tightened another ½ turn. The device shall be examined for interference with working parts or restriction of flow passages.

3.6.3 Criteria

Any evidence of interference with working components or restriction of flow shall result in a rejection of the device.

3.7 Hydrostatic Test of the Complete Device

3.7.1 Purpose

The purpose of this test is to ascertain whether leaks or damage occurs when the device is subjected to 250.0 psi (1724 kPa) or two (2) times the manufacturer's rated working pressure, whichever is greater.

3.7.2 Procedure

Fill the device with water ensuring that all air has been purged from the device. Pressurize the device to 250.0 psi (1724 kPa) or two (2) times the manufacturer's maximum rated working pressure, whichever is greater. This pressure shall be maintained for five (5) minutes during which time the device shall be examined for evidence of any leaks.

For deck-mounted and integrally-applied types, allow for an open hydraulic path from the inlet of the assembly to which it is applied, up to the outlet of the device. Seal all vents to atmosphere except the air inlet of the device. Apply pressure to the water inlet and outlet of the assembly.

3.7.3 Criteria

Any leaks shall result in a rejection of the device.

Section IV

4.0 Detailed Requirements

4.1 Materials

4.1.1 Metal to Metal Seating

Metal to metal seating of relief means venting to atmosphere shall not be acceptable. Either seat, valve disc or both shall be of non-metallic materials.

4.2 Pipe Threads

4.2.1 Taper Threads

Taper pipe threads, except dryseal, shall be in compliance with standard ANSI/ASME B1.20.1.

4.2.2 Dryseal Pipe Threads

Dryseal pipe threads shall comply with standard ANSI B1.20.3.

4.2.3 Other Connections

Other types of connections shall conform to appropriate standards.

4.3 Markings

The markings shall be either cast, etched, stamped or engraved on the body of the device, or on a corrosion and water resistant label securely attached to the device with a corrosion resistant material.

4.3.1 Marking of Pipe-applied Devices

Pipe-applied devices shall have the following information marked where it is visible after the device has been installed:

a) Manufacturer's name or trademark
b) Model number of the device
c) Rated working pressure
d) Nominal valve size
e) The direction of water flow through the device
f) Critical level – optional for all devices, except for devices that are incorporated in an outlet tube furnished by the manufacturer
g) "Deck Mounted" when tested as deck and equipment mounted per Section 3.5

4.3.2 Marking of Integrally-applied and Flushometer-applied Devices

All other devices subject to the requirements of this standard shall have the following information marked where it is visible after the device has been installed:

a) Manufacturer’s name or trademark
b) Model number of the device
c) Critical level – optional for all devices except for devices that are incorporated in an outlet tube furnished by the manufacturer
d) “Deck Mounted” when tested as deck and equipment mounted per Section 3.5

Integrally-applied devices may contain the markings on the fitting it is installed into.

4.4 Installation and Maintenance Instructions

4.4.1 Included Items

Installation instructions shall be provided in addition to drawings or schematic sketches that provide for the proper installation of the device. The instructions shall describe or show by drawings the correct installed position.

Installation instructions shall include statements as follows:

a) The device shall be installed in accordance with the requirements of the local plumbing code.
b) The device shall not be installed where the venting of water from the device during its normal functioning causes damage.
c) The device shall be installed such that it is not subjected to backpressure.
d) The following statement shall be included in the installation instructions: "This atmospheric vacuum breaker shall not be subjected to continuous pressure for more than twelve (12) hours."

4.4.2 Section 4.4.1 shall not apply to integrally-applied devices.

4.4.3 Critical Level

In the absence of a critical level (CL) mark on a device that is a separate device, deck mounted device, or equipment-mounted device, the extreme bottom of the body casting shall be considered the critical level of the device for testing and installation purposes. Where the device is incorporated in an outlet tube (e.g. from a flushometer) furnished by the manufacturer, the extreme bottom of the internal unit shall be noted on the outside of the tube by a CL line, for use in determining its installed position.

4.4.4 Repair

All devices capable of being maintained or repaired in the field shall be provided with complete detailed instructions.

Section V

5.0 Definitions

Definitions not found in this section are located in the Plumbing Dictionary (Sixth Edition) published by ASSE International.

Deck-mounted/Equipment-mounted
An atmospheric vacuum breaker that allows a maximum water rise of 1/2 inch (12.7 mm) in its discharge piping when the inlet of the device is subjected to a vacuum of less than or equal to 25 inches (85 kPa) of mercury.

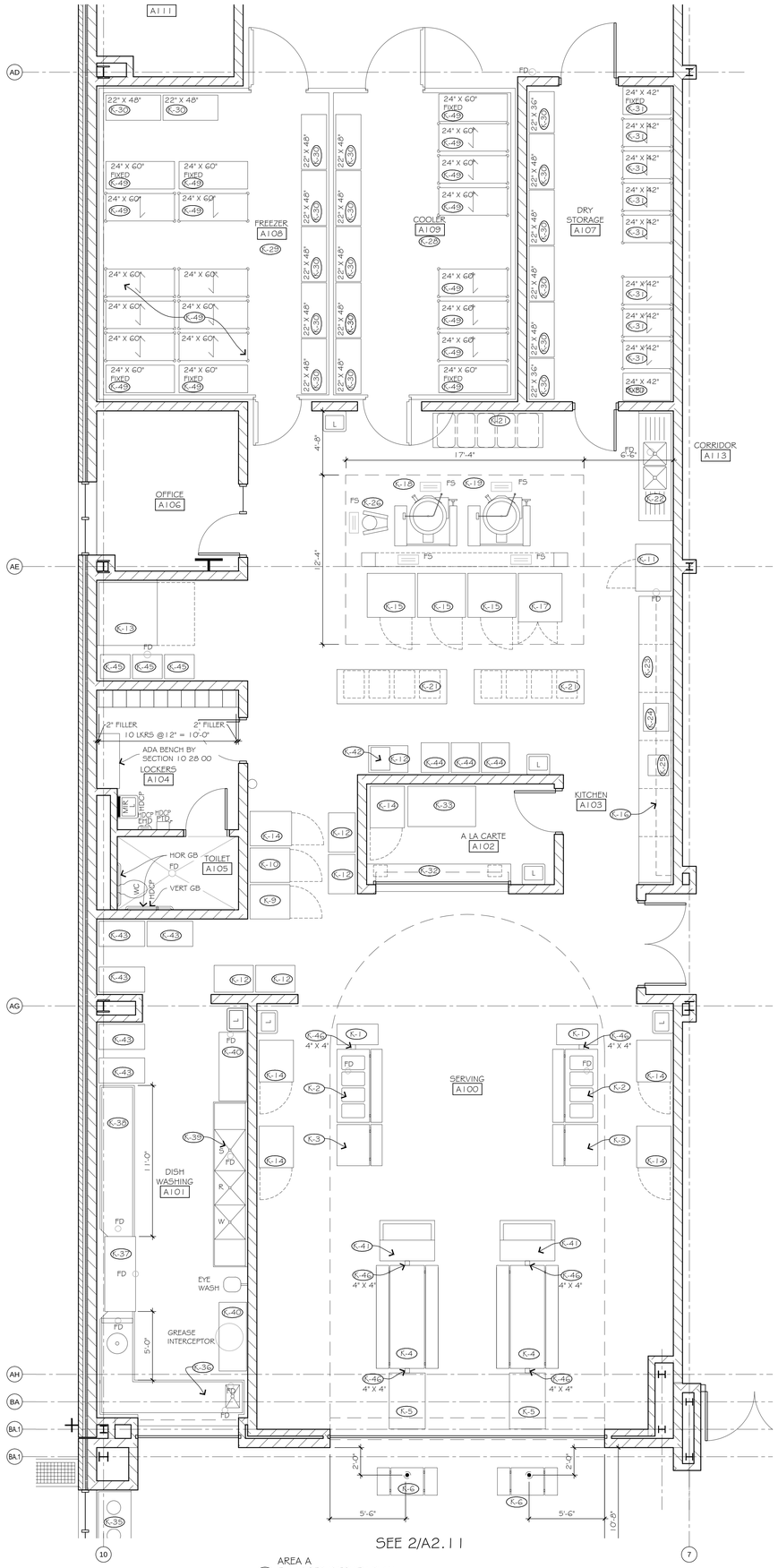
Flushometer-applied Vacuum Breaker
The inlet of this vacuum breaker is coupled to the outlet of a flushometer as defined by ASSE 1037 / ASME A112.1037 / CSA B125.37 and the outlet is normally coupled to a fixture.

Integrally-applied Vacuum Breaker
This vacuum breaker is installed within a fixture or fitting and is installed by the manufacturer as a sub-assembly. These devices are not normally serviced by a plumber.

Pipe-applied Vacuum Breaker
This vacuum breaker is coupled to a pipe at its inlet and outlet. The standard design is comprised of an inlet at its base and an outlet 90-degrees from the inlet at the vacuum breaker's side wall.

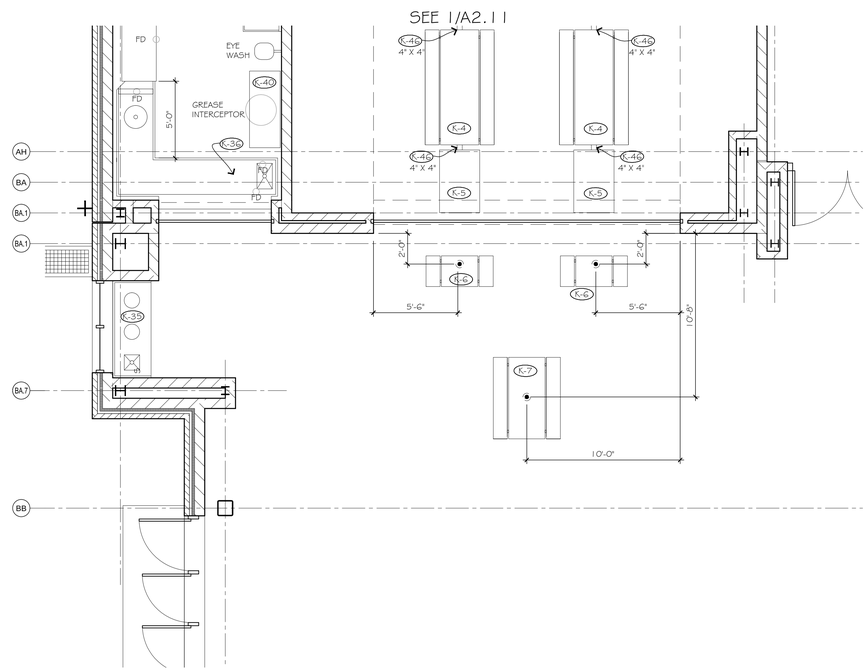
ASSE International Chapter of IAPMO, LLC

18927 Hickory Creek Drive, Suite 220 • Mokena, Illinois 60448
Phone: 708.995.3019 • Fax: 708.479.6139 • http://www.asse-plumbing.org

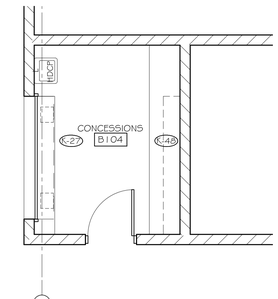


AREA A
ENLARGED KITCHEN PLAN
SCALE: 1/4" = 1'-0"

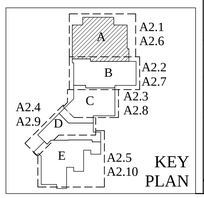
KITCHEN EQUIPMENT SCHEDULE	
NUMBER	DESCRIPTION
K-1	MOBILE TRAY AND SILVER CART
K-2	MOBILE HOT WELL SERVING CART
K-3	MOBILE UTILITY SERVING CART- SINGLE SIDED
K-4	MOBILE REFRIGERATED SALAD BAR CART
K-5	MOBILE MILK COOLER
K-6	MOBILE CASHIER CART
K-7	MOBILE CONDIMENT CART
K-8	OMIT THIS ITEM
K-9	REACH-IN FREEZER
K-10	REACH-IN REFRIGERATOR
K-11	BLAST CHILLER
K-12	MOBILE UTILITY CART
K-13	ROTATING RACK OVEN
K-14	PROOFING AND HOLDING CABINET
K-15	COMBINATION OVEN/STEAMER
K-16	STAINLESS STEEL WALL CABINETS
K-17	DOUBLE STACKED CONVECTION OVENS
K-18	STEAM JACKETED KETTLE
K-19	STEAM JACKETED KETTLE
K-20	OMIT THIS ITEM
K-21	WORK TABLE
K-22	VEGETABLE SINK WITH DISPOSER
K-23	PREP COUNTER WITH BASE CABINETS
K-24	VEGETABLE PROCESSOR
K-25	PORTABLE MIXER
K-26	MIXER
K-27	CONCESSION COUNTER
K-28	WALK-IN COOLER
K-29	WALK-IN FREEZER
K-30	DUNNAGE RACKS
K-31	HIGH DENSITY DRY FOODS SHELVING
K-32	SERVICE COUNTER
K-33	MERCHANDISER
K-34	OMIT THIS ITEM
K-35	RECYCLING COUNTER
K-36	SOILED DISH TABLE
K-37	DISHWASHER
K-38	CLEAN DISH TABLE
K-39	THREE COMPARTMENT SINK
K-40	MOBILE POT CART
K-41	MERCHANDISER
K-42	MICROWAVE OVEN
K-43	MOBILE TRAY CART
K-44	MOBILE ADJUSTABLE RACKS
K-45	ROLL-IN OVEN RACKS
K-46	UTILITY POLE
K-47	EXHAUST HOOD AND UTILITY CONDUIT
K-48	CONCESSION WORK COUNTER WITH BASE AND WALL CABINETS
K-49	HIGH DENSITY COOLER/ FREEZER SHELVING



AREA A
ENLARGED KITCHEN PLAN
SCALE: 1/4" = 1'-0"



AREA B
ENLARGED CONCESSIONS PLAN
SCALE: 1/4" = 1'-0"



KEY PLAN

Attachment A

ARCHITECTS REGO + YOUNGQUIST
7601 Wayzata Boulevard Suite 200 St. Louis Park, Minnesota 55426
Phone: 952-544-8941 Fax: 952-544-0585 aryarch.com

I hereby certify that this plan was prepared by me or under my direct supervision and that I am a duly Licensed Architect under the laws of the State of Minnesota.

PAUL YOUNGQUIST
Registration Number 13031

Project Title
2018
OLTMAN NEW MIDDLE SCHOOL
BID PACKAGE #3 - BUILDING
ENCLOSURE AND FINISHES
ISD #833 COTTAGE GROVE, MN
Commission Number 2108

Sheet Title
ENLARGED PLANS - KITCHEN AND CONCESSIONS

Drawn by DE,PP
Checked by DE
Date 03/17/17
Revised 00/00/00

North

Sheet Number
A2.11