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II     Tentative Order of Discussion

III    Uniform Plumbing Code Change Proposals
2018 Uniform Plumbing Code Technical Committee Meeting
Double Tree Hotel, Ontario, CA
May 17 - 18, 2018
AGENDA

I. Call to Order
II. Chairman Comments
III. Announcements
IV. Self-Introductions
V. Review and Approval of Agenda
VI. Approval of Minutes from Previous Meeting (Via Teleconference on April 10, 2018)
VII. Review Code Change Proposals
VIII. Other business
IX. Next scheduled meeting (April 29-May 2, 2019; Denver, Colorado)
X. Adjournment
The following is the tentative order of discussion on which the proposed changes will be discussed at the Technical Committee Meeting. Proposed code changes that are grouped together are those that are both indented and separated by lines. Indented proposed code changes are those being discussed out of numerical order.

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Item #: 001
UPC 2021 Section: 102.3

SUBMITTER: Ronald George, CPD, President
Plumb-Tech Design & Consulting Services LLC
Rep: Self

RECOMMENDATION:
Revise text

102.0 Applicability.

102.3 Maintenance. The plumbing and drainage system, both existing and new, of a premise under the Authority Having Jurisdiction shall be maintained in a sanitary and safe operating condition. Devices, equipment, or safeguards required by this code shall be maintained in accordance with the manufacturer’s maintenance instructions so that a hazard is not created code edition under which installed.

The owner or the owner’s designated agent shall be responsible for maintenance of plumbing systems. To determine compliance with this subsection, the Authority Having Jurisdiction shall be permitted to cause re-inspect a plumbing system. to be re-inspected.

SUBSTANTIATION:
Many hazards are created that are associated with poor maintenance. Such hazard include, but are not limited to: 1. Hot water temperatures maintained too low causing Legionella bacteria growth along with many other micro-organisms in water systems. 2. Scald hazards associated with water temperatures delivered from fixtures hotter than the temperatures allowed in Chapter four. 3. Backflow hazards associated with maintenance operations (chemical dispenser connections to mop sink faucets, etc.) Carbon Monoxide hazards associated with improper maintenance of water heaters, etc.
Item #: 002
UPC 2021  Section: 102.4

SUBMITTER: Ronald George, CPD, President
Plumb-Tech Design & Consulting Services LLC
Rep: Self

RECOMMENDATION:
Revise text

102.0 Applicability.

102.4 Additions, Alterations, Renovations, or Repairs. Additions, alterations, renovations, or repairs shall conform to that required for a new system without requiring the existing plumbing system to be in accordance with the requirements of this code. Additions, alterations, renovations, or repairs shall not cause an existing system to become unsafe, insanitary, or overloaded.

Additions, alterations, renovations, or repairs to existing plumbing installations shall comply with the provisions for new construction. Additions, alterations, or repairs or replacement of equipment in an existing system shall not create a hazard of any kind elsewhere in the system. Any unless such deviations are found to be necessary and are first shall be approved by the Authority Having Jurisdiction.

SUBSTANTIATION:
It is common to find that a water heater or temperature actuated mixing valve maintenance or replacement work contributes to a scald incident where someone is seriously injured or dies from scald injuries. This code change proposal is intended to addresses this issue. If a water heater or a temperature actuated mixing valve is repaired or replaced and the building has existing, non-code compliant fixtures, (shower or tub filler valves), a serious scald hazard can be created if the new equipment has a higher temperature outlet. The Water heater thermostat in tank type heaters should not be used for temperature control, because the thermostat are simply burner ON and burner OFF controls with the sensor at the bottom of the water heater and they are not designed for sensing or controlling hot water temperatures at the water heater outlet temperature control. This code change will require checking of hot water temperatures after alterations to a hot water system including adjustment, repair or replacement of a water heater, temperature actuated mixing valve or other component in a system that can create or increase a scald hazard where one may not have been present before the work. This code change proposal will require checking the fixtures for temperature limit stop adjustments simply adjusting the temperature on existing temperature activated mixing valves or adding a temperature actuated mixing valve or some other means to address the hazard other than the thermostat on the water heater. ASSE is currently working on this issue as a white paper because it is known that there are many scald incidents associated with water heater and associated hot water system work. This should also be part of an awareness and continuing education training curriculum for the trades.
Item #: 003
UPC 2021   Section: 206.0, 309.6

SUBMITTER: Phillip H Ribbs
PHR Consultants

RECOMMENDATION:
Add new text

206.0   - D -

**Dead Leg.** A section of pipe which contains water that has no flow, does not circulate, remains stagnant, or is infrequently used.

309.0 Workmanship.

**309.6 Dead Legs.** Dead legs shall be made as short as possible and shall contain a means of flushing or located in line with downstream fixtures.

SUBSTANTIATION:
Dead legs are currently silent in the code and should be addressed to avoid the growth of bacteria in water supply systems.
SUBMITTER: Phillip H Ribbs  
PHR Consultants  

RECOMMENDATION:  
Add new text  

207.0 - E -  

**Emergency Floor Drain.** A floor drain that does not receive discharge from any fixture drain or indirect waste pipe, and serves to protect from damage where accidental spills, leaks or fixture backups occur.

SUBSTANTIATION:  
This term “emergency floor drain, is used in Table 702.1 (Drainage Fixture Units Values) and currently, there is no definition. This is definition will clarify the difference from a regular floor drain and emergency floor drain to appropriately select the fixture units for the floor drain.
Item #: 005

UPC 2021 Section: 212.0

SUBMITTER: Mark Fasel
Viega LLC

RECOMMENDATION:
Revise text

212.0 - J -

Joint, Press-Connect. A permanent mechanical joint incorporating an elastomeric seal or an elastomeric seal and corrosion resistant grip or bite ring. The joint is made with a pressing tool and jaw or ring that complies with the manufacturer's installation instructions.

SUBSTANTIATION:
We have discovered that the mechanical attaching grip "or bite" ring is referred to as a grip ring by some manufacturer's and a bite ring by others. The proposed addition of the words "or bite" are for clarification that a Press-Connect joint may incorporate a grip or a bite ring in the design. These terms are usually found in the dimensional drawings of the fittings. This revision will provide clarification for the Building Official and Installer so there are no misunderstandings on what may be considered a Press-Connect Joint.
Private or Private Use. Applies to plumbing fixtures in residences and apartments, to private bathrooms in hotels, and hospitals, to plumbing fixtures in patient care rooms in health care facilities, and to restrooms in commercial establishments where the fixtures are intended for the use of a family or an individual.

SUBSTANTIATION:
The purpose of this proposal is to clarify what portions of health care facilities are considered private use. There are two parts to this proposal. First, patient rooms with private bathrooms, or with individual hand washing fixtures can be found in many health care facilities, not just hospitals. Hence, we want to expand what is covered by the definition of private. Second, health care engineers and practitioners want it to be clear that lavatories in patient care rooms and the plumbing fixtures in the en-suite bathroom are intended for use of a limited number of people. This includes patients and the staff who come in direct contact with them. As such, it makes more sense for the plumbing code to treat all the plumbing fixtures inside patient care rooms as private, not just those in hospital bathrooms as is currently the case. The benefits of this proposal are: 1. Allows all plumbing fixtures in the patient care rooms of health care facilities to follow the rules for the same type of occupancy -- private. 2. Reduces the risks of contracting Legionnaires disease while still protecting other aspects of health and safety. The Statement of Problem and Substantiation/Resolution below contains a more detailed discussion of the issues related to Legionella. This is the same as what is presented in my proposal for Section 407.4. The lavatory doesn’t know whether it has been installed in a public or private occupancy. People use lavatories in all occupancies; the same rules with the same water for temperature must be used to do the same basic tasks. Given that the task is essentially the same, there is no particularly good reason to limit the temperature in public use occupancies and not do so in private use ones other than to do energy savings. Most of the flow rate and maximum temperature limitations currently found in our codes are based on recommendations contained in ASHRAE 90.1 (which is a building energy standard) for very high use fixtures -- i.e. transient public lavatories. Why shouldn’t we limit the hot water temperature at public use lavatories? Because we have now confirmed the unintended consequences of these energy saving initiatives that cause unsafe conditions in the hot water distribution system, conditions that support the growth of waterborne pathogens, in particular, Legionella.

Legionella in building water systems has become a major concern for public health with the incidence of Legionnaires’ disease growing by 500% from 0.4 cases per 100,000 people in 2000 to 2.0 cases per 100,000 people in 2015.1 Where does Legionella grow within the building water system? It enters the building through the potable water supply. It grows where there are nutrients, where the disinfectant is longer adequate and where the temperatures support growth. The disinfectant that comes in with the potable water generally prevents the growth of the pathogen on the cold-water side of the plumbing system, so long as there is regular turnover of the water in the piping. The effectiveness of chlorine and other disinfectants typically used by municipalities decreases the longer it stays in the plumbing system. This happens whenever the frequencies of uses are very low or there are long periods of no use. Below 78°F, Legionella bacteria can survive, but are dormant. At 120°F Legionella can survive but do not multiply. At 140°F it dies within 30 minutes. At 151°F it dies within 2 minutes. However, Legionella bacteria grow extremely well when the temperature is between 85 and 110°F. So the question is where in the building water systems are the temperatures in this range? They can be in this range in both the cold and hot water distribution systems, although they will happen much more frequently in the hot water piping. The high-risk temperatures can occur where the cold-water piping is in close proximity to a source of heat, such as a hot water pipe or heating equipment. They can also occur on the cold input side to a master-mixing valve under no flow conditions: 140°F hot in, 125°F setpoint for the mixed temperature and for some distance back along the cold water pipe the temperature is in the range of 85-110°F. The high-risk temperatures can occur in the hot water piping on every branch off a central recirculation system, even those that are maintained in the 140-124°F range that is recommended by ASHRAE Guideline 12. The circulation loop piping is hot, the temperature of the building is 65-75°F and the branches are not being used for many hours of the day. For some distance along the hot water branch pipe the temperature will be in the range of 85-110°F. Many public restrooms, even though they are located in heavily occupied buildings, are in fact used infrequently. In addition, the use period is often of such short duration, that the likelihood of hot water reaching the faucet through typical lengths and diameters of branch piping is very low. This means that in many cases, even though both hot and cold water are connected to the lavatory, people are washing their hands in building temperature water (65-75°F). Wherever the hot water discharge temperature is limited to 120°F, the temperature on the branch lines for most public restrooms will rarely be high enough, for long enough, for the pathogens to die. Only transient public use lavatories are likely to have high enough frequencies of use for water hotter than 120°F to reach the faucet so that the mixing valve can prevent it from getting hotter. This too is rare, and people are often washing their hands in building temperature water (65-75°F). It used be thought that warm water was necessary for effective hand cleaning to control the spread of germs (bacteria). Science has since proven that the temperature of the water used for hand washing does not impact the efficacy of removing bacteria at all.2,3,4 While each of these three papers are very clear the CDC sums it up best with “The temperature of the water does not appear to affect microbe removal; however, warmer water may cause more skin irritation and is more environmentally costly.”4 The most important variables for removing bacteria from ones hands are scrubbing and the use of soap. Neither of these criteria is within the purview of a plumbing code. In many places of the country, for at least part of the year, the incoming cold water is roughly the same as the temperature in the building. In others, the incoming cold water is warmer than the building, and it cools down as it makes its way to the lavatory. Conversely, the where the incoming cold water is colder than the building it warms up on its way to the lavatory. Careful planning for each climate can do much to bring the cold-water temperature close to the temperature of the building for little or no additional cost or the regular addition of energy. In some places it will be either necessary or desirable to raise the temperature of the very cold incoming water up to the temperature of the building more quickly and a method of heating it will be required. However, to stay in the safe range for pathogen growth, the maximum temperature for this water should be no higher than 78°F. We recommend that the UPC: 1. Remove the temperature restriction for all public lavatories. 2. Only limit the temperature at transient public lavatories. 3. Make it optional to provide hot water to lavatories serving the transient public. References: 1) US Centers for Disease Control (CDC) Atlanta, GA Chart titled, “Legionnaires’ Disease is on the Rise 2000-2015” 2) National Notifiable Diseases Surveillance System https://www.cdc.gov/legionella/downloads/fe-legionella-clinicians.pdf 3) Quantifying the Effects of Water Temperature, Soap Volume, Lather Time, and Antimicrobial Soap as Variables in the Removal of Escherichia coli ATCC 11229 from Hands Journal of Food Protection June 2017 4) The environmental cost of hot water for handwashing - Water & Health Journal Volume 37, Issue 4, July 2013 Amanda R. Carrico, Micajah Spoden, Kenneth A. Wallston, Michael P. Vandenbergh http://onlineibrary.wiley.com/doi/10.1111/jhj.12012/abstract 4) Show Me the Science - How to Wash Your Hands CDC Website https://www.cdc.gov/handwashing/show-me-the-science-handwashing.html
Item #: 007  
UPC 2021   Section: 220.0  

SUBMITTER: Sidney Cavanaugh  
Cavanaugh Consulting  
Rep: LMK Technologies  

RECOMMENDATION:  
Add new text  

220.0.  -R-  

Rehabilitation. When the interior surface of the pipe and or fittings are scoured or cleaned and resurfaced with epoxy/resin to create smooth and original performance to the pipes and fittings.  

Cured in Place. When a thermo-set resin saturated into an absorbant textile tube is pressed against an inner pipe wall and cured to form a new pipe within a pipe.  

Watertight. When used in reference to cured-in-place pipe rehabilitation (CIPP) it means that no ground water shall migrate or track between the CIPP and the host pipe, as molded hydrophilic gaskets shall provide a watertight end seal.  

SUBSTANTIATION:  
These definitions are needed in code to clarify sections of code related to rehabilitation of building sewers and sewer service laterals (Section 715.3) and to explain the difference for rehabilitation as it relates to pressure piping systems (Section 320).
Item #: 008

UPC 2021   Section: Chapter 2

SUBMITTER: IAPMO Staff - Update Extracts
             NFPA 54 Extract Update

RECOMMENDATION:
Revise text

207.0    – E –

Effective Ground-Fault Current Path. An intentionally constructed, low-impedance electrically conductive path designed and intended to carry current under ground-fault conditions from the point of a ground fault on a wiring system to the electrical supply source and that facilitates the operation of the overcurrent protective device or ground-fault detectors on high-impedance grounded systems. [NFPA 54:3.3.34]

224.0    – V –

Vent Offset. An arrangement of two or more fittings and pipe installed for the purpose of locating a vertical section of the vent pipe in a different but parallel plane with respect to an adjacent section of a vertical vent pipe. [NFPA 54:3.3.102]

SUBSTANTIATION:
In accordance with IAPMO Governing Consensus Project, the definitions for “effective ground-fault current path” and vent offset” in Chapter 2 are being revised to correlate with the latest edition of NFPA 54-2018.
Item #: 009
UPC 2021 Section: Chapter 2

SUBMITTER: IAPMO Staff - Update Extracts
NFPA 99 Extract Update

RECOMMENDATION:
Revise text

205.0 - C -
Critical Care Area. A room or space in which failure of equipment or a system is likely to cause major injury or death to patients or caregivers (Category 1). [NFPA 99:3.3.28] See Patient Care Space, Category 1

209.0 210.0 - G -
Health Care Facility’s Governing Body. The person or persons who have the overall legal responsibility for the operation of a health care facility. [NFPA 99:3.3.62 3.3.72]

214.0 209.0 - L G -
General Anesthesia and Levels of Sedation/Analgesia.
Deep Sedation/Analgesia. A drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully following repeated or painful stimulation. The ability to independently maintain ventilatory function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained. [NFPA 99:3.3.61.2 3.3.66.2]

215.0 - M -
Medical Gas. A patient medical gas or medical support gas. [See also Patient Medical Gas and Medical Support Gas.] [NFPA 99:3.3.99 3.3.104]

SUBSTANTIATION:
The above sections have been revised to correlate with NFPA 99-2018 (latest version) in accordance with IAPMO’s Regulations Governing Committee Projects (Extract Guidelines).
Item #: 010
UPC 2021 Section: 301.2

SUBMITTER: Ronald George, CPD, President
Plumb-Tech Design & Consulting Services LLC
Rep: Self

RECOMMENDATION:
Revise text

301.0 General.

301.2 Minimum Standards. Pipe, pipe fittings, traps, fixtures, material, and devices used in a plumbing system shall be installed in accordance with the scope of the applicable standards for the product. Products shall be listed (third-party certified) by a listing agency (accredited conformity assessment body) as complying with the approved applicable recognized standards referenced in this code, and shall be free from defects. Unless otherwise provided for in this code, materials, fixtures, or devices used or entering into the construction of plumbing systems, or parts thereof shall be submitted to the Authority Having Jurisdiction for approval.

SUBSTANTIATION:
It is important for a product to be installed in accordance with the scope for which the product standard was developed. There are many products that have specific applications spelled out in the “scope” of the standard and using the devices in an application that does not comply with the scope of the standard could create a danger or hazard to users. Example #1: Temperature control device standards identify the applications for use of the product mention in their “scope” which defines how the product should be used. If someone were to install an ASSE 1017 Temperature actuated mixing valve on the water supply to an emergency fixture system, it would be the wrong application and violate the scope of the standard along with exposing the users to serious scald dangers. The proper mixing valve for an emergency fixture application would be an ASSE 1071 device which is developed for Emergency fixture application as noted in the scope of the standard. ASSE 1071 devices are designed to by-pass cold water in the event of a failure or over-temperature situation. Example # 2: An ASSE 1017 temperature actuated mixing valve for building water distribution systems should not be used for a gang shower application because the 1017 standard allows (Up to plus or minus 7 Degrees from the set point) large temperature swings would be inappropriate for single temperature metering faucets or single temperature on/off type gang showers. The appropriate shower valve would need to be an ASSE 1069 device which is designed to control temperature to a very accurate range for tempered water applications. There are many other examples.
Item #: 011
UPC 2021  Section: 301.2

SUBMITTER: Randy Young
Sacramento JATC

RECOMMENDATION:
Revise text

301.0 General.

301.2 Minimum Standards. Pipe, pipe fittings, traps, fixtures, material, and devices used in a plumbing system shall be listed (third-party certified) by a listing agency (accredited conformity assessment body) as complying with the approved applicable recognized standards referenced in this code, and shall be free from defects. Unless otherwise provided for in this code, materials, fixtures, or devices used or entering into the construction of plumbing systems, or parts thereof shall be submitted to the Authority Having Jurisdiction for approval, prior to the product being installed.

SUBSTANTIATION:
Any product entering the plumbing system should be approved prior to being installed. This can alleviate unnecessary costs and delays to the project, by allowing the AHJ proper time to evaluate the proposed product to ensure to the end user the product is a safe effective product and no compromises to the integrity of the system will be a result of using such products.
SUBMITTER: Tsan-Liang Su
Stevens Institute of Technology

RECOMMENDATION:
Add new text

301.0 General.

301.2 Minimum Standards. Pipe, pipe fittings, traps, fixtures, material, water-conditioning and -treatment equipment, and devices used in a plumbing system shall be listed (third-party certified) by a listing agency (accredited conformity assessment body) as complying with the approved applicable recognized standards referenced in this code, and shall be free from defects. Unless otherwise provided for in this code, materials, fixtures, or devices used or entering into the construction of plumbing systems, or parts thereof shall be submitted to the Authority Having Jurisdiction for approval.

304.0 Connections to Plumbing System Required.

304.1 General. Plumbing fixtures, drains, appurtenances, water-conditioning and -treatment equipment, and appliances, used to receive or discharge liquid wastes or sewage, shall be connected properly to the drainage system of the building or premises, in accordance with the requirements of this code.

610.0 Size of Potable Water Piping.

610.2 Pressure Loss. Where a water-conditioning or -treatment device filter, water softener, backflow prevention device, tankless water heater, or similar device is installed in a water supply line, the pressure loss through such devices shall be included in the pressure loss calculations of the system, and the water supply pipe and meter shall be adequately sized to provide for such a pressure loss.

No water-conditioning or -treatment device filter, water softener, backflow prevention device, or similar device regulated by this code shall be installed in a potable water supply piping where the installation of such device produces an excessive pressure drop in such water supply piping. In the absence of specific pressure drop information, the diameter of the inlet or outlet of such device or its connecting piping shall be not less than the diameter of such water distribution piping to the fixtures served by the device.

Such devices shall be of a type approved by the Authority Having Jurisdiction and shall be tested for flow rating and pressure loss by an approved laboratory or recognized testing agency to standards consistent with the intent of this chapter.

611.0 Drinking Water Conditioning or Treatment Units-Devices.

611.1 Application. Drinking Point-of-use and point-of-entry water-conditioning or -treatment devices shall comply with the appropriate standards per this section. Aesthetic water treatment devices shall comply with NSF 42. Water treatment devices reducing potential health hazards shall comply with NSF 53. Water softeners shall comply with NSF 44. Ultraviolet water treatment systems shall comply with NSF 55. Reverse osmosis drinking water treatment systems shall comply with NSF 58. Drinking water distillation systems shall comply with NSF 62. Commerical drinking water-conditioning or -treatment devices shall comply with ASSE 1087.

611.2 Air Gap Discharge. Discharge from drinking water treatment units shall enter the drainage system through an air gap in accordance with Table 603.3.1 or an air gap device that complies with Table 603.2, NSF 58, or IAPMO PS 65.

611.3 Plumbing Connections Tubing. Pipe, tubing, and pipe fittings supplying water from a point-of-use or point-of-entry water-conditioning or -treatment device shall comply with NSF 14 or NSF 61. The interconnection tubing within a device shall comply with the requirements of NSF 14, NSF 61 or Section 611.1.

611.4 Sizing of Point-of-Entry Water-Conditioning or Treatment Devices Residential Softeners. Residential-use water softeners shall be sized in accordance with Table 611.4. Third-party certified pressure loss characteristics shall be provided with all devices. The pressure loss through such devices shall be included in the pressure loss calculations of the system, and the water supply pipe and meter shall be adequately sized to provide for such a pressure loss.

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Notes:
1. Installation of a kitchen sink and dishwasher, laundry tray, and automatic clothes washer permitted without additional size increase.
2. Additional water closet and lavatory permitted.
3. Over four bathroom groups, the softener size shall be engineered for the specific installation.
611.5 Sizing of Point-of-Use Water-Conditioning or Treatment Devices. Point-of-use water-conditioning or treatment devices that provide potable water to appliances, fittings, or appurtenances that require a minimum pressure and flow rate demand shall be sized, designed, and installed to meet the downstream appliance, fitting, or appurtenance manufacturer’s specifications so as to not cause improper operation.

611.6 Brine Tank Connections. Where a potable water connection is made to a water softener brine tank, connect a backspigging backflow prevention device protecting against pollution under continuous pressure in accordance with ASSE 1087, or an appropriate backflow prevention device in accordance with Table 603.2. The building drainage system shall be capable of handling the additional discharge load of the water-conditioning or -treatment device.

218.0 Point-of-Entry Water-Conditioning or -Treatment Device. A water treatment device serving the water distribution system of a building for the purposes of altering, modifying, adding, or removing any minerals, chemicals, contaminants, and suspended solids in the water that is distributed throughout the building. Outdoor hose bibs are typically excluded from being served by conditioned or treated water.

225.0 WATER CONDITIONING OR TREATMENT DEVICE. A point-of-use (POU) or point-of-entry (POE) original equipment appliance, appurtenance, fixture, or a combination thereof designed to treat potable water so as to alter, modify, add, or remove any minerals, chemicals, contaminants, and suspended solids contained in the source water. Example technologies include but are not limited to softeners, filters, and reverse osmosis systems.

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<td>ASSE 1087-2018 (Draft)</td>
<td>Performance Requirements for Commercial and Food Service Water Treatment</td>
<td>Water Conditioning, Water Treatment</td>
<td>611.1, 611.6</td>
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<tr>
<td>NSF 14-2016</td>
<td>Plastics Piping System Components and Related Materials</td>
<td>Miscellaneous</td>
<td>301.2.3, 604.1, 611.3</td>
</tr>
<tr>
<td>NSF 61-2016</td>
<td>Drinking Water System Components -- Health Effects</td>
<td>Miscellaneous</td>
<td>415.1, 417.1, 604.1, 604.5, 606.1, 607.2, 608.2, 611.3</td>
</tr>
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</table>

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Note: ASSE 1087 is a working draft and is not completed at the time of this monograph.

Note: NSF 14 and NSF 61 meet the requirements for mandatory reference standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION: 218 and 225 – There currently are no definitions for a water treatment device, nor for point-of-use or point-of-entry treatment devices. These are generally accepted definitions. 611.0 – Changing the heading of the section to be consistent with what is used and installed in the industry today. 611.1 – These standards do not deal with design of the products, but rather the safety, structural integrity, and performance requirements. Updated language to describe the current standards for all POE and POU treatment devices. ASSE 1087 is a working draft and is not completed at the time of this monograph.

611.6 Brine Tank Connections. Where a potable water connection is made to a water softener brine tank, connect a backspigging backflow prevention device protecting against pollution under continuous pressure in accordance with ASSE 1087, or an appropriate backflow prevention device in accordance with Table 603.2. The building drainage system shall be capable of handling the additional discharge load of the water-conditioning or -treatment device.

Point-of-Use Water-Conditioning or -Treatment Device. A water treatment device installed to serve a single atmospheric outlet such as a faucet for the purposes of altering, modifying, adding, or removing any minerals, chemicals, contaminants, and suspended solids in water supplied to the outlet. Point of use treatment is often used to treat water only for drinking and cooking.

225.0 WATER CONDITIONING OR TREATMENT DEVICE. A point-of-use (POU) or point-of-entry (POE) original equipment appliance, appurtenance, fixture, or a combination thereof designed to treat potable water so as to alter, modify, add, or remove any minerals, chemicals, contaminants, and suspended solids contained in the source water. Example technologies include but are not limited to softeners, filters, and reverse osmosis systems.

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<tbody>
<tr>
<td>ASSE 1087-2018 (Draft)</td>
<td>Performance Requirements for Commercial and Food Service Water Treatment</td>
<td>Water Conditioning, Water Treatment</td>
<td>611.1, 611.6</td>
</tr>
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SUBSTANTIATION: 218 and 225 – There currently are no definitions for a water treatment device, nor for point-of-use or point-of-entry treatment devices. These are generally accepted definitions. 611.0 – Changing the heading of the section to be consistent with what is used and installed in the industry today. 611.1 – These standards do not deal with design of the products, but rather the safety, structural integrity, and performance requirements. Updated language to describe the current standards for all POE and POU treatment devices. ASSE 1087 is a new standard specifically developed to address commercial water treatment equipment. ASSE 1087 covers all water treatment products that are connected to the building’s plumbing system for potable water. It does not cover water treatment products used for process water or waste water applications. Also, it does not cover claims regarding changes to water chemistry, microbiology, and aesthetics (i.e. smell, taste, appearance, etc.) as those are covered by various other standards or test protocols as currently referenced in the UPC. Examples of water treatment equipment include: Deionizers, Filters, Softeners, Physical Devices, Reverse Osmosis devices, UV treatment devices, Ozone treatment devices, and Distillers. 611.2 - The type of backflow prevention device may be varied in order to ensure protection of the potable water supply, even though the most common ones used are air gaps and air gap devices. Finally, it is critical that the drain system be able to accept the volume of discharge from the device. 611.3 – The title "Plumbing Connections" is more appropriate as there are connections both to and from a device as well as within the device. Described the appropriate standards for each of these use cases. When the connections are within a device covered by a standard, the connections need to meet the requirements of that device's standard. Also, as an example, the low pH or minimal total dissolved solids from the product water of a reverse osmosis system will cause pitting and corrosion of downstream copper tubing. Some consideration needs to be made for this when a system is designed and installed. 611.4 & 611.5 – This language is missing from section 611 as questions arise frequently in the field as to how to size a system when water conditioning and treatment units are involved. Documentation on losses is not always available which may lead to over- or under-sized systems. This is a more accurate representation of how to properly size any water distribution system, and is consistent with the existing language in Appendix A. 611.6 – There is concern in some municipalities that the brine solution typically found in water softening systems can backflow into the potable water system. Currently there are no backflow preventers installed in these systems to prevent this low hazard, non-health pollution due to backspigging. The backspigging risk occurs when the water softener is in regeneration mode during the brine tank fill operations. ASSE 1087 provides the appropriate integral backsiphonage prevention testing on the system or conversely, a selection can be made from Table 603.2. Table 611.4 – This table is no longer relevant given the proposed language of 611.4 and 611.5.
Item #: 013

UPC 2021 Section: 301.2.4

SUBMITTER: Mohamed Dano
Control Air Conditioning Corporation

RECOMMENDATION:
Revise text

301.0 General.

301.2 Minimum Standards. (remaining text unchanged)

301.2.4 Cast-Iron Soil Pipe, Fittings, and Hubless Couplings. Cast-iron soil pipe, fittings, and hubless couplings shall be third party certified in accordance with ASTM C1277 and/or CISPI 310 for couplings and ASTM A888, ASTM A74, and/or CISPI 301 for pipes and fittings.

SUBSTANTIATION:
1. ASTM A888 and CISPI 301 cover a different type of pipe as compared with ASTM A74. ASTM A888/301 are for no-hub pipe while ASTM A74 covers hub/spigot type pipe. The dimensional requirements are different as well, therefore the same pipe cannot meet all of them simultaneously. 2. ASTM A888 and CISPI 301 are nearly identical as it pertains to product requirements. It is redundant to require a product to be certified to both standards. Moreover, it would put undue strain on manufacturers to meet both, and on AHJ’s to have to verify compliance to both. 3. Similarly, ASTM C1277 and CISPI 310 are nearly identical as it pertains to product requirements. It is redundant to require a product to be certified to both standards. Moreover, it would put undue strain on manufacturers to meet both, and on AHJ’s to have to verify compliance to both. 4. Considering the above reasons, replacing “and” with “or” in both places in section 301.2.4 would result in a more appropriate statement.
piping systems and is often caused by Galvanic Corrosion. Galvanic corrosion occurs when two dissimilar metals are in contact with each other and in contact with a water solution that allows electrical current flow between the two dissimilar metals. The contact must be good enough to conduct electricity, and both metals must be exposed to the solution. The driving force for galvanic corrosion is the electric potential difference that develops between the two metals. This difference increases as the distance between the metals in the galvanic series of metals increases. The list of metals below shows a galvanic series for some commercial metals and alloys. When two metals from the series are in contact in a conductive liquid electrolyte solution, like water, the corrosion rate of the more active (anodic) metal increases and the corrosion rate of the more noble (cathodic) metal decreases. Using this concept corrosion engineers have used sacrificial anodes made of magnesium with copper leads welded to underground metal structures to protect underground metal structure from corrosion. The magnesium anode will corrode first. The anodes can be checked and replaced for continuous corrosion protection. The list below shows the galvanic series of metals and alloys. The higher the metal is on this list, the noble the metal will be. The greater the distance between the two metals the greater the electrical potential between the two dissimilar metals will be and the greater the corrosion rate will be for the less noble metal. When two metals from the list below are connected together in a piping system, and they have an electrically conductive fluid like municipal water in contact with both metals, there will be a current flow through the fluid from the less noble material (Positive charge) to the more noble material (Negative charge) Where the current leaves the less noble metal, there will be corrosion occur at the point of current leaving the less noble material. The current is usually greater and the corrosion is greater closer the contact point of the two metals. This is called a corrosion battery cell. It is very common when two dissimilar metals are in contact with each other and there is a fluid that allows current to flow between the two metals. When two dissimilar metals are connected together in a piping system and in the presence of an electrolyte like water, it allows an electrical current to flow between the two different metals. The greater the difference in the electrical potential number of the two metals, the greater the corrosion rate will be for the less noble metal. Current will flow from the metal with the higher number to the metal with the lower number causing corrosion to occur near the joint between the two dissimilar metals. It did not appear to me that there was a significant galvanic corrosion problem. The pipes I examined were clearly eroded away by high velocity domestic hot water. List of Galvanic series of metals. (Noble metals at the top) The following is the galvanic series for seawater. The order may slightly change for some materials in different environments. Cathode End of the Scale (More Noble Metals) 1. Graphite 2. Palladium 3. Platinum 4. Gold 5. Silver 6. Titanium 7. Stainless steel 316 (passive) 8. Stainless Steel 304 (passive) 9. Silicon bronze 10. Stainless Steel 316 (active) 11. Monel 400 12. Phosphor bronze 13. Admiralty brass 14. Cupronickel 15. Molybdenum 16. Red brass 17. Brass plating 18. Yellow brass 19. Naval brass 20. Uranium 8% Mo 21. Niobium 1% Zr 22. Tungsten 23. Tin 24. Lead 25. Stainless Steel 304 (active) 26. Tantalum 27. Chromium plating 28. Nickel (passive) 29. Copper 30. Nickel (active) 31. Cast iron 32. Steel 33. Indium 34. Aluminum 35. Uranium (pure) 36. Cadmium 37. Beryllium 38. Zinc plating (see galvanization) 39. Magnesium Anode end of the scale (Less Noble Metals) Example: In the list above if galvanized pipe (Steel pipe with a Zinc Coating) is connected to copper, The galvanized (Zinc) pipe will corrode to sacrifice to the copper. If Copper is connected to Stainless steel type 304, then the copper will corrode to sacrifice to the stainless steel. Galvanic corrosion can be controlled by the use of sacrificial anodes, isolation of the metals from electrical continuance, protective plastic coatings or epoxy coatings or with corrosion inhibitors. Proper placement of sacrificial anodes is a precise science. The most serious form of galvanic corrosion occurs in plumbing or HVAC piping systems that contain both copper and steel alloys and are filled with water (an electrolyte). Di-electric unions and/or di-electric waterways are often used in such systems to prevent the flow of current between the two different metals. If in doubt, checking the stainless steel piping for your next project, it can be a very good material, but it is important to make sure the copper and stainless steel are isolated to prevent corrosion of the copper pipes & brass valves or consider Schedule 80 CPVC or another material that will not lead to dissimilar metals issues.
Item #: 015
UPC 2021 Section: 313.2, Table 1701.1

SUBMITTER: Tim Collings
Self

RECOMMENDATION:
Revise text

313.0 Hangers and Supports.

313.2 Material. Hangers and anchors shall be of sufficient strength to support the weight of the pipe and its contents. Piping shall be isolated from incompatible materials. **Steel hangers for supply and DWV piping up to 6 inches (150 mm) shall comply with IAPMO PS 95.**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
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<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO PS 95-2018</td>
<td>Pipe Support Hangers and Hooks</td>
<td>Miscellaneous</td>
<td>313.2</td>
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</table>

(portion of table not shown remain unchanged)

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<tr>
<th>DOCUMENT NUMBER</th>
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<tbody>
<tr>
<td>IAPMO PS 95-2001</td>
<td>Drain, Waste, and Vent Hangers and Plastic Pipe Support Hooks</td>
<td>DWV Components</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

Note: IAPMO PS 95 meets the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
This proposal will update this section to reference the applicable standard for steel hangers for supply and DWV pipe. The scope of IAPMO PS 95-2018 covers steel hangers for pipe up to 6 in.
SUBMITTER: Christopher Jensen  
UL LLC  
RECOMMENDATION:  
Delete text without substitution  

312.0 Protection of Piping, Materials, and Structures.  

312.10 Sleeves. (remaining text unchanged)  

312.10.3 Firewalls. A pipe sleeve through a firewall shall have the space around the pipe completely sealed with an approved fire-resistive material in accordance with other codes.  

SUBSTANTIATION:  
This requirement is more appropriately covered in the building codes. Section 312.7 properly directs code users to the building code for the requirements for penetrating fire-resistance rated construction with piping, tubing and duct systems. Penetrations of fire rated construction is not germane to just "fire walls". Building codes address a multitude of fire resistance rated assemblies including "fire barriers", "fire partitions", "fire walls" and horizontal assemblies to name a few. Horizontal and vertical fire resistance rated assemblies have very specific requirements for penetrations that include pipe sleeve materials, forming materials, fill materials etc. These requirements are suitably covered in the approved through penetration firestop systems specified in the building codes.
Item #: 017

UPC 2021 Section: 402.6.1

SUBMITTER: Timothy Wood
Barracuda Brackets LLC

RECOMMENDATION:
Revise text

402.0 Installation.

402.6 Flanged Fixture Connections. (remaining text unchanged)

402.6.1 Closet Rings (Closet Flanges). Closet rings (closet flanges) for water closets or similar fixtures shall be of an approved type and shall be copper alloy, copper, hard lead, cast-iron, galvanized malleable iron, ABS, PVC, or other approved materials. Each such closet ring (closet flange) shall be approximately 7 inches (178 mm) in diameter and, where installed, shall, together with the soil pipe, present a $\frac{1}{2}$ inch (38 mm) wide flange or face to receive the fixture gasket or closet seal.

Caulked-on closet rings (closet flanges) shall be not less than $\frac{1}{4}$ of an inch (6.4 mm) thick and not less than 2 inches (51 mm) in overall depth.

Closest rings (closet flanges) shall be burned or soldered to lead bends or stubs, shall be caulked to cast-iron soil pipe, shall be solvent cemented to ABS and PVC, and shall be screwed or fastened in an approved manner to other materials.

Closest bends or close stubs shall be cut-off to present a smooth surface even with the top of the closest ring before the rough inspection is called.

Closest rings (closet flanges) shall be adequately designed and secured to support fixtures connected thereto, and flanged to provide a watertight joint with the floor.

SUBSTANTIATION:
Every bottom drop toilet has to be connected to the DWV pipe requiring a hole in the floor. This unsealed hole can allow sewage laden water onto the surface of the subfloor under the toilet and flow into the area below causing property damage when the toilet leaks. Water from shower over spray and other bathroom circumstances can pool on the floor and then seep under the toilets base eventually dripping into this hole. Water can easily use grout seams between floor tiles allowing water to get under a toilet. Regardless the source, any water present along with the building material available can support the growth of mold which is an undisputed and a scientific fact. Mold exposure is a known killer. Mold spores growing under the toilet can seep out from under the toilet's base the same way water flows in. When mold is present spores can flow into the bathroom 24 hours a day where anyone can inhale them. Many Medical Doctors now believe that mold spore inhalation can be a contributing factor to the Fibromyalgia epidemic and might even be the cause. Raw sewage includes any contagious disease the user of the toilet has posing health risks to everyone below or around a leaking toilet and could affect other non-infected family members. In apartment buildings potential victims also includes people from apartments living below where the raw sewage laden water flows. The diseases in raw sewage include Campylobacteriosis, Cryptosporidiosis, Encephalitis, Gastroenteritis, and including any contagious disease the toilet user has including Hepatitis A, E-Coli, mumps and many others. The health risks could also be from disease laden insects including cockroaches using the DWV pipes surface as a pathway into the home through the unsealed hole under the toilet. Cockroaches can carry bacteria including salmonella, staphylococcus, and streptococcus and viruses including the polio virus. Cockroaches can crawl out from under the toilets base into other living areas. A properly installed and leak tested toilet does not give consumers protection in lieu of a flange installed watertight with the floor. Because: 1. The seal between the toilet and the flange could become compromised. 2. It does not keep insects out. 3. It does not keep water from seeping under the toilet base. 4. It should not be considered a reason to justify keeping an open hole under a toilet. This code language change would require toilets flanges to be adequately designed and secured to support fixtures connected thereto, and suitably flanged to provide a water-tight joint in the floor, like every other floor drain.
Item #: 018

UPC 2021  Section: 402.6.3

SUBMITTER: Phillip H Ribbs
PHR Consultants

RECOMMENDATION:
Revise text

402.6 Flanged Fixture Connections. (remaining text unchanged)

402.6.3 Securing Floor-Mounted, Back-Outlet Water Closet Bowls. Floor-mounted, back-outlet water closet bowls shall be set level with an angle of 90 degrees (1.57 rad) between the floor and wall at the centerline of the fixture outlet. The floor and wall shall have a flat mounting surface not less than 5 inches (127 mm) to the right and left of the fixture outlet centerline. The fixture shall be secured to the wall outlet flange or drainage connection and the floor by corrosion-resistant screws or bolts. The closet flange shall be secured to a firm base.

Where floor-mounted, back-outlet water closets are used, the soil pipe shall be not less than 3 inches (80 mm) in diameter. Offset, eccentric, or reducing floor closet flanges shall not be used.

SUBSTANTIATION:
Floor flanges are known to secure pipe to the floor or walls and usually contain a female thread. The proposed change provides the appropriate name for the type of flange used on water closets. A closet flange is known as a toilet flange, is a type of flange that both mounts a toilet to the floor and connects the toilet drain to the drain pipe.
Item #: 019
UPC 2021 Section: 403.3

SUBMITTER: Phillip H Ribbs
PHR Consultants

RECOMMENDATION:
Revise text

403.0 Accessible Plumbing Facilities.

403.3 Exposed Pipes and Surfaces. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise be configured to protect against contact and shall contain no sharp or abrasive surfaces. Protectors, insulators, or both shall comply with ASME A112.18.9 or ASTM C1822.

SUBSTANTIATION:
Exposed pipes under sinks can cause burns or injury by exposed hot piping and sharp or abrasive surfaces. The code only addresses insulation of exposed piping. The additional language will assist the end user to clarify that the final installation shall additionally be free of any sharp or abrasive surface.
Item #: 020
UPC 2021  Section: 403.3

SUBMITTER: Mark Fish
Zurn Industries, LLC

RECOMMENDATION:
Revise text

403.0 Accessible Plumbing Facilities.

403.3 Exposed Pipes and Surfaces. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise be configured to protect against contact. Protectors, insulators, or both shall comply with ASME A112.18.9 or ASTM C1822 or IAPMO PS 94.

<table>
<thead>
<tr>
<th>TABLE 1701.1</th>
<th>REFERENCED STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD NUMBER</td>
<td>STANDARD TITLE</td>
</tr>
<tr>
<td>IAPMO PS 94-2012</td>
<td>Insulated Protectors for P-Traps, Supply Stops, and Risers</td>
</tr>
</tbody>
</table>

Note: IAPMO PS 94 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

<table>
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SUBSTANTIATION:
PS 94 covers plastic protectors “full under-sink guards” which are currently in use but are not covered in either of the standards currently referenced ASME A112.18.9 or ASTM C1822. The full scope of PS 94 covers insulated protectors for P-traps, supply stops, and risers, including full under-sink guards, intended to cover plumbing parts and equipment. These systems are widely used in the industry and provisions are necessary for the application and for guidance to the Authority Having Jurisdiction.
SUBMITTER: Johnathan Daruvala  
County of Orange

RECOMMENDATION:  
Revise text

404.0 Waste Fittings and Overflows.

404.2 Overflows. Where a fixture is provided with an overflow, the overflow shall comply with Section 404.2.1 or Section 404.2.2.

404.2.1 Sinks and Bathtubs. Where a fixture is provided with an overflow, the overflow shall comply with Section 404.2.1 or Section 404.2.2.

404.2.2 Water Closets and Urinals. Where a fixture is provided with an overflow, the overflow shall comply with Section 404.2.1 or Section 404.2.2.

TABLE 1701.1  
REFERENCED STANDARDS

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<tbody>
<tr>
<td>IAPMO IGC 252-2018</td>
<td>Water Closet with an Overflow</td>
<td>Fixtures</td>
<td>404.2.2</td>
</tr>
</tbody>
</table>

(portions of the table not shown remain unchanged)

Note: IAPMO IGC 252 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:  
The provisions for sinks and bathtubs were separated from those for water closets and urinals as one may not apply to the other. Separating the sections clarifies the intent and assists the end user. Furthermore, IAPMO IGC 252 establishes minimum requirements for water closets with overflows which are not covered by any other existing standards.
SUBMITTER: Julius Ballanco, P.E.
        JB Engineering and Code Consulting, P.C.
        Rep: Bradley Corp.

RECOMMENDATION:
        Revise text

407.0 Lavatories.

407.1 Application. Lavatories shall comply with ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4, ASME A112.19.12, CSA B45.5/IAPMO Z124, CSA B45.8/IAPMO Z401, CSA B45.11/IAPMO Z401 or CSA B45.12/IAPMO Z402. Group wash fixtures shall comply with the requirements of Section 401.2. Every 20 inches (508 mm) of rim space of a group wash fixture shall be considered as one lavatory for determining the number of lavatories required in accordance with Table 422.1.

<table>
<thead>
<tr>
<th>TYPE OF OCCUPANCY</th>
<th>WATER CLOSETS (FIXTURES PER PERSON)</th>
<th>URINALS (FIXTURES PER PERSON)</th>
<th>LAVATORIES (FIXTURES PER PERSON)</th>
<th>SANITUOBS OR SHOWERS (FIXTURES PER PERSON)</th>
<th>DRINKING FOUNTAINS/FACILITIES (FIXTURES PER PERSON)</th>
<th>OTHER</th>
</tr>
</thead>
</table>

Notes:
1. The figures shown are based upon one fixture being the minimum required for the number of persons indicated or any fraction thereof.
2. A restaurant is defined as a business that sells food to be consumed on the premises.
   a. The number of occupants for a drive-in restaurant shall be considered as equal to the number of parking stalls.
   b. Hand-washing facilities shall be available in the kitchen for employees.
3. The total number of required water closets for females shall be not less than the total number of required water closets and urinals for males.
4. For each urinal added in excess of the minimum required, one water closet shall be permitted to be deducted. The number of water closets shall not be reduced to less than two-thirds of the minimum requirement.
5. Group lavatories that are 24 lineal inches (610 mm) of wash sink or 18 inches (457 mm) of a circular basin, where provided with water outlets for such space, shall be considered equivalent to one lavatory.

(renumber remaining notes)

209.0  -  G -

Group Wash Fixture. A lavatory that allows more than one person to utilize the fixture at the same time. The fixture has one or more drains and one or more faucets.

SUBSTANTIATION:
The current code uses two terms to describe the same fixture. In Note 5 of Table 422.1 the term “wash sink” and “circular basin” are used. The proper term used in the plumbing industry is “group wash fixture.” A definition of group wash fixture is being added to Chapter 2. The group wash fixture definition identifies the fixture, including that there could be one or more drains and one or more faucets connected with the fixture. The determination of the spacing equating to a single lavatory belongs in Section 407.1, not hidden in a note to Table 422.1. A sentence is added to Section 407.1 identifying every 20 inches of space to equate to one lavatory. This is the standard used in the industry. There is no difference in spacing between a circular, semi-circular, or non-circular group wash fixture. The same spacing is required for an individual to use the fixture. Note 5 is being deleted with the addition of the text to Section 407.1. The note is no longer necessary.
SUBMITTER: Tim Collings
Self

RECOMMENDATION:
Revise text

407.0 Lavatories.

<table>
<thead>
<tr>
<th>TABLE 1701.1</th>
<th>REFERENCED STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD NUMBER</td>
<td>STANDARD TITLE</td>
</tr>
<tr>
<td>IAPMO IGC 127-2018</td>
<td>Combined Hand-Washing Systems</td>
</tr>
</tbody>
</table>

Note: IAPMO IGC 127 meets the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
There is no standard referenced for compliance of combination systems. The scope of IGC 127 covers combination systems comprised of electronically actuated soap dispensers, faucets, and hand air-dryers. The products covered by IGC 127 are required to comply with a lifecycle test for the system in addition to compliance with the appropriate standards that address the individual aspects of the lavatories such as CSA B45.5/IAPMO Z124 for plastic lavatories and ASME A112.18.1/CSA B125.1 for supply fittings.
407.0 Lavatories.

407.3 Limitation of Hot Water Temperature for Public Lavatories. Hot water delivered from public-use lavatories shall be limited to a maximum temperature of 120°F (49°C) by a device that complies with ASSE 1070/ASME A112.1070/CSA B125.70. The water heater thermostat shall not be considered a control for meeting this provision. The maximum temperature shall be regulated by one of following means:

1. A limiting device conforming to either ASSE 1070/ASME A112.1070/CSA B125.70 or CSA B125.3.
2. A thermostatic mixing valve conforming to ASSE 1017.
3. A water heater conforming to ASSE 1082.
4. A water heater conforming to ASSE 1084.

408.0 Showers.

408.3 Individual Shower and Tub-Shower Combination Control Valves. Showers and tub-shower combinations shall be provided with individual control valves of the pressure balance, thermostatic, or combination pressure balance/thermostatic mixing valve type that provide scald and thermal shock protection for the rated flow rate of the installed showerhead. These valves shall be installed at the point of use and comply with ASSE 1016/ASME A112.1016/CSA B125.16 or ASME A112.18.1/CSA B125.1. Gang showers, where supplied with a single temperature controlled water supply pipe, shall be controlled by a mixing valve that complies with ASSE 1069. Handle position stops shall be provided on each valve and shall be adjusted per the manufacturer’s instructions to deliver. The maximum mixed water temperature discharging from an individual valve shall be set to 120°F (49°C). Water heater thermostats shall not be considered a suitable control for meeting this provision. The maximum temperature shall be regulated by one of following means:

1. A field adjustment and setting of the handle position stop on the shower or tub/shower combination valve set in accordance with the manufacturer's instructions.
2. A limiting device conforming to either ASSE 1070/ASME A112.1070/CSA B125.70 or CSA B125.3.
3. A thermostatic mixing valve conforming to ASSE 1017.
4. A water heater conforming to ASSE 1082.
5. A water heater conforming to ASSE 1084.
6. A temperature actuated flow reduction device conforming to ASSE 1062.

409.0 Bathtubs and Whirlpool Bathtubs.

409.4 Limitation of Hot Water in Bathtubs and Whirlpool Bathtubs. The maximum hot water temperature discharging from the bathtub and whirlpool bathtub filler shall be limited to 120°F (49°C) by a device that complies with ASSE 1070/ASME A112.1070/CSA B125.70. The water heater thermostat shall not be considered a control for meeting this provision. The maximum temperature shall be regulated by one of following means:

1. A field adjustment and setting of the handle position stop on the tub/shower combination valve complying with ASSE 1016/ASME A112.1016/CSA B125.16 set in accordance with the manufacturer's instructions.
2. A limiting device conforming to either ASSE 1070/ASME A112.1070/CSA B125.70 or CSA B125.3.
3. A thermostatic mixing valve conforming to ASSE 1017.
4. A water heater conforming to ASSE 1082.
5. A water heater conforming to ASSE 1084.

410.0 Bidets.

410.3 Limitation of Water Temperature in Bidets. The maximum hot water temperature discharging from a bidet shall be limited to 110°F (43°C) by a device that complies with ASSE 1070/ASME A112.1070/CSA B125.70 or CSA B125.3. The water heater thermostat shall not be considered a control for meeting this provision. The maximum temperature shall be regulated by one of following means:
(1) A limiting device conforming to either ASSE 1070/ASME A112.1070/CSA B125.70 or CSA B125.3.

(2) A thermostatic mixing valve conforming to ASSE 1017.

(3) A water heater conforming to ASSE 1082.

(4) A water heater conforming to ASSE 1084.

### TABLE 1701.1
**REFERENCED STANDARDS**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1017-2009</td>
<td>Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems</td>
<td>Valves</td>
<td>407.3, 408.3, 409.4, 410.3</td>
</tr>
<tr>
<td>ASSE 1062-2017</td>
<td>Performance Requirements for Temperature Actuated, Flow Reduction (TAFR) Valves to Individual Supply Fittings</td>
<td>Valves</td>
<td>408.3</td>
</tr>
<tr>
<td>ASSE 1082-201X</td>
<td>Performance Requirements for Water Heaters used as Temperature Control Devices for Hot Water Distribution Systems</td>
<td>Appliances</td>
<td>407.3, 408.3, 409.4, 410.3</td>
</tr>
<tr>
<td>ASSE 1084-20XX</td>
<td>Performance Requirements for Water Heaters used as Temperature Limiting Devices</td>
<td>Appliances</td>
<td>407.3, 408.3, 409.4, 410.3</td>
</tr>
<tr>
<td>CSA B125.3-2018</td>
<td>Plumbing Fittings</td>
<td>Fittings</td>
<td>407.3, 408.3, 409.4, 410.3</td>
</tr>
</tbody>
</table>

Note: ASSE 1017, ASSE 1062, ASSE 1070/ASME A112.1070/CSA B125.70, and CSA B125.3 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

Note: ASSE 1082 and ASSE 1084 are working drafts and is not completed at the time of this monograph.

### TABLE 1701.2
**STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES**

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
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<tbody>
<tr>
<td>ASSE 1017-2009</td>
<td>Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems</td>
<td>Valve</td>
</tr>
<tr>
<td>ASSE 1062-2006</td>
<td>Performance Requirements for Temperature Actuated, Flow Reduction (TAFR) Valves to Individual Supply Fittings</td>
<td>Valve</td>
</tr>
</tbody>
</table>

SUBSTANTIATION:
There are methods other than that handle limit stop and ASSE 1070/ASME A112.1070/CSA B125.70 devices that can be used to limit the maximum water temperature to 120°F. All of these other methods are equally effective in preventing scalding in a shower, bathtub, bidet, and handwashing facility. Three new ASSE standards regulate water heaters to be equivalent to various temperature limiting and thermostatic mixing valves. ASSE 1082 requires the water heater to be equivalent to an ASSE 1017 valve. Similarly, ASSE 1085 requires the water heater to be equivalent to ASSE 1070/ASME A112.1070/CSA B125.70 devices. For showers and gang showers, ASSE 1082 devices can be used to cut the flow pattern in a shower when the temperature reaches 115° F. This provides scald protection from upper temperatures and is used in conjunction with a compensating shower (balanced pressure or thermostatic mixing) valve. Finally, an ASSE 1017 valve can be used at the water heater to limit the upper temperature of the hot water. When installed, there is no need to adjust the handle limit stop since the hot water at the shower valve cannot exceed 120° F.
Item #: 025

UPC 2021 Section: 407.3

SUBMITTER: Michael Dean Curtright
MacDonald - Miller Facility Solutions
Reps: ASPE - Seattle Chapter, IAPMO N.W. Washington State Chapter

RECOMMENDATION:
Revise text

407.0 Lavatories.
407.3 Limitation of Hot Water Temperature for Public Lavatories. Hot water delivered from public-use lavatories shall be limited to a maximum temperature of 120°F (49°C) by a device that complies with ASSE 1070/ASME A112.1070/CSA B125.70. The water heater thermostat shall not be considered a control for meeting this provision.

Exceptions:
1) Lavatories in one and two-family dwellings and multiple single-family dwellings (townhouses).
2) Lavatories supplied by a temperature actuated mixing valve for hot water distribution systems limited to a maximum temperature of 120°F (49°C) by a device that complies with ASSE 1017.

Note: ASSE 1017 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
The Risks There is a significant public health risk of scalding that needs urgent attention. This may occur in private occupancies such as apartments and hotels (Fn. 1, Fn. 2). The tender skin of very young children and the slow reaction time of the elderly and the handicapped make them most vulnerable to serious hot water burns (Fn. 3). Scalding injuries are tremendously painful, and the effects can last for years. Scalding occurs for a variety of reasons. In some cases, water heater thermostats are faulty, set too high or do not reflect the actual temperature due to thermostat placement and tank stratification. In others, temperature regulating valves at the domestic hot water source are either malfunctioning or missing altogether. Water heaters are commonly set to temperatures above 131°F (55°C) to prevent development of harmful bacteria, such as Legionella, in the water supply. Storage heaters may be set to temperatures above 131°F (55°C) to “increase available first hour delivery”. Water temperatures above 106°F (41°C) are painful. At 131°F (55°C), a child can be scalded in less than 5 seconds (Fn. 4). While it may be good engineering practice to install an ASSE 1017 thermostatic mixing valve on central HW distribution systems, it is not a code requirement. Even when such measures are taken, they may be compromised in multi-pressure zone, high rise construction, where HW is recirculated within a pressure zone through an electric storage heater. Repeatedly, the code states, “The water heater thermostat shall not be considered a control for [Limitation of Hot Water Temperature].” The 2018 UPC Public lavatories, all showers, tub-shower combinations, whirlpool bathtubs, bidets, and emergency shower and/or eye washes are required to have scald protection. They are defined as “private use”. The Proposed Solution Amend the 2018 to require either an ASSE 1017 thermostatic mixing valve where central distribution systems are used or, in the absence of an ASSE 1017 require individual ASSE 1070 TMVs at all private apartment and hotel lavatories. Footnotes 1. Public lavatories, UPC 2018, 407.3.2. UPC 2018 Chapter 2, Definitions, page 17, “Public or Public Use”, “Private or Private Use”. 3. https://www.cdc.gov/safechild/burns/index.html 4. U.S. Government Memorandum, C.P.S.C., Peter L. Armstrong, Sept. 15, 1978 5. UPC 2016, 407.3, 408.3, 409.4, 410.3.
Item #: 026
UPC 2021 Section: 407.3, 407.4

SUBMITTER: Tim Keane (Legionella Risk Management, Inc), Brian Hageman (Mazzetti)

RECOMMENDATION:
Revise text

407.3 Limitation of Hot Water Temperature for Public Lavatories. Hot water delivered from public-use lavatories shall be limited to a maximum temperature of 120°F (49°C) by a device that complies with ASSE 1070/ASME A112.1070/CSA B125.70. The water heater thermostat shall not be considered a control for meeting this provision.

(renumber remaining sections)

407.4 Transient Public Lavatories. Self-closing or metering faucets shall be installed on lavatories intended to serve the transient public, such as those in, but not limited to service stations, train stations, airports, restaurants, and convention halls. Transient public lavatories shall be provided with cold water, hot water or both. Hot water delivered from transient public-use lavatories shall be limited to a maximum temperature of 120°F (49°C) by a device that is in accordance with ASSE 1017 or ASSE 1070/ASME A112.18.1070/CSA B125.3 The water heater thermostat shall not be considered a control for meeting this provision.

Note: ASSE 1017 and ASSE 1070/ASME A112.1070/CSA B125.70 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
There are three purposes for this proposal. The first is to limit the requirement to control the maximum temperature at public lavatories to a subset of public use – transient public lavatories. The second is to make it optional to provide hot water to lavatories serving the transient public. The third is to make clear if water is already being delivered at 120F in the hot water supply through a 1017 device that another temperature control device downstream of the 1017 valve is not required or recommended. Here is the substantiation for this proposal. Present code wording says an ASSE 1070 device must be installed in public lavatories. If however there is already a master mixing valve controlling temperature to 120F then adding a second temperature control device downstream of the master mixing valve is a huge cost and dramatically increases the risk for Legionella growth and negatively impacts the operation of the downstream mixing valve. If the water coming into the mixing valve is 120F and the water leaving the mixing valve is 120F then no cold water is added to temper the water and the cold supply line to the mixing valve becomes a dead leg. Additionally manufacturers of mixing valves typically recommend for the mixing valve to function properly it must have at least a 10F temperature differential between the supply and outlet temperatures of the mixing valve. The lavatory doesn’t know whether it has been installed in a public or private occupancy. People use lavatories in all occupancies; the same people, with the same needs for water temperature to do the same basic tasks. Given that the task is essentially the same, there is no particularly good reason to limit the temperature in public use occupancies and not do so in private use ones other than energy savings. Most of the flow rate and maximum temperature limitations currently found in our codes are based on recommendations contained in ASHRAE 90.1 (which is a building energy standard) for very high use fixtures – i.e. transient public lavatories. Why shouldn’t we limit the hot water temperature at public use lavatories? Because we have now confirmed the unintended consequences of these energy saving initiatives that cause unsafe conditions in the hot water distribution system; conditions that support the growth of waterborne pathogens, in particular, Legionella. Legionella in building water systems has become a major concern for public health with the incidence of Legionnaires’ disease.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1017-2009</td>
<td>Temperature Actuated Mixing Valves for Hot Water Distribution Systems</td>
<td>Valves</td>
<td>407.4</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)
growing by 500% from 0.4 cases per 100,000 people in 2000 to 2.0 cases per 100,000 people in 2015.1 Where does Legionella grow within the building water system? It enters the
building through the potable water supply. It grows were there are nutrients, where the disinfectant is longer adequate and where the temperatures support growth. The disinfectant
that comes in with the potable water generally prevents the growth of the pathogen on the cold-water side of the plumbing system, so long as there is regular turnover of the water in
the piping. The effectiveness of chlorine and other disinfectants typically used by municipalities decreases the longer it stays in the plumbing system. This happens whenever the
frequencies of uses are very low or there are long periods of no use. Below 78F, Legionella bacteria can survive, but are dormant. At 120F Legionella can survive but do not multiply.
At 140 F it dies within 32 minutes. At 151F it dies within 2 minutes. However, Legionella bacteria grow extremely well when the temperature is between 85 and 110F. So the question
is where in the building water systems are the temperatures in this range? They can be in this range in both the cold and hot water distribution systems, although they will happen
much more frequently in the hot water piping. The high-risk temperatures can occur where the cold-water piping is in close proximity to a source of heat, such as a hot water pipe or
heating equipment. They can also occur on the cold input side to a master-mixing valve under no flow conditions: 140F hot in, 125F setpoint for the mixed temperature and for some
distance back along the cold water pipe the temperature is in the range of 85-110F. The high-risk temperatures can occur in the hot water piping on every branch off a central
recirculation system, even those that are maintained in the 140-124F range that is recommended by ASHRAE Guideline 12. The circulation loop piping is hot, the temperature of the
building is 65-75F and the branches are not being used many hours of the day. For some distance along the hot water branch pipe the temperature will be in the range of 85-110F.
Many public restrooms, even though they are located in heavily occupied buildings, are in fact used infrequently. In addition, the use period is often of such short duration, that the
likelihood of hot water reaching the faucet through typical lengths and diameters of branch piping is very low. This means that in many cases, even though both hot and cold water
are connected to the lavatory, people are washing their hands in building temperature water (65-75F). Wherever the hot water discharge temperature is limited to 120F, the
temperature on the branch lines for most public restrooms will rarely be high enough, for long enough, for the pathogens to die. Only transient public use lavatories are likely to have
high enough frequencies of use for water hotter than 120F to reach the faucet so that the mixing valve can prevent it from getting hotter. This too is rare, and people are often
washing their hands in building temperature water (65-75F). It used be thought that warm water was necessary for effective hand cleaning to control the spread of germs (bacteria).
Science has since proven that the temperature of the water used for hand washing does not impact the efficacy of removing bacteria at all. 2,3,4 While each of these three papers
are very clear the CDC sums it up best with “The temperature of the water does not appear to affect microbe removal; however, warmer water may cause more skin irritation and is
more environmentally costly.”4 The most important variables for removing bacteria from ones hands are scrubbing and the use of soap. Neither of these criteria is within the purview
of a plumbing code. In many parts of the country, for at least part of the year, the incoming cold temperature is roughly the same as the temperature in the building. In others, the
incoming cold water is warmer than the building, and it cools down as it makes its way to the lavatory. Conversely, the where the incoming cold water is colder than the building it
warms up on its way to the lavatory. Careful planning for each climate can do much to bring the cold-water temperature close to the temperature of the building for little or no
additional cost or the regular addition of energy. In some places it will be either necessary or desirable to raise the temperature of the very cold incoming water up to the temperature
of the building more quickly and a method of heating it will be required. However, to stay in the safe range for pathogen growth, the maximum temperature for this water should be
no higher than 78F. We recommend that the UPC: 1. Remove the temperature restriction for all public lavatories. 2. Only limit the temperature at transient public lavatories. 3. Make
it optional to provide hot water to lavatories serving the transient public. References: 1) US Centers for Disease Control (CDC) Atlanta, GA Chart titled, “Legionnaires’ Disease is on
Temperature, Soap Volume, Lather Time, and Antimicrobial Soap as Variables in the Removal of Escherichia coli ATCC 11229 from Hands Journal of Food Protection June 2017
Dane A. Jensen,1 David R. Macinga,2 David J. Shumaker,2 Roberto Bellino,2 James W. Arbogast,2 and Donald W. Schaffner1 http://jfoodprotection.com/doi/full/10.4315/0362-
028X.JFP-16-370?code=fopr-site Above was in an article titled Cool Water as Effective as Hot for Removing Germs During Handwashing Infection Control Today May 30 2017 3)
Item #: 027
UPC 2021 Section: 408.1, Table 1701.1

SUBMITTER: April Trafton
Donald F. Dickerson Associates

RECOMMENDATION:
Revise text

408.0 Showers.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO IGC 154-2016</td>
<td>Shower and Tub/Shower Enclosures, Bathubs, Fixtures</td>
<td>408.1</td>
<td></td>
</tr>
</tbody>
</table>

Note: IAPMO IGC 154 meets the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
IAPMO IGC 154 establishes minimum requirements for manufactured shower receptors with operating controls panel that are part of enclosures. There are currently over 20 manufacturers which have been tested to IGC 154 and it should be included among the referenced standards for manufactured shower receptors in this section to ensure the health and safety of the public.
Item #: 028
UPC 2021 Section: 408.3

SUBMITTER: Ronald George, CPD, President
Plumb-Tech Design & Consulting Services LLC
Rep: Self

RECOMMENDATION:
Revise text

408.0 Showers.

408.3 Individual Shower and Tub-Shower Combination Control Valves. Showers and tub-shower combinations shall be provided with individual control valves of the pressure balance, thermostatic, or combination pressure balance/thermostatic mixing valve type that provide scald and thermal shock protection for the rated flow rate of the installed showerhead. These valves shall be installed at the point of use and comply with ASSE 1016/ASME A112.1016/CSA B125.16 or ASME A112.18.1/CSA B125.1. Gang showers, where supplied with a single temperature-controlled water supply pipe, shall be controlled by a mixing valve that complies with ASSE 1069. Handle position, temperature limiting stops shall be provided on each shower and tub-shower combination valves and shall be adjusted per the manufacturer’s instructions to deliver maximum mixed water setting of 120°F (49°C). Water heater thermostats shall not be considered a suitable control for meeting this provision.

408.3.1 Gang Showers. Where gang showers are supplied with a single temperature-controlled water supply pipe, it shall be controlled by a mixing valve that complies with ASSE 1069.

<table>
<thead>
<tr>
<th>TABLE 1701.1</th>
<th>REFERENCED STANDARDS</th>
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<tbody>
<tr>
<td>STANDARD NUMBER</td>
<td>STANDARD TITLE</td>
</tr>
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<td>ASSE 1069-2005</td>
<td>Automatic Temperature Control Mixing Valves</td>
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</tbody>
</table>

Note: ASSE 1069 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
The gang shower text was inserted in the middle of the shower and tub/shower text where it appeared that the handle position stops did not apply to showers and tub/shower combinations, but applied to gang showers. I simply moved to gang shower language to the end of this section and made it a new section. Now the temperature limit stop language will apply to showers and tub/showers.
Item #: 029
UPC 2021 Section: 408.5

SUBMITTER: Phillip H Ribbs
PHR Consultants

RECOMMENDATION:
Revise text

408.0 Showers.

408.5 Finished Curb or Threshold. Where a shower receptor has a finished dam, curb, or threshold, it shall be not less than 1 inch (25.4 mm) lower than the sides and back of such receptor. In no case, shall a dam or threshold be less than 2 inches (51 mm) or exceeding 9 inches (229 mm) in depth where measured from the top of the dam or threshold to the top of the drain. Each such receptor shall be provided with an integral nailing flange to be located where the receptor meets the vertical surface of the finished interior of the shower compartment. The flange shall be watertight and extend vertically not less than 1 inch (25.4 mm) above the top of the sides of the receptor. The finished floor of the receptor shall slope uniformly from the sides towards the drain not less than 1/8 inch per foot (10.4 mm/m), nor more than 1/2 inch per foot (41.6 mm/m).

Thresholds shall be of sufficient width to accommodate a minimum 22 inch (559 mm) door. Shower doors shall open so as to maintain not less than a 22 inch (559 mm) unobstructed opening for egress.

The **entire floor space** to showers without thresholds shall be considered a wet location and shall comply with the requirements of the building, residential, and electrical codes.

Exceptions:

(1) Showers in accordance with Section 403.2.
(2) A cast-iron shower receptor flange shall be not less than 0.3 of an inch (7.62 mm) in height.
(3) For flanges not used as a means of securing, the sealing flange shall be not less than 0.3 of an inch (7.62 mm) in height.

SUBSTANTIATION:
The current code is unclear as to what is considered an adjoining space. The proposed modification adds clarity that the adjoining spaces are the adjoining floor spaces next to the shower floors. The proposed revision will assist the end user for application and the AHJ for enforcement of this section.
SUBMITTER: Angel Guzman
The American Society of Mechanical Engineers (ASME)

RECOMMENDATION:
Revise text

408.5 Finished Curb or Threshold. Where a shower receptor has a finished dam, curb, or threshold, it shall be not less than 1 inch (25.4 mm) lower than the sides and back of such receptor. In no case, shall a dam or threshold be less than 2 inches (51 mm) or exceeding 9 inches (229 mm) in depth where measured from the top of the dam or threshold to the top of the drain. Each such receptor shall be provided with an integral nailing flange to be located where the receptor meets the vertical surface of the finished interior of the shower compartment. The flange shall be watertight and extend vertically not less than 1 inch (25.4 mm) above the top of the sides of the receptor. The finished floor of the receptor shall slope uniformly from the sides towards the drain not less than 1/8 inch per foot (10.4 mm/m), nor more than 1/2 inch per foot (41.6 mm/m).

Thresholds shall be of sufficient width to accommodate a minimum 22 inch (559 mm) door. Shower doors shall open so as to maintain not less than a 22 inch (559 mm) unobstructed opening for egress. The immediate adjoining space to showers without thresholds shall be considered a wet location and shall comply with the requirements of the building, residential, and electrical codes.

Exceptions:
(1) Showers in accordance with Section 403.2.
(2) A cast-iron shower receptor flange shall be not less than 0.3 of an inch (7.62 mm) in height.
(3) For flanges not used as a means of securing, the sealing flange shall be not less than 0.3 of an inch (7.62 mm) in height.

SUBSTANTIATION:
All the harmonized ASME/CSA standards for plumbing fixtures (ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4) allow for field installed flanges. The IAPMO Z124/CSA B45.5 standard includes a specific test for verifying that no water leaks through the flange and fixture joint. By requiring that the nailing flange be integral to the fixture, this would restrict many products which are fully allowed and compliant with the national recognized performance standards currently referenced in this 2018 UPC.
Item #: 031
UPC 2021 Section: 408.11, Table 1701.1

SUBMITTER: Chris Connolly
Orbital Systems

RECOMMENDATION:
Revise text

408.0 Showers.

408.11 Recirculating Shower Systems. Recirculating shower systems shall comply with IAPMO IGC 330.

TABLE 1701.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTION(S)</th>
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</thead>
<tbody>
<tr>
<td>IAPMO IGC 330-2017</td>
<td>Recirculating Shower Systems</td>
<td>Fixtures</td>
<td>408.11</td>
</tr>
</tbody>
</table>

Note: IAPMO IGC 330 meets the requirements for a mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
Recirculating showers are new to most plumbers and code officials. IAPMO approved IGC 330 in 2016 and revised it in 2017. This Standard covers portable and stationary recirculating shower systems intended for new and retrofit residential and commercial applications and specifies requirements for materials, physical characteristics, performance testing, and markings. In addition to being required to pass tests for shower enclosures, there are requirements for backflow prevention and for filtration and disinfection. There are products being tested by IAPMO R&T with the intention of being listed with the full UPC mark by the end of 2018. It seems advisable to include a section in the 2021 UPC that lets plumbers and code officials know that recirculating showers need to comply with a standard and to reference that standard in Table 1701.1. Alternatively, if the Technical Committee does not feel that a section in the UPC is warranted at this time, it would then be advisable to include the IGC in Table 1701.2.
Item #: 032
UPC 2021 Section: 408.11

SUBMITTER: Gary Klein
Gary Klein and Associates, Inc.
Rep: Self

RECOMMENDATION:
Revise text

408.0 Showers.

408.11 Drain Water Heat Recovery Units. Vertical drain water heat recovery units shall comply with CSA B55.2, and be tested and labeled in accordance with CSA B55.1. Sloped DWHR unit(s) shall comply with IAPMO PS 92, and be tested and labeled in accordance with IAPMO IGC 346.

Table 1701.1
<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSA B55.2-2012</td>
<td>Drain Water Heat Recovery Units</td>
<td>Miscellaneous</td>
<td>408.11</td>
</tr>
<tr>
<td>IAPMO IGC 346-2017</td>
<td>Test Method for Measuring the Performance of Drain Water Heat Recovery Units</td>
<td>Miscellaneous</td>
<td>408.11</td>
</tr>
<tr>
<td>IAPMO PS 92-2013</td>
<td>Heat Exchangers and Indirect Water Heaters</td>
<td>Miscellaneous</td>
<td>408.11</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: CSA B55.1, CSA B55.2, IAPMO IGC 346, and IAPMO PS 92 meet the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

Table 1701.2
<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO PS 92-2013</td>
<td>Heat Exchangers and Indirect Water Heaters</td>
<td>Miscellaneous</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

SUBSTANTIATION:

Drain water heat exchangers are still relatively new to most plumbers and code officials. The California Energy Commission has included provisions in the 2019 Title 24 amendments (currently in 45-day language) that enable builders to use drain water heat exchangers as a compliance option during the construction process. In addition, the Energy Commission has agreed to list compliant devices so that their performance can be verified during plan check and in the field. Since these provisions and the listing service will take effect as of January 2020, it seems advisable to include a section in the 2021 UPC that lets plumbers and code officials know that drain water heat exchangers need to comply with certain standards and to reference those standards in Table 1701.1. Alternatively, if the Technical Committee does not feel that a section in the UPC is warranted at this time, it would then seem advisable to include the standards in Table 1701.1. IAPMO PS 92 is already in this Table. Here is the substantiation for this proposal. IAPMO PS 92 was first approved in 2002, updated over the years with the most recent version being 2011, when language was added for low-slope (horizontal) drain water heat exchangers. The Canadian manufacturers of drain water heat exchangers developed CSA B55.1 and CSA B55.2, which were first published in 2012. CSA B55.1 specifies requirements for measuring the heat recovery efficiency and pressure loss for vertically installed falling film drain water heat recovery (DWHR) units. The standard applies to DWHR units of any diameter, with a configuration where potable water and drain water flow rate is equal and with a flow rate range of 1.45-3.78 gpm (5.5 to 14 L/min). CSA B55.2 specifies requirements for the durability and safety of vertically in stalled, falling-film drain water heat recovery (DWHR) units. It applies to DWHR units of any diameter and length and configuration for use with potable water, and to their components and materials supplied by the manufacturer, their assembly and installation instructions, and their operation after assembly in accordance...
with these instructions. The standard does not apply to site preparation or installation procedures. IAPMO first approved IGC 346 in 2017. This standard specifies test methods for measuring the performance, including the heat recovery efficiency and pressure loss, of sloped and vertical drain water heat recovery units. It is intended to serve as a performance assessment for producers, distributors, architects, code officials, contractors, installers and end users. The test methods for application to sloped drain water heat recovery units in this standard are referenced to the existing methods specified in CSA B55.1 except that the test specimen is installed in the test apparatus in a sloped orientation. Until IGC 346 was approved, only drain water heat exchangers intended for installation in the vertical position had an approved method of test, CSA B55.1. IGC 346 was developed to enable certification and listing of drain water heat exchangers for any drain slope, so long as the minimum slope is 1 degree. The reason that we have suggested inclusion in Section 408 Showers, is that drain water heat exchangers work best when there is a simultaneously use of both hot and cold water that lasts for several minutes at a time. If there is a better location, please place it there.
Item #: 033
UPC 2021 Section: 409.1

SUBMITTER: Christopher Jensen
UL LLC

RECOMMENDATION:
Revise text

409.0 Bathtubs and Whirlpool Bathtubs.


<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 1795-2016</td>
<td>Hydromassage Bathtubs (with revisions through December 8, 2017)</td>
<td>Fixtures</td>
<td>409.1</td>
</tr>
</tbody>
</table>

(portions of table not shown remains unchanged)

TABLE 1701.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 1795-2016</td>
<td>Hydromassage Bathtubs (with revisions through October 7, 2016)</td>
<td>Fixtures</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: UL 1795 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
UL 1795 Standard for Safety for Hydromassage Bathtubs covers the electrical safety requirements for Whirlpool bathtubs whereas ASME 112.19.7 covers the plumbing safety requirements. These bathtubs have electrical components such as circulating pumps and heaters. Referencing UL 1795 in Section 409.1 will help assure that these bathtubs are properly listed to cover all hazards and installed in accordance with the listing and manufacturers installation instructions. Although the ASME Standard references the UL Standard it is just for components not the entire assembly. In addition the ASME Standard does not require third party certification which would ensure compliance with Section 301.2 of the code.
SUBMITTER: Ronald George, CPD, President
     Plumb-Tech Design & Consulting Services LLC
     Rep: Self

RECOMMENDATION:
Revise text

409.0 Bathtubs and Whirlpool Bathtubs.

409.4 Limitation of Hot Water in Bathtubs and Whirlpool Bathtubs. The maximum hot water temperature discharging from the bathtub and whirlpool bathtub filler shall be limited to 120°F (49°C) by a device that complies with ASSE 1070/ASME A112.1070/CSA B125.70. The minimum hot water temperature supplied to the hot water side of the bathtub and whirlpool bathtub filler faucet shall be 115°F/46°C. The water heater thermostat shall not be considered a control for meeting this provision.

SUBSTANTIATION:
In many locations with Cast-iron bathtubs, in older buildings where tankless heaters are being retro-fitted, there have been some type of heaters that are not capable of providing more than a 35 degree rise (designed for lavatory hand wash applications and they count on 70 degree ambient cold water). When these types of water heaters are applied to bathtubs or showers, the flow is such that the heaters cannot provide hot water when the cold water temperature is 40 F. This code change addresses the minimum temperature required to fill a cast iron bathtub assuming heat loss from heat sync into the walls of a cold bathtub in order to provide a warm bath.
Item #: 035
UPC 2021 Section: 409.6.2

SUBMITTER: Christopher Jensen
UL LLC

RECOMMENDATION:
Add new text

409.0 Bathtubs and Whirlpool Bathtubs.

409.6 Installation and Access. (remaining text unchanged)

409.6.2 Whirlpool Bathtub Accessories. Whirlpool bathtub accessories, including heaters and blowers, shall be listed and labeled in accordance with UL 1795 and shall be installed in accordance with the terms of their listing and the manufacturer’s installation instructions.

<table>
<thead>
<tr>
<th>TABLE 1701.1</th>
<th>REFERENCED STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD NUMBER</td>
<td>STANDARD TITLE</td>
</tr>
<tr>
<td>UL 1795-2016</td>
<td>Hydromassage Bathtubs (with revisions through December 8, 2017)</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: UL 1795 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

<table>
<thead>
<tr>
<th>TABLE 1701.2</th>
<th>STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOCUMENT NUMBER</td>
<td>DOCUMENT TITLE</td>
</tr>
<tr>
<td>UL 1795-2016</td>
<td>Hydromassage Bathtubs (with revisions through October 7, 2016)</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

SUBSTANTIATION:
This proposal recognized that there are listed accessories, such as heaters and blowers, that are available to be added to whirlpool bathtubs in the field. These accessories need to be listed to the appropriate standard, and be installed in accordance with their listing and the manufacturer’s installation instructions.
Item #: 036
UPC 2021 Section: 204.0, 415.1, 417.6

SUBMITTER: Jason M Shank
Plumbers Local 55/MCA JATC

RECOMMENDATION:
Add new text

415.0 Drinking Fountains.
415.1 Application. Drinking fountains shall be self-closing and comply with ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, or ASME A112.19.3/CSA B45.4. Drinking fountains shall also comply with NSF 61. Permanently installed electric water coolers and electric bottle filling stations shall also comply with UL 399. Electric water coolers and electric bottle filling stations connected to the potable water distribution system and sanitary drainage system that are vented to atmosphere shall comply with ASSE 1023.

417.0 Faucets and Fixture Fittings.

417.6 Beverage Faucets. Beverage faucets shall be deck-mounted at the critical level of a kitchen sink. Beverage faucets shall comply with ASME A112.18.1/CSA B125.1. Beverage faucets that dispense electrically heated or chilled water and have a reservoir vented to the atmosphere shall comply with ASSE 1023. Electric devices that heat water shall comply with UL 499. Electric devices that chill water shall comply with UL 399.

204.0

Beverage Faucet. A plumbing fitting connected to the potable water distribution system that is designed and intended for filling personal use drinking water bottles or containers. The fitting discharges into a kitchen sink.

Bottle Filling Station. A plumbing fixture connected to the potable water distribution system and sanitary drainage system that is designed and intended for filling personal use drinking water bottles or containers not less than 10 inches (254 mm) in height. Such fixtures can be separate from or integral to a drinking fountain and can incorporate a water filter and a heating or cooling system for heating or chilling the drinking water.

<table>
<thead>
<tr>
<th>TABLE 1701.1</th>
<th>REFERENCED STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD NUMBER</td>
<td>STANDARD TITLE</td>
</tr>
<tr>
<td>ASME A112.18.1-2012 (R2015), CSA B125.1-2012 (R2017)</td>
<td>Plumbing Supply Fittings</td>
</tr>
<tr>
<td>ASSE 1023-1979</td>
<td>Hot Water Dispensers Household Storage Type - Electrical</td>
</tr>
<tr>
<td>UL 399-2016</td>
<td>Drinking Water Coolers (with revisions through May 17, 2017)</td>
</tr>
<tr>
<td>UL 499-2014</td>
<td>Electric Heating Appliances (with revision through February 23, 2017)</td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

Note: ASME A112.18.1, ASSE 1023, UL 399, and UL 499 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

<table>
<thead>
<tr>
<th>TABLE 1701.2</th>
<th>STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOCUMENT NUMBER</td>
<td>DOCUMENT TITLE</td>
</tr>
<tr>
<td>ASSE 1023-1979</td>
<td>Hot Water Dispensers Household Storage Type - Electrical</td>
</tr>
</tbody>
</table>
SUBSTANTIATION:
There is currently no definition in the UPC for a beverage faucet: fittings that are drinking water dispensers at the kitchen sink that provides easy access to fill a glass or bottle with water. 415.1 There are electric water coolers and water heaters that are connected to the water supply in light commercial locations to provide easy access to heated and chilled water. These devices currently are not considered in the UPC as many do not discharge into an indirect waste pipe but rather into a drip pan. For those devices that do discharge into the sanitary drainage system, they operate similar to a beverage faucet in that they heat or chill potable water. These water coolers and water heaters are typically seen either as counter-top units or as floor-standing units. 417.6 Beverage faucets are currently in the scope of ASME A112.18.1. Those beverage faucets that have an integral reservoir of hot water vented to atmosphere generally are already in compliance with ASSE 1023.
Item #: 037
UPC 2021  Section: 416.2, Table 1701.1

SUBMITTER: Julius Ballanco, P.E.
JB Engineering and Code Consulting, P.C.
Rep: Bradley Corp.

RECOMMENDATION:
Revise text

416.0 Emergency Eyewash and Shower Equipment.

416.2 Water Supply. Emergency eyewash and shower equipment shall not be limited in the water supply flow rates. Where hot and cold water is supplied to an emergency
shower or eyewash station, the temperature of the water supply shall be controlled by a temperature actuated mixing valve complying with ASSE 1071. Where water is supplied
directly to an emergency shower or eyewash station from a water heater, the water heater shall comply with ASSE 1085. The flow rate, discharge pattern, and temperature of
flushing fluids shall be provided in accordance with ISEA Z358.1.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1085-2018</td>
<td>Performance Requirements for Water Heaters for Emergency Equipment</td>
<td>Appliances</td>
<td>416.2</td>
</tr>
</tbody>
</table>

Note: ASSE 1085 is a working draft and is not completed at the time of this monograph.

SUBSTANTIATION:
There is a new ASSE standard for water heater serving emergency fixtures. The standard is ASSE 1085. This standard requires the water heater to control the temperature to a
tepid range as required for emergency fixtures. ASSE 1085 water heater provide the equivalent level of protection as an ASSE 1071 thermostatic mixing valve.
SUBMITTER: Tim Keane  
Legionella Risk Management, Inc.  
Rep: Self

RECOMMENDATION:  
Revise text

416.0 Emergency Eyewash and Shower Equipment.

416.2 Water Supply. Emergency eyewash and shower equipment shall not be limited in the water supply flow rates. Where hot and cold water is supplied to an emergency shower or eyewash station, the temperature of the water supply shall be controlled by a temperature actuated mixing valve complying with ASSE 1071. The flow rate, discharge pattern, and temperature of flushing fluids shall be provided in accordance with ISEA Z358.1.

Exceptions:
(1) Where approved by the Authority Having Jurisdiction, the temperature shall be not more than 85°F (29°C) for emergency equipment.
(2) Where the cold water supply is above 60°F (16°C) at all times, it is not required to supply hot water to emergency equipment.

SUBSTANTIATION:
The purpose of this proposal is to reduce the risk of Legionella bacteria growth in the building water systems due to low use hot and cold water drop legs at emergency eyewash and shower equipment. The high heat loads needed to heat cold water to a temperature of 100F can require very large heaters and is often an issue when designing hot water systems. I’ve done seminars across the country for plumbing designer engineers and many plumbing system designers think they must design these systems to achieve 100F. There are very few applications where 100F is needed, flushing unique chemicals such as fluorine is an example where warmer water is recommended. In all applications I’ve seen for emergency eye wash and shower equipment in healthcare, mechanical rooms, laundry areas etc. there is no requirement based on chemicals used for higher temperature water. Temperature is a catalyst for chemical reactions, so for the majority of chemical contact, cooler temperatures would be better for removal of chemicals and lessen the potential for skin or eye reactions. Also I’ve seen on many occasions where CPD’s believe tempered water, as required by Z358.1, means a local mixing valve is required. In one building, a new state crime lab, they found all their mixing valves at eye wash stations and showers heavily colonized with legionella. The temperature range of 85 to 110F should be avoided in all plumbing codes, also local mixing valves in very low use applications should be avoided where possible. In this application the temperature range of operation is not that important as these units are only operated a few minutes per week then immediately after operation the water in drop leg lines returns to room temperature. What is important is eliminating or minimizing this risk in the design phase by installing the smallest possible water supply line pipe diameters and lengths and where possible supplying no hot water, and using only cold water supply and where necessary local heat sources such as instant hot water heaters or heat tape. A more detailed discussion of Legionella risk is presented below. It is the same as the supporting statement for my proposal for Appendix N.
416.0 Emergency Eyewash and Shower Equipment.

416.4 Location. Emergency eyewash and shower equipment shall be located on the same level as the hazard and accessible for immediate use. The path of travel shall be free of obstructions and shall be clearly identified with signage.

416.4.1 Configuration for Flushing. Where there is a sink in the area, the emergency eyewash and shower equipment shall be located as close as practical to the sink. The sink and emergency equipment shall share common hot and cold branch lines such that the sink is downstream of the fixture branch to the emergency equipment. The fixture branch to the emergency equipment shall be as short as practical.

SUBSTANTIATION:
These emergency eyewash and shower fixtures are by application dead legs 1,2,3,4,5, their purpose is to be used in emergencies. They are recommended to be flushed at best once a week. However, this may only be an adequate frequency when the water quality is high and the other risks of Legionella growth are low. At the other extreme, when water quality is low and other risks are high, flushing these dead legs once a week may be insufficient to control the risk of Legionella growth. In almost all locations where there is an eye wash or shower, there is a commonly used sink nearby such as at a nurses’ station or in a mechanical room. If hot and cold water are supplied to an emergency shower mixing valve and lines are run from those hot and cold water immediately prior to the mixing valve to supply hot and cold water to the sink then every time the sink is used, the drop legs to the emergency shower all the way up to the mixing valve are flushed. With this design installation, flushing the emergency eyewash or shower once a week will in almost all cases control the risk of Legionella. Here is the substantiation for this proposal. Dead legs are a known and well documented source for Legionella growth that can then contaminate entire building water systems 1,2,3,4,5,6,7. All Legionella standards and guidelines recommend eliminating dead legs in plumbing systems. The only thing that would prevent Legionella grown in dead legs from contaminating adjacent piping would be a back flow preventer at or near the supply line to the dead leg. A backflow preventer at the supply line would not reduce the risk of Legionella transmission from the dead leg when opened, accordingly isolating dead legs with backflow preventers is not recommended, what is recommended is eliminating dead legs. Legionella in building water systems has become a major concern for public health with the incidence of Legionnaires’ disease growing by 500% from 0.4 cases per 100,000 people in 2000 to 2.0 cases per 100,000 people in 20158,9. Where does Legionella grow within the building water system? It enters the building through the potable water supply. It grows where there are nutrients, where the disinfectant is longer adequate and where the temperatures support growth and where water is stagnant. The disinfectant that comes in with the potable water generally prevents the growth of the pathogen on the cold-water side of the plumbing system, so long as there is regular turnover of the water in the piping. The amount of residual chlorine in piping decreases the longer the water stays in the plumbing system, this is referred to as water aging. This happens whenever the frequencies of uses are very low or there are long periods of no use. Below 78°F, Legionella bacteria can survive, but are dormant. At 120°F Legionella can survive but do not multiply. At 140°F it dies within 32 minutes. Legionella bacteria grow extremely well when the temperature is between 85 and 110°F. Water temperatures can be in this range in both the cold and hot water distribution systems, although more frequently in the hot water piping. Also, these temperatures can result in cold water pipes located in rooms where the ambient air temperature is warm such as mechanical rooms or where the cold-water piping is in close proximity to a source of heat, such as an uninsulated or poorly insulated hot water pipe, heating equipment or equipment that releases heat. Reference statements regarding Emergency Eye Wash and Safety Showers Draft ASHRAE Guideline 12 (2018)5 Potable water design section of states, “Eye wash and safety showers. Infrequently used components, such as eye wash or safety shower stations, should be located at the beginning or middle of a branch and as near as practical to a commonly used fixture, in order to reduce stagnation and facilitate flushing.” OSHA Technical Manual Section III: Chapter 7 Legionnaires’ Disease (1999)6 B. Common Sources of Contaminated Water. 1. Water sources that frequently provide optimal conditions for growth of the organisms include: other sources including stagnant water in fire sprinkler systems and warm water for eye washes and safety showers.
Item #: 040
UPC 2021 Section: 420.0, 420.1, Table 1701.1

SUBMITTER: Tim Collings
Self

RECOMMENDATION:
Revise text

420.0 Sinks.


<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO IGC 127-2018</td>
<td>Combined Hand-Washing Systems</td>
<td>Fixtures</td>
<td>420.1</td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

Note: IAPMO IGC 127 meets the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
There is no standard referenced for compliance of combined washing systems. The scope of IGC 127 covers combined hand-washing systems. The products covered by IGC 127 are required to comply with a lifecycle test for the system in addition to compliance with the standards that address individual aspects of the product such as ASME A112.19.2/CSA B45.1 for ceramic plumbing fixtures and ASME A112.18.2/CSA B125.2 for waste fittings.
422.0 Clothes Washing Machines.

422.1 Application. Clothes washing machines for household use and commercial use by the general public shall comply with UL 2157. Commercial, industrial and institutional clothes-washing equipment for use by trained or supervised personnel shall comply with UL 1206.

422.2 Backflow Protection. The water supply connection to a clothes washing machine shall be in accordance with Section 603.5.5.

422.3 Drainage Connection. Clothes washing machines shall discharge through an air break into a standpipe in accordance with Section 804.1 or a laundry sink.

(renumber remaining sections)

TABLE 1701.1

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 1206-2003</td>
<td>Electric Commercial Clothes-Washing Equipment (with revisions through October 3, 2017)</td>
<td>Appliances</td>
<td>422.1</td>
</tr>
<tr>
<td>UL 2157-2015</td>
<td>Electric Clothes Washing Machines and Extractors</td>
<td>Appliances</td>
<td>422.1</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: UL 1206 and UL 2157 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

TABLE 1701.2

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 1206-2003</td>
<td>Electric Commercial Clothes-Washing Equipment (with revisions through November 30, 2012)</td>
<td>Appliances</td>
</tr>
<tr>
<td>UL 2157-2015</td>
<td>Electric Clothes Washing Machines and Extractors</td>
<td>Appliances</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

SUBSTANTIATION:
Clothes washing machines are common appliances that are connected to a building's water supply and drainage system. The code should have specific requirements to address the appropriate safety standards for clothes washing machines including both electrical and water hazards. Clothes washing machines contain electric motors, lights and controls that can pose an electrical shock and fire hazard. Additionally, the backflow protection for the domestic water supply and drainage connection for these appliances should be appropriately addressed in one location. Adding this new section in Chapter 4 provides needed clarity for the proper installation of clothes washing machines. Note: Renumber existing Section 422 to Section 423 so the new Section 422 appears at the end of the list of specific fixtures and before the minimum number of required fixtures.
TABLE 501.1(1)
WATER HEATERS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>STANDARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric, Household Storage</td>
<td>UL 174</td>
</tr>
<tr>
<td>Oil-Fired Storage Tank</td>
<td>UL 732</td>
</tr>
<tr>
<td>Gas-Fired, 75,000 Btu/h or less, Storage</td>
<td>CSA Z21.10.1</td>
</tr>
<tr>
<td>Gas-Fired, Above 75,000 Btu/h, Storage and Instantaneous</td>
<td>CSA Z21.10.3</td>
</tr>
<tr>
<td>Electric, Commercial Storage</td>
<td>UL 1453</td>
</tr>
<tr>
<td>Solid Fuel-Fired</td>
<td>UL 2523</td>
</tr>
<tr>
<td>Electric Instantaneous</td>
<td>UL 499</td>
</tr>
</tbody>
</table>

For SI units: 1000 British thermal units per hour = 0.293 kW

TABLE 1701.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 499-2014</td>
<td>Electric Heating Appliances (with revisions through February 23, 2017)</td>
<td>Appliances</td>
<td>Table 501.1(1)</td>
</tr>
</tbody>
</table>

Note: UL 499 meets the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
Electric Instantaneous water heaters are becoming a common appliance in homes and commercial installations. The UL Standard for listing and certifying instantaneous water heaters is UL 499. This Standard should be added to this list of Standards used for other types of water heaters. Additionally, adding the term “Storage” “Fired” and “Instantaneous” where applicable to the titles of the existing Standards in this Table will help Authorities Having Jurisdiction verify compliance with the appropriate Standards. These Standards are Titled: • UL 174 Household Electric Storage Tank Water Heaters • UL 732 Oil-fired Storage Tank Water Heaters • CSA Z21.10.1 Gas water heaters, volume I, storage water heaters with input ratings of 75,000 Btu per hour or less • CSA Z21.10.3 Gas-fired water heaters, volume III, storage water heaters with input ratings above 75,000 Btu per hour, circulating and instantaneous. • UL 1453 Electric Booster and Commercial Storage Tank Water Heaters • UL 2523 Solid Fuel-Fired Hydronic Heating Appliances, Water Heaters, and Boilers • UL 499 Electric Heating Appliances
Item #: 043
UPC 2021  Section: TIA UPC Chapter 5, Table 501.1(2)

SUBMITTER: Frank Stanonik
Air-Conditioning, Heating, and Refrigeration Institute

RECOMMENDATION:
Revise text

<table>
<thead>
<tr>
<th>TABLE 501.1(2)</th>
<th>FIRST HOUR RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Bathrooms</td>
<td>1 to 1.5</td>
</tr>
<tr>
<td>Number of Bedrooms</td>
<td>1 to 1.5</td>
</tr>
<tr>
<td>First Hour Rating, 2 Gallons</td>
<td>42</td>
</tr>
</tbody>
</table>

For SI units: 1 gallon = 3.785 L

Notes:
1. The first hour rating is found on the “Energy Guide” label.
2. Solar water heaters shall be sized to meet the appropriate first hour rating as shown in the table.

SUBSTANTIATION:
Technical Merit: The U.S. Department of Energy has significantly revised the test procedures for measuring the efficiency of residential water heaters. Those revisions include changes to the method for determining the First Hour Rating (FHR) of all residential storage water heaters. Manufacturers will be required to display the revised First Hour Ratings starting in June 2017. The general effect of the revised method is a FHR that is lower than the previous value determined for a given model. As a result, the First Hour Rating requirements in the table noted above must be edited to reflect the new procedure for determining the FHR. The revised DOE test procedure can be found at the following link: https://www.ecfr.gov/cgi-bin/textidx?SID=80dfaf785ea350ebee184bb0ae03e7f80&mc=true&node=ap10.3.430_127.e&rgn=div9. Also attached is the December 29, 2016 final rule that provided conversion factors to adjust existing ratings to the new test procedure. The table on page 96232 shows the conversion factors for the first hour ratings of the various types of water heaters. Emergency nature: If these changes are not made to the Uniform Plumbing Code, products that met the current requirements and which have not changed in their design or input rating will no longer comply with the table. Also, the table, if unchanged, will drive contractors to select larger, higher cost water heaters, which are oversized to meet the needs of the applications. Those selections will not be the most cost-effective, efficient choice for the consumer. If the table is unchanged, the revised DOE method for measuring FHR will make the table more restrictive. No additional training should be required.
504.0 Water Heater Requirements.

504.1 Location. Water heater installations in bedrooms and bathrooms shall comply with one of the following [NFPA 54:10.27.1]:

(1) Fuel-burning water heaters shall be permitted to be installed in a closet located in the bedroom or bathroom provided the closet is equipped with a listed, gasketed door assembly and a listed self-closing device. The selfclosing door assembly shall meet the requirements of Section 504.1.1. The door assembly shall be installed with a threshold and bottom door seal and shall meet the requirements of Section 504.1.2. Combustion air for such installations shall be obtained from the outdoors in accordance with Section 506.4. The closet shall be for the exclusive use of the water heater.

(2) Water heater shall be of the direct vent type. [NFPA 54:10.27.1(2)]

(3) Household electric storage tank water heaters listed and labeled to UL174 and installed in accordance with the manufacturers installation instructions.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 174-2004</td>
<td>Household Electric Storage Tank Water Heaters</td>
<td>Appliances</td>
<td>504.1(1), Table 501.1(1)</td>
</tr>
</tbody>
</table>

Note: UL 174 meet the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
Electric water heaters do not produce products of combustion nor do they require combustion air. The location limitations found in Section 504.1 address installation of fuel-burning appliances and the need for proper combustion air and removal of products of combustion. This change acknowledges that a listed electric water heater installed in accordance with its listing and manufacturers installation instructions need not be installed in a space meeting Section 504.1(1).
507.0 Appliance and Equipment Installation Requirements.

507.2 Seismic Provisions. In seismic design categories C, D, E, and F, water heaters shall be anchored or strapped to resist horizontal displacement due to earthquake motion. Strapping shall be at points within the upper one-third and lower one-third of its vertical dimensions. At the lower point, a distance of not less than 4 inches (102 mm) shall be maintained from the controls with the strapping.

SUBSTANTIATION:
There have been fire and property damage due to falling or moving water heaters. Where earthquake motion moves a water heater, there are times when heaters do not fall over, however, the connectors are sometimes ripped off. This proposed code change removes the specific seismic design categories and makes the anchor and strapping requirements mandatory for all installations. One cannot predict where and when an earthquake or other force of nature will move the ground, and create possible dangers with water heaters that are not secured.
Item #: 046
UPC 2021  Section: 507.2

SUBMITTER: Richard Houle  
Reliance Worldwide Corporation

RECOMMENDATION: 
Revise text

507.0 Appliance and Equipment Installation Requirements.

507.2 Water Heater Supports. Tank type water heaters shall be laterally supported to prevent the water heater from tipping over. The support shall be attached on the upper one-third of the tank. The support shall not compromise the outer shell of the tank and shall be installed in accordance with the water heater manufacturer's installation instructions.

507.2.1 Seismic Provisions. In seismic design categories C, D, E and F, water heaters shall be anchored or strapped to resist horizontal displacement due to earthquake motion. Strapping shall be at points within the upper one-third and lower one-third of its vertical dimensions. At the lower point, a distance of not less than 4 inches (102 mm) shall be maintained from the controls with the strapping.

SUBSTANTIATION:
Heavy equipment, especially those with a high center of gravity such as a storage water heater, can be knocked over accidentally. When they do: a. There is the potential for bodily injury or death, should the equipment tip over onto a person b. There is the potential for a fire and/or explosion, should a fuel gas line be damaged or ruptured due to the equipment’s movement. In the case of a water heater or similar large water containing vessel, a vital source of potable water storage can be lost if the tank tips over and drains out onto the ground. This code requirement currently exists in the building code for equipment weighing 400 lbs or more. A 40 gallon water heater will weigh close to 400 lbs when filled with water.
Item #: 047
UPC 2021  Section: 508.2.1, 508.2.1.1

SUBMITTER: David Dias
Sheet Metal Workers Local 104

RECOMMENDATION:
Revise text

508.0 Appliances on Roofs.

508.2 Installation of Appliances on Roofs. (remaining text unchanged)

508.2.1 Edge of Roof Clearance. Appliances shall be installed on a well-drained surface of the roof. At least 6 feet (1829 mm) of clearance shall be available between any part of the appliance, and the edge of a roof or similar hazard.  

508.2.1.1 Guards or Rails. Where the clearance between the appliance and the edge of roof is not met as required in Section 508.2.1, rigidly fixed rails, guards, parapets, or other building structures at least 42 inches (1067 mm) in height shall be provided on the exposed side. [NFPA 54:9.4.2.2] Guards shall not be required where personnel fall protection in accordance with ASSE Z359.1 is installed.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE Z359.1-2016</td>
<td>The Fall Protection Code</td>
<td>Miscellaneous</td>
<td>508.2.1.1</td>
</tr>
</tbody>
</table>

(remaining table not shown remain unchanged)

Note: ASSE Z359.1 meets the requirements for a mandatory reference standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
Section 508.2.1 is being revised to separate the guards requirement in a separate location for ease of use of the document. Furthermore, guards are not necessary where personnel fall protection is provided in accordance with ASSE Z359 is installed. This is similar to the current OSHA requirements.
Item #: 048
UPC 2021 Section: 509.5.1.2

SUBMITTER: David Dias
Sheet Metal Workers Local 104

RECOMMENDATION:
Revise text

509.5 Masonry, Metal, and Factory-Built Chimneys. (remaining text unchanged)

509.5.1 Factory-Built Chimneys. (remaining text unchanged)

509.5.1.2 Listing Requirements. Factory-built chimneys shall comply with the requirements of UL 103, or UL 959 or UL 2561. Factory-built chimneys for use with wood-burning appliances shall comply with the Type HT requirements of UL 103. [NFPA 211:6.1.3.1]

### TABLE 1701.1
**REFERENCED STANDARDS**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 2561-2016</td>
<td>Standard for Safety - 1400 Degree Fahrenheit Factory-Built Chimneys</td>
<td>Fuel Gas, Appliances</td>
<td>509.5.1.2</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: UL 2561 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

**SUBSTANTIATION:**
Section 509.5.1.2 is being revised to include the correct standards for factory-built chimneys. This is consistent with current industry standards.
506.3 Indoor Opening Size and Location. Openings used to connect indoor spaces shall be sized and located in accordance with the following:

1. Combining spaces in the same story. Each opening shall have a minimum free area of not less than 1 square inch per 1000 Btu/h (0.002 m²/kW) of the total input rating of all appliances in the space, but not less than 100 square inches (0.65 m²). One permanent opening shall commence within 12 inches (305 mm) of the top of the enclosure, and one permanent opening shall commence within 12 inches (305 mm) of the bottom of the enclosure (see Figure 506.3). The minimum dimension of air openings shall not be not less than 3 inches (76 mm).

2. Combining spaces in different stories. The volumes of spaces in different stories shall be considered as communicating spaces where such spaces are connected by one or more permanent openings in doors or floors having a total minimum free area of not less than 2 square inches per 1000 Btu/h (0.004 m²/kW) of total input rating of all appliances. [NFPA 54.9.3.2.3]

509.7.3.6 Roof Thimble. Where a single-wall metal pipe passes through a roof constructed of combustible material, a noncombustible, nonventilating thimble shall be used at the point of passage. The thimble shall extend not less than at least 18 inches (457 mm) above and 6 inches (152 mm) below the roof with the annular space open at the bottom and closed only at the top. The thimble shall be sized in accordance with Section 509.7.3.5. [NFPA 54:12.8.4.5]

509.7.4 Size of Single-Wall Metal Pipe. Single-wall metal piping shall comply with the following requirements: Section 509.7.4.1 through Section 509.7.4.3. [NFPA 54:12.8.5]

509.7.4.1 Staging of Venting System. Where a venting system of a single-wall metal pipe shall be sized in accordance with one of the following methods and the appliance manufacturer's instructions:

1. For a draft hood-equipped appliance, in accordance with Section 510.0.

2. For a venting system for a single appliance with a draft hood, the areas of the connector and the pipe each shall be not less than 2 square inches per 1000 Btu/h (0.004 m²/kW) of total input rating of all appliances. [NFPA 54.9.3.2.3]

509.7.4.2 Non-Round Metal Pipe. Where a single-wall metal pipe is used and has a shape other than round, it shall have an equivalent effective area equal to the effective area of the round pipe for which it is substituted, and the minimum internal dimension of the pipe shall be not less than 2 inches (50 mm). [NFPA 54:12.8.5.4]

509.7.4.3 Venting Capacity. The vent cap or a roof assembly shall have a venting capacity not less than that of the pipe to which it is attached. [NFPA 54:12.8.5.5]

509.7.5 Support of Single-Wall Metal Pipe. All portions of single-wall metal pipe shall be supported for the design and weight of the material employed. [NFPA 54:12.8.6]

509.8.2 Direct-Vent Appliance. The vent terminal of a direct-vent appliance with an input of 10 000 Btu/h (2.93 kW) or less vent terminals shall be located at least 6 inches (152 mm) from any air opening into a building, an appliance with an input over 10 000 Btu/h (2.93 kW) but not over 50 000 Btu/h (14.7 kW) shall have at least a 12 inch (305 mm) vent termination clearance in accordance with Table 509.8.2. The bottom of the vent terminal and the air intake shall be located at least not less than 12 inches (305 mm) above finished ground level. [NFPA 54:12.9.3]

506.5.3 Outdoor Opening(s) Size. The outdoor opening(s) size shall be calculated in accordance with the following:

1. The ratio of the interior spaces shall be the available volume of the all communicating spaces divided by the required volume.

2. The outdoor size reduction factor shall be one minus the ratio of interior spaces.

3. The minimum size of outdoor opening(s) shall be not less than the full size of outdoor opening(s) calculated in accordance with Section 506.4, multiplied by the reduction factor. The minimum dimension of air openings shall not be not less than 3 inches (76 mm). [NFPA 54.9.3.4(3)]

507.11 Process Air. In addition to air needed for combustion in commercial or industrial processes, process air shall be provided as required for cooling of appliances, equipment, or material; for controlling dew point, heating, drying, oxidation, dilution, safety exhaust, odor control, and air for compressors; and for comfort and proper working conditions for personnel. [NFPA 54:9.1.7]

507.17 Extra Device or Attachment. No device or attachment shall be installed on an appliance that is capable of impairing could in any way impair the combustion of gas. [NFPA 54:9.1.15]

507.23 Combination of Appliances and Equipment. Any combination of appliances, equipment, attachments, or devices used together in any manner shall be in accordance comply with the standards that apply to the individual appliance and equipment. [NFPA 54:9.1.21]
507.24 Installation Instructions. The installing agency shall comply with the appliance and equipment manufacturer’s installation instructions and recommendations in completing an installation. The installing agency shall leave the appliance’s installation, operating, and maintenance instructions in a location on the premises where they are readily available for reference and guidance of the Authority Having Jurisdiction, service personnel, and the owner or operator. [NFPA 54:9.1.22]

508.0 Appliances on Roofs.

508.0.2 Fasteners. Access All access locks, screws, and bolts shall be of corrosion-resistant material. [NFPA 54:9.4.1.3]

509.2.4 Ventilating Hoods. The use of ventilating hoods and exhaust systems shall be limited to vent appliances to the outdoors. [NFPA 54:12.3.3]

509.2.5 Well-Ventilated Spaces. The operation of flue gases from industrial-type appliances shall be limited to vented to the outdoors where such gases are discharged directly into a large and well-ventilated industrial space. [NFPA 54:12.3.4]

509.3 Design and Construction Minimum Safe Performance. Venting systems shall be designed and constructed to convey all flue and vent gases to the outdoors. [NFPA 54:12.1]

509.3.3 Mechanical Draft Systems. Mechanical draft systems shall be listed in accordance with UL 378 and installed in accordance with both the appliance and the mechanical draft system manufacturer’s installation instructions. [NFPA 54:12.4.3.1]

509.3.3.2 Leakage. Forced draft systems and all portions of induced draft systems under positive pressure during operation shall be designed and installed so as to prevent leakage of flue or vent gases into a building. [NFPA 54:12.4.3.3]

509.3.4 Ventilating Hoods and Exhaust Systems. Ventilating hoods and exhaust systems shall be permitted to be used to vent appliances installed in commercial applications. [NFPA 54:12.5.1]

509.3.4.1 Automatically Operated Appliances. Where automatically operated appliances, other than commercial cooking appliances, are vented through a ventilating hood or exhaust system equipped with a damper or with a power means of exhaust, provisions shall be made to allow the flow of gas to the main burners when the damper is open to a position to properly vent the appliance and when the power means of exhaust is in operation. [NFPA 54:12.4.4.21]

509.3.5 Circulating Air Ducts, Above-Ceiling Air-Handling Saccps, and Furnace Plenums. Venting systems shall not extend into or pass through any fabricated air duct or furnace plenum. [NFPA 54:12.4.5.1]

509.4 Type of Venting System to be Used. The type of venting system to be used shall be in accordance with Table 509.4. [NFPA 54:12.5.1]

509.4.1 Plastic Piping. Where plastic piping is used to vent an appliance, the appliance shall be listed for use with such venting materials and the appliance manufacturer’s installation instructions shall identify the specific plastic piping material. The plastic pipe venting materials shall be labeled in accordance with the product standards specified by the appliance manufacturer or shall be listed and labeled in accordance with UL 1738. [NFPA 54:12.5.2]

509.4.2 Plastic Vent Joints. Plastic pipe and fittings used to vent appliances shall be installed in accordance with the appliance manufacturer’s installation instructions. Plastic pipe venting materials listed and labeled in accordance with ANSI/UL 1738 shall be installed in accordance with the vent manufacturer’s installation instructions. Where primer is required, it shall be of a contrasting color. [NFPA 54:12.5.3]

509.4.3 Special Gas Vents. Special gas vents shall be listed and labeled in accordance with UL 1738 and installed in accordance with the special gas vent manufacturer’s installation instructions. [NFPA 54:12.5.4]

509.5.2 Metal Chimneys. Metal chimneys shall be built and installed in accordance with NFPA 211. [NFPA 54:12.6.1.2]

509.5.3 Masonry Chimneys. Masonry chimneys shall be built and installed in accordance with NFPA 211 and lined with approved one of the following:

1. Approved clay flue lining
2. A chimney lining system, or other listed and labeled in accordance with UL 1777
3. Other approved material that resists corrosion, erosion, softening, or cracking from vent gases at temperatures not exceeding up to 1800°F (982°C).

Exception: Masonry chimney flues lined with a chimney lining system specifically listed for use with listed appliances with draft hoods, Category 1 appliances, and other appliances listed for use with Type B vents shall be permitted. The liner shall be installed in accordance with the liner manufacturer’s installation instructions. A permanent identifying label shall be attached at the point where the connection is to be made to the liner. The label shall read: “This chimney liner is for appliances that burn gas only. Do not connect to solid- or liquid-fuel-burning appliances or incinerators.” [NFPA 54:12.6.1.3]

509.5.6 Cleanouts. Cleanouts shall be examined to determine that and where they will do not remain tightly closed when not in use. [NFPA 54:12.6.4.3]

509.5.6.3 Existing Chimney. When inspection reveals that an existing chimney is not safe for the intended application, it shall be repaired, rebuilt, lined, relined, or replaced with a vent or chimney suitable for the appliances to be attached. [NFPA 54:12.6.4.4]

509.5.7.3 Combination Gas- and Oil-Burning Appliances. A single chimney flue serving a listed combination gas- and oil-burning appliance shall be sized to properly vent in accordance with the appliance manufacturer’s instructions. [NFPA 54:12.6.5.4]

509.6.1 Termination Requirements. The termination of gas vents shall comply with the following requirements:

1. A gas vent shall terminate in accordance with one of the following:
   1a) Gas vents that are 12 inches (300 mm) or less in size and located not less than 8 feet (2438 mm) from a vertical wall or similar obstruction shall terminate above the roof in accordance with Figure 509.6.1 and Table 509.6.1.
   1b) Gas vents that are over 12 inches (300 mm) in size or are located less than 8 feet (2438 mm) from a vertical wall or similar obstruction shall terminate not less than 2 feet (610 mm) above the highest point where they pass through the roof and not less than 2 feet (610 mm) above any portion of a building within 10 feet (3048 mm) horizontally.
   1c) Industrial appliances as provided in Section 509.2.5.
   1d) Direct-vent systems as provided in Section 509.2.6.
   1e) Appliance vents with integral vents as provided in Section 509.2.7.
   1f) Mechanical draft systems as provided in Section 509.3 through Section 509.3.3.5.
   1g) Ventilating hoods and exhaust systems as provided in Section 509.3.4 and Section 509.3.4.1. [NFPA 54:12.7.2(1)]

2. Type B and L Vents. A Type B or a Type L gas vent shall terminate at least 5 feet (1524 mm) in vertical height above the highest connected appliance draft hood or flue collar. [NFPA 54:12.7.2(2)]
509.6.4.2 Type B-W Vents. A Type B-W gas vent shall terminate at least 12 feet (3658 mm) in vertical height above the bottom of the wall furnace. [NFPA 54:12.7.3(4)]

509.6.4.3 Exterior Wall Termination. A gas vent extending through an exterior wall shall not terminate adjacent to the wall or below eaves or parapets, except as provided in Section 509.2.6 and Section 509.3.3 through Section 509.3.3.5. [NFPA 54:12.7.3(5)]

509.6.4.1 Decorative Shrouds. Decorative shrouds shall not be installed at the termination of gas vents except where such shrouds are listed for use with the specific gas venting system and are installed in accordance with the manufacturer’s installation instructions. [NFPA 54:12.7.3(6)]

509.6.4.4 Termination Shrouds. All gas vents shall extend through the roof flashing, roof jack, or roof thimble and terminate with a listed cap or listed roof assembly. [NFPA 54:12.7.3(7)]

509.6.4.5 Forced Air Inlet. A gas vent shall terminate at least 3 feet (914 mm) above a forced air inlet located within 10 feet (3048 mm). [NFPA 54:12.7.3(8)]

509.6.2 Size of Gas Vents. Venting systems shall be sized and constructed in accordance with Section 510.0 through Section 510.6.2 for other approved engineering methods and the gas vent and the appliance manufacturer’s instructions. [NFPA 54:12.7.3(9)]

509.7.3.1 Limitations. Single-wall metal pipe shall be used only for runs directly from the space in which the appliance is located through the roof or exterior wall to the outer air. A pipe passing through a roof shall extend without interruption through the roof flashing, roof jacket, or roof thimble. [NFPA 54:12.8.4.2]

509.7.3.2 Attic or Concealed Space. Single-wall metal pipe shall not originate in any unoccupied attic or concealed space and shall not pass through any attic, inside wall, concealed space, or floor. [NFPA 54:12.8.4.3]

509.7.3.6 Roof Thimble. Where a single-wall metal pipe passes through a roof constructed of combustible material, a noncombustible, nonventilating thimble shall be used at the point of passage. The thimble shall extend not less than 18 inches (457 mm) above and 6 inches (152 mm) below the roof with the annular space open at the bottom and closed only at the top. The thimble shall be sized in accordance with Section 509.7.3.5. [NFPA 54:12.8.4.5]

509.7.4 Size of Single-Wall Metal Pipe. Single-wall metal piping shall comply with the following requirements. Section 509.7.4.1 through Section 509.7.4.3. [NFPA 54:12.8.4.6]

509.7.4.1 Sizing of Venting System. A venting system of a single-wall metal pipe shall be sized in accordance with one of the following methods and the appliance manufacturer’s instructions:

(4) For a draft hood-equipped appliance, in accordance with Section 510.0.

(5) For a venting system for a single appliance with a draft hood, the areas of the connector and the pipe each shall be not less than seven times the draft hood outlet area.

(6) Other approved engineering methods. [NFPA 54:12.8.4.11]

509.7.4.2 Non-Round Metal Pipe. Where a single-wall metal pipe is used and has a shape other than round, it shall have an equivalent effective area equal to the effective area of the round pipe for which it is substituted, and the minimum internal dimension of the pipe shall be not less than 1.5 inches (38 mm). [NFPA 54:12.8.4.12]

509.7.4.3 Venting Capacity. The vent cap or a roof assembly shall have a venting capacity not less than that of the pipe to which it is attached. [NFPA 54:12.8.4.13]

509.7.5 Support of Single-Wall Metal Pipe. All portions of single-wall metal pipe shall be supported for the design and weight of the material employed. [NFPA 54:12.8.6]

509.8.2 Direct-Vent Appliance. The vent terminal of a direct-vent appliance with an input of 10,000 Btu (2.93 kW) or less vent terminals shall be located at least 6 inches (152 mm) from any air opening into a building, an appliance with an input over 10,000 Btu (2.93 kW) but not over 50,000 Btu (14.7 kW) shall be installed with a 3 inch (76 mm) vent termination clearance, and an appliance with an input over 50,000 Btu (14.7 kW) shall have at least a 12 inch (305 mm) vent termination clearance in accordance with Table 509.8.2. The bottom of the vent terminal and the air intake shall be located at least not less than 12 inches (305 mm) above finished ground level. [NFPA 54:12.9.3]

<table>
<thead>
<tr>
<th>DIRECT VENT APPLIANCE</th>
<th>THROUGH THE WALL DIRECT VENT TERMINATION CLEARANCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT RATING</td>
<td>THROUGH THE WALL TERMINAL CLEARANCE FROM ANY AIR</td>
</tr>
<tr>
<td>OPENS INTO A BUILDING</td>
<td></td>
</tr>
</tbody>
</table>

[FIGURE 509.7.3.4(1)]

EXTENT OF PROTECTION NECESSARY TO REDUCE CLEARANCES FROM GAS APPLIANCES OR VENT CONNECTORS

[FIGURE 509.7.3.4(2)]

FIGURE 509.7.3.4(1) EXTENT OF PROTECTION NECESSARY TO REDUCE CLEARANCES FROM GAS APPLIANCES OR VENT CONNECTORS

[FIGURE 509.7.3.4(3)]

FIGURE 509.7.3.4(2) EXTENT OF PROTECTION NECESSARY TO REDUCE CLEARANCES FROM GAS APPLIANCES OR VENT CONNECTORS

<table>
<thead>
<tr>
<th>INPUT RATING</th>
<th>THROUGH THE WALL DIRECT VENT TERMINATION CLEARANCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIRECT VENT APPLIANCE</td>
<td>THROUGH THE WALL TERMINAL CLEARANCE FROM ANY AIR</td>
</tr>
<tr>
<td>INPUT RATING</td>
<td>OPENS INTO A BUILDING</td>
</tr>
</tbody>
</table>

1. A = Equals the clearance with no protection specified in Table 509.7.3.4(1) and Table 509.7.3.4(2) and in the sections applying to various types of combustible material.

2. B = Equals the reduced clearance permitted in accordance with Table 509.7.3.4(2).

3. The protection applied to the construction using combustible material shall extend far enough in each direction to make C equal to A.
509.10.2.2 Size. Where two or more appliances are connected to a common vent or chimney, each vent connector shall be sized in accordance with Section 510.0 or other approved engineering methods. [NFPA 54:12.11.3.3]

As an alternative method applicable only where all of the appliances are draft-hood-equipped, each vent connector shall have an effective area not less than the area of the draft hood outlet of the appliance to which it is connected. [NFPA 54:12.11.3.4]

509.10.3.2 Pressure. Vent connectors serving Category I appliances shall not be connected to any portion of a mechanical draft system operating under positive static pressure, such as those serving Category III or Category IV appliances. [NFPA 54:12.11.4.3]

509.10.4 Clearance. Minimum clearances from vent connectors to combustible material shall comply with Table 509.7.3.4(1).

Exception: The clearance between a vent connector and combustible material shall be permitted to be reduced where the combustible material is protected as specified for vent connectors in Table 509.7.3.4(2). [NFPA 54:12.11.5]

509.12.2 Draft Control Devices. Where a draft control device is part of the appliance or is supplied by the appliance manufacturer, it shall be installed in accordance with the manufacturer’s installation instructions. In the absence of manufacturer’s installation instructions, the device shall be attached to the flue collar of the appliance or as near to the appliance as practical. [NFPA 54:12.13.3]

509.12.3 Additional Devices. Appliances requiring controlled chimney draft shall be permitted to be equipped with listed double-acting barometric draft regulators installed and adjusted in accordance with the manufacturer’s installation instructions. [NFPA 54:12.13.4]

509.12.4 Location. Draft hoods and barometric draft regulators shall be installed in the same room or enclosure as the appliance in such a manner as to prevent any difference in pressure between the hood or regulator and the combustion air supply. [NFPA 54:12.13.5]

509.12.5 Positioning. Draft hoods and draft regulators shall be installed in the position for which they were designed with reference to the horizontal and vertical planes and shall be located so that the relief opening is not obstructed by any part of the appliance or adjacent construction. The appliance and its draft hood shall be located so that the relief opening is accessible for checking vent operation. [NFPA 54:12.13.6]

509.12.6 Clearance. A draft hood shall be located so that its relief opening is not less than 6 inches (152 mm) from any surface except that of the appliance it serves and the venting system to which the draft hood is connected. Where a greater or lesser clearance is indicated on the appliance label, the clearance shall not be less than that specified on the label. Such clearances shall not be reduced. [NFPA 54:12.13.7]

509.13 Manually Operated Dampers. A manually operated damper shall not be placed in any appliance vent connector. Fixed baffles shall not be classified as manually operated dampers. [NFPA 54:12.14]

509.15 Obstructions. Devices that retard the flow of vent gases shall not be installed in a vent connector, chimney, or vent. The following shall not be considered as obstructions:

(1) Draft regulators and safety controls specifically listed for installation in venting systems and installed in accordance with the manufacturer’s installation instructions.

(2) Approved draft regulators and safety controls designed and installed in accordance with approved engineering methods.

(3) Listed heat reclaimers and automatically operated vent dampers installed in accordance with the manufacturer’s installation instructions.

(4) Vent dampers serving listed appliances installed in accordance with Section 510.1 or Section 510.2 or other approved engineering methods.

(5) Approved economizers, heat reclaimers, and recuperators installed in venting systems of appliances not required to be equipped with draft hoods, provided the appliance manufacturer’s installation instructions cover the installation of such a device in the venting system and performance in accordance with Section 509.3 and Section 509.3.1 is obtained. [NFPA 54:12.16]

510.1 Single Appliance Vent Table 510.1.2(1) through Table 510.1.2(6). Venting Table 510.1.2(1) through Table 510.1.2(6) shall not be used where obstructions are installed in the venting system. The installation of vents serving listed appliances with vent dampers shall be in accordance with the appliance manufacturer’s installation instructions or in accordance with the following:

(1) The minimum capacity shall be determined using the “NAT Max” column.

(2) The minimum capacity shall be determined as though the appliance were a fan-assisted appliance, using the “FAN Min” column to determine the minimum capacity of the vent system. Where the corresponding “FAN Min” is “NA”, the vent configuration shall not be permitted, and an alternative venting configuration shall be utilized. [NFPA 54:12.13.1.1]

510.1.13 Single Run of Vent. In a single run of vent or vent connector, more than one diameter and type shall be permitted to be used, provided that all the sizes and types are permitted by the tables. [NFPA 54:13.1.14]

510.2.10 High-Altitude Installations. Sea level input ratings shall be used when determining maximum capacity for high-altitude installation. Actual input (derated for altitude) shall be used for determining minimum capacity for high-altitude installation. [NFPA 54:13.2.11]

510.2.12 Vent Height. For multiple appliances located on one floor, the available total height (H) shall be measured from the highest draft hood outlet or flue collar up to the level of the outlet of the common vent. [NFPA 54:13.2.13]

510.2.13 Multistory Installations. For multistory installations, the available total height (H) for each segment of the system shall be the vertical distance between the highest draft hood outlet or flue collar entering that segment and the centerline of the next higher interconnection tee. [NFPA 54:13.2.14]

510.2.23 Multiple Connector and Vent Sizes. Where a table permits more than one diameter of pipe to be used for a connector or vent, all the permitted sizes shall be permitted to be used. [NFPA 54:13.2.26]
99% Winter Design Temperatures for the Contiguous United States

This map is a necessarily generalized guide to temperatures in the contiguous United States. Temperatures shown for areas such as mountainous regions and large urban centers may not be accurate. The climate data used to develop this map are from the ASHRAE Handbook — Fundamentals (Chapter 24, Table 1: Climate Conditions for the United States).

For 99% winter design temperatures in Alaska, consult the ASHRAE Handbook — Fundamentals.

99% winter design temperatures for Hawaii are greater than 37°F

For SI units: °C = (°F-32)/1.8

FIGURE 510.1.10
RANGE OF WINTER DESIGN TEMPERATURES USED IN ANALYZING EXTERIOR MASONRY CHIMNEYS IN THE UNITED STATES
[NFPA 54: FIGURE F.2.4]

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 1738-2010</td>
<td>Venting Systems for Gas-Burning Appliances, Categories II, III, and IV (with revisions through November 11, 2014)</td>
<td>Fuel Gas, Appliances</td>
<td>509.4.1, 509.4.2, 509.4.3</td>
</tr>
<tr>
<td>UL 1777-2015</td>
<td>Chimney Liners</td>
<td>Chimney Liners</td>
<td>509.5.3</td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

Note: UL 378, UL1738, and UL 1777 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
In accordance with IAPMO Governing Consensus Project, Section Chapter 5 is being revised to the latest edition of NFPA 54-2018.
SUBMITTER: Ronald George, CPD, President  
Plumb-Tech Design & Consulting Services LLC  
Rep: Self

RECOMMENDATION:  
Revise text

601.0 General.

601.2 Hot and Cold Water Required. Hot and cold water shall be provided in accordance with Section 601.2.1 and Section 601.2.2. 

601.2.1 Cold Water. Except where not deemed necessary for safety or sanitation by the Authority Having Jurisdiction, each plumbing fixture shall be provided with an adequate supply of potable running water piped thereto in an approved manner, so arranged as to flush and keep it in a clean and sanitary condition without danger of backflow or cross-connection. Water closets and urinals shall be flushed using an approved flush tank or flushometer valve. 

Exception: Listed fixtures that do not require water for their operation and are not connected to the water supply. 

601.2.2 Hot Water. Hot water shall be required in all occupancies where plumbing fixtures are installed for private use, hot water shall be required for bathing, washing, laundry, cooking purposes, dishwashing or maintenance. In occupancies where plumbing fixtures are installed for public use, hot water shall be required for bathing and washing purposes. This requirement shall not supersede the requirements for individual temperature control limitations for public lavatories and public and private bidets, bathtubs, whirlpool bathtubs, and shower control valves in Chapter 4.

SUBSTANTIATION: 
This change will clean up the language in regards to hot and cold water.
In occupancies where plumbing fixtures are installed for public use, hot water shall be required for bathing and washing purposes. This requirement shall not supersede the requirements for individual temperature control limitations for transient public lavatories and public and private bidets, bathtubs, whirlpool bathtubs, and shower control valves.

**SUBSTANTIATION:**

The purpose of this proposal is to make it optional to provide hot water to lavatories in any occupancy. If the Committee prefers the temperature approach that I submitted in a different proposal for Section 601.2 to enabling cold water, hot water, or both, that would be fine. Here is the substantiation for this proposal. Health and safety for hand washing needs to include 1) scald prevention, 2) hand washing efficacy and 3) minimizing the risk of pathogen growth in the building’s water distribution system. We do not want the temperature of the water at hand washing sinks to be too hot. We want the temperature of the water to be acceptable (not too cold) so that people will scrub their hands long enough to get them clean. We want to reduce the likelihood that pathogens will grow in the water distribution system. And, we would like to accomplish all of these health and safety functions in the most cost effective and sustainable manner possible. Section 407.3 in the 2018 UPC limits the water temperature delivered from public-use lavatories to a maximum of 120°F. The primary purpose of this section is to protect the users from too high a temperature; aka scalding. A temperature of 120°F is generally considered a safe scald limit. Legionella in building water systems has become a major concern for public health with the incidence of Legionnaires’ disease growing by 500% from 0.4 cases per 100,000 people in 2000 to 2.0 cases per 100,000 people in 2015. It used be thought that warm water was necessary for effective hand cleaning to control the spread of germs (bacteria). Science has since proven that the temperature of the water used for hand washing does not impact the efficacy of removing bacteria at all. 2, 3, 4 While each of these three papers are very clear the CDC sums it up best with “The temperature of the water does not appear to affect microbe removal; however, warmer water may cause more skin irritation and is more environmentally costly.” The most important variables for removing bacteria from ones hands are scrubbing and the use of soap. Neither of these criteria is within the purview of a building code. The Facilities Guidelines Institute has published three documents for use by the health care industry that address the temperature for hand washing – 2018 Guidelines for Design and Construction of Hospitals and the 2018 Guidelines for Design and Construction of Outpatient Facilities and the 2018 Guidelines for Design and Construction Residential Health, Care, and Support Facilities. These documents state that one way to limit the potential growth of Legionella in a heated potable water system is to distribute the water at a temperature lower than 80°F. Another way of looking at this guideline is to say that providing hot water for hand washing shouldn’t be a requirement; it should be optional. This proposal makes it optional for washing purposes in any occupancy. If this guidance is safe enough for health care facilities, then it should be safe enough for all occupancies. References: 1) US Centers for Disease Control (CDC) Atlanta, GA Chart titled “Legionnaires’ Disease is on the Rise 2000-2015” National Notifiable Diseases Surveillance System https://www.cdc.gov/legionella/downloads/fs-legionella-clinicians.pdf 2) Quantifying the Effects of Water Temperature, Soap Volume, Lather Time, and Antimicrobial Soap as Variables in the Removal of Escherichia coli ATCC 11229 from Hands Journal of Food Protection June 2017 Dana A. Jensen,1 David R. Macinga,2 David J. Shumaker,2 Roberto Bellino,2 James W. Arbogast,2 and Donald W. Schaffner1 http://jfoodprotection.com/doi/full/10.4315/0362-028X_JFP-16-370?code=fopr-site Above was in an article titled Cool Water as Effective as Hot for Removing Germs During Handwashing Infection Control Today May 30 2017 3) The environmental cost of misinformation: why the recommendation to use elevated temperatures for handwashing is problematic International Journal of Consumer Studies Volume 37, Issue 4 July 2013 Amanda R. Carrico, Micajah Spoden, Kenneth A. Wallston, Michael P. Vandenberg http://onlinelibrary.wiley.com/doi/10.1111/jocs.12012/abstract 4) Show Me the Science - How to Wash Your Hands CDC Website https://www.cdc.gov/handwashing/show-me-the-science-handwashing.html
hand washing needs to include 1) scald prevention, 2) hand washing efficacy and 3) minimizing the risk of pathogen growth in the building’s water distribution system. We do not

The purpose of this proposal is to make it optional to provide hot water to lavatories serving the transient public. Here is the substantiation for this proposal. Health and safety for

SUBSTANTIATION:
Science has since proven that the temperature of the water used for hand washing does not impact the efficacy of removing bacteria at all. 2,3,4 While each of these three papers

people in 2000 to 2.0 cases per 100,000 people in 2015.1 It used be thought that warm water was necessary for effective hand cleaning to control the spread of germs (bacteria).

limit. Legionella in building water systems has become a major concern for public health with the incidence of Legionnaires’ disease growing by 500% from 0.4 cases per 100,000

long enough to get them clean. We want to reduce the likelihood that pathogens will grow in the water distribution system. And, we would like to accomplish all of these health and

want the temperature of the water at hand washing sinks to be too hot. We want the temperature of the water to be acceptable (not too cold) so that people will scrub their hands

In occupancies where plumbing fixtures are installed for private use, hot water shall be required for bathing, washing, laundry, cooking purposes, dishwashing or maintenance. In

Except where not deemed necessary for safety and sanitation by the Authority Having Jurisdiction, each plumbing fixture shall be provided with an adequate supply of potable running water piped thereto in an approved manner, so arranged as to flush and keep it in a clean and sanitary conditions without danger of backflow or cross-connection. Water closets and urinals shall be flushed by means of an approved flush tank or flushometer valve.

Exception: Listed fixtures that do not require water for their operation and are not connected to the water supply.

In occupancies where plumbing fixtures are installed for public use, hot water shall be required for bathing and washing purposes. In occupancies with transient public lavatories, it shall be permitted to deliver cold water, hot water, or both for washing purposes. This requirement shall not supersed the requirements for individual temperature control limitations for transient public lavatories and public and private bidets, bathtubs, whirlpool bathtubs and shower control valves.

SUBSTANTIATION:
The purpose of this proposal is to make it optional to provide hot water to lavatories serving the transient public. Here is the substantiation for this proposal. Health and safety for hand washing needs to include 1) scald prevention, 2) hand washing efficacy and 3) minimizing the risk of pathogen growth in the building’s water distribution system. We do not want the temperature of the water at hand washing sinks to be too hot. We want the temperature of the water to be acceptable (not too cold) so that people will scrub their hands long enough to get them clean. We want to reduce the likelihood that pathogens will grow in the water distribution system. And, we would like to accomplish all of these health and safety functions in the most cost effective and sustainable manner possible. Section 407.3 in the 2018 UPC limits the water temperature delivered from public-use lavatories to a maximum of 120°F. The primary purpose of this section is to protect the users from too high a temperature, aka scalding. A temperature of 120°F is generally considered a safe scald limit. Legionella in building water systems has become a major concern for public health with the incidence of Legionnaires’ disease growing by 500% from 0.4 cases per 100,000 people in 2000 to 2.0 cases per 100,000 people in 2015.1 It used be thought that warm water was necessary for effective hand cleaning to control the spread of germs (bacteria). Science has since proven that the temperature of the water for their use for hand washing does not impact the efficacy of removing bacteria at all. 2,3,4 While each of these three papers are very clear the CDC sums it up best with “The temperature of the water does not appear to affect microbe removal; however, warmer water may cause more skin irritation and is more environmentally costly.” 4 The most important variables for removing bacteria from ones hands are scrubbing and the use of soap. Neither of these criteria is within the purview of a building code. The Facilities Guidelines Institute has published three documents for use by the health care industry that address the temperature for hand washing – 2018 Guidelines for Design and Construction of Hospitals and the 2018 Guidelines for Design and Construction of Outpatient Facilities and the 2018 Guidelines for Design and Construction Residential Health, Care, and Support Facilities. These documents state that one way to limit the potential growth of Legionella in a heated potable water system is to distribute the water at a temperature lower than 80°F. Another way of looking at this guideline is to say that providing hot water for hand washing shouldn’t be a requirement; it should be optional. This proposal makes it optional for lavatories serving the transient public. If this guidance is safe enough for health care facilities, then it should be safe enough for people using transient public lavatories. References: 1) US Centers for Disease Control (CDC) Atlanta, GA Chart titled, “Legionnaires’ Disease is on the Rise 2000-2015” National Notifiable Diseases Surveillance System https://www.cdc.gov/legionella/downloads/fs-legionella-clinicians.pdf 2) Quantifying the Effects of Water Temperature, Soap Volume, Lather Time, and Antimicrobial Soap as Variables in the Removal of Escherichia coli ATCC 11229 from Hands Journal of Food Protection June 2017 Dane A. Jensen,1 David R. Macinga,2 David J. Shumaker,2 Roberto Bellino,2 James W. Arbogast,2 and Donald W. Schaffer1 http://jfoodprotection.com/doi/full/10.4315/0362-028X.JFP-16-370?code=fopr-site Above was in an article titled Cool Water as Effective as Hot for Removing Germs During Handwashing Infection Control Today May 30 2017 3) The environmental cost of misinformation: why the recommendation to use elevated temperatures for handwashing is problematic International Journal of Consumer Studies Volume 37, Issue 4 July 2013 Amanda R. Carrico, Micahia Spoden, Kenneth A. Wallston, Michael P. Vandenbergh http://onlinelibrary.wiley.com/doi/10.1111/ijcs.12012/abstract 4) Show Me the Science - How to Wash Your Hands CDC Website https://www.cdc.gov/handwashing/show-me-the-science-handwashing.html
601.2 Hot and Cold Water Required. Except where not deemed necessary for safety and sanitation by the Authority Having Jurisdiction, each plumbing fixture shall be provided with an adequate supply of potable running water piped thereto in an approved manner, so arranged as to flush and keep it in a clean and sanitary conditions without danger of backflow or cross-connection. Water closets and urinals shall be flushed by means of an approved flush tank or flushometer valve.

Exception: Listed fixtures that do not require water for their operation and are not connected to the water supply.

In occupancies where plumbing fixtures are installed for private use, hot water shall be required for bathing, washing, laundry, cooking purposes, dishwashing or maintenance. In occupancies where plumbing fixtures are installed for public use, hot water shall be required for bathing and washing purposes. In all occupancies it shall be permitted to deliver water for washing purposes at a temperature that does not exceed 77°F (25°C). This requirement shall not supersede the requirements for individual temperature control limitations for transient public lavatories and public and private bidets, bathtubs, whirlpool bathtubs and shower control valves.

SUBSTANTIATION:
The purpose of this proposal is to make it optional to provide hot water to lavatories in any occupancy. In addition to making hot water optional for lavatories in any occupancy, this proposal offers a different way to look at the resolution of the problem than I used in the proposal that I submitted for 601.2 which only called out only transient public lavatories. If the Committee prefers the temperature approach to enabling cold water, hot water, or both, but only wants it to be applicable to transient public lavatories, that would be fine. It would also be fine if the Committee prefers the approach of enabling cold water, hot water or both and making it applicable to all occupancies. Here is the substantiation for this proposal. Health and safety for hand washing needs to include 1) scald prevention, 2) hand washing efficacy and 3) minimizing the risk of patient growth in the building’s water distribution system. We do not want the temperature of the water at hand washing sinks to be too hot. We want the temperature of the water to be acceptable (not too cold) so that people will scrub their hands long enough to get them clean. We want to reduce the likelihood that pathogens will grow in the water distribution system. And, we would like to accomplish all of these health and safety functions in the most cost effective and sustainable manner possible. Section 407.3 in the 2018 UPC limits the water temperature delivered from public-use lavatories to a maximum of 120°F. The primary purpose of this section is to protect the users from too high a temperature; aka scalding. A temperature of 120°F is generally considered a safe scald limit. Legionella in building water systems has become a major concern for public health with the incidence of Legionnaires’ disease growing by 500% from 0.4 cases per 100,000 people in 2000 to 2.0 cases per 100,000 people in 2015.1 It used be thought that warm water was necessary for effective hand cleaning to control the spread of germs (bacteria). Science has since proven that the temperature of the water used for hand washing does not impact the efficacy of removing bacteria at all.2, 3, 4 While each of these three papers are very clear the CDC sums it up best with “The temperature of the water does not appear to affect microbe removal; however, warmer water may cause more skin irritation and is more environmentally costly.”4 The most important variables for removing bacteria from one’s hands are scrubbing and the use of soap. Neither of these criteria is within the purview of a building code. The Facilities Guidelines Institute has published three documents for use by the health care industry that address the temperature for hand washing – 2018 Guidelines for Design and Construction of Hospitals and the 2018 Guidelines for Design and Construction of Outpatient Facilities and the 2018 Guidelines for Design and Construction Residential Health, Care, and Support Facilities. These documents state that one way to limit the potential growth of Legionella in a heated potable water system is to distribute the water at a temperature lower than 80°F. Another way of looking at this guidance is to say that providing hot water for hand washing shouldn’t be a requirement; it should be optional. This proposal makes it optional for washing purposes in any occupancy. If this guidance is safe enough for health care facilities, then it should be safe enough for all occupancies. References: 1) US Centers for Disease Control (CDC) Atlanta, GA Chart titled, “Legionnaires’ Disease is on the Rise 2000-2015”2) Quantifying the Effects of Water Temperature, Soap Volume, Lather Time, and Antimicrobial Soap as Variables in the Removal of Escherichia coli ATCC 11229 from Hands Journal of Food Protection June 2017 Dane A. Jensen,1 David R. Macinga,2 David J. Shumaker,2 Roberto Bellino,2 James W. Arbogast,2 and Donald W. Schaffner1 http://jfoodprotection.com/doi/full/10.4315/0362-028X.JFP-16-370? code=fopr-site Above was in an article titled Cool Water as Effective as Hot for Removing Germs During Handwashing Infection Control Today May 30 2017 3) The environmental cost of misinformation: why the recommendation to use elevated temperatures for handwashing is problematic International Journal of Consumer Studies Volume 37, Issue 4 July 2013 Amanda R. Carrico, Micajah Spoden, Kenneth A. Wallston, Michael P. Vandenbergh http://onlinelibrary.wiley.com/doi/10.1111/jics.12012/abstract 4) Show Me the Science - How to Wash Your Hands CDC Website https://www.cdc.gov/handwashing/show-me-the-science-handwashing.html
SUBMITTER: Brian Hageman
Mazzetti

RECOMMENDATION:
Revise text

601.0 General.

601.2 Hot and Cold Water Required. Except where not deemed necessary for safety or sanitation by the Authority Having Jurisdiction, each plumbing fixture shall be provided with an adequate supply of potable running water piped thereto in an approved manner, so arranged as to flush and keep it in a clean and sanitary condition without danger of backflow or cross-connection. Water closets and urinals shall be flushed using an approved flush tank or flushometer valve.

Exceptions:

(1) Listed fixtures that do not require water for their operation and are not connected to the water supply.

(2) Where not deemed necessary for safety and sanitation by the Authority Having Jurisdiction.

In occupancies where plumbing fixtures are installed for private use, hot water shall be required for bathing, washing, laundry, cooking purposes, dishwashing or maintenance. In occupancies where plumbing fixtures are installed for public use, hot water shall be required for bathing and washing purposes. This requirement shall not supersede the requirements for individual temperature control limitations for public lavatories and public and private bidets, bathtubs, whirlpool bathtubs, and shower control valves.

SUBSTANTIATION:
The purpose for this proposal is to clarify the understanding of the section by rewording the first paragraph and creating a second exception. The wording of this section is awkward, starting out with an exception. Moving this phrase to the exceptions seems to make it more clear.
Item #: 055
UPC 2021  Section: 601.2

SUBMITTER: Duane Jonlin
Seattle Dept of Construction and Inspections

RECOMMENDATION:
Revise text

601.0 General.

601.2 Hot and Cold Water Required - Water Supply and Flushing. Except where not deemed necessary for safety or sanitation by the Authority Having Jurisdiction, each plumbing fixture shall be provided with an adequate supply of potable running water piped thereto in an approved manner, so arranged as to flush and keep it in a clean and sanitary condition without danger of backflow or cross-connection. Water closets and urinals shall be flushed by means of an approved flush tank or flushometer valve.

Exception: Listed fixtures that do not require water for their operation and are not connected to the water supply.

601.2.1 Hot and Cold Water Required. In occupancies where plumbing fixtures are installed for private use, hot water shall be required for bathing, washing, laundry, cooking purposes, dishwashing or maintenance. In occupancies where plumbing fixtures are installed for public use, hot water shall be required for bathing and washing purposes. This requirement shall not supersede the requirements for individual temperature control limitations for public lavatories and public and private bidets, bathtubs, whirlpool bathtubs, and shower control valves.

Exception: Lavatories and other handwashing fixtures installed for public use are permitted to provide water at temperatures between 65°F and 80°F (18°C and 27°C), in lieu of hot water.

SUBSTANTIATION:
Hot water should no longer be mandated by the UPC for public lavatories, but instead should be made optional. Using room-temperature water for handwashing will provide public health and safety benefits, energy and carbon reductions, construction cost savings, and long-term operational cost savings. Studies demonstrate that water temperature is irrelevant to handwashing hygiene – one’s hands become equally clean using any temperature water. Warm water, by contrast, provides the optimal environment for uncontrolled growth of legionella and other bacteria, especially in mixing valves and related piping connections. The energy use (and associated carbon pollution) for water heating and pumping is significant, especially for circulating hot water systems, and lavatories represent by far the greatest number of fixtures connected to hot water. The construction cost associated with supplying hot water to lavatories throughout a facility is also significant, not to mention the operational costs of fuel, maintenance, repairs, and equipment replacement. The range of typical room temperatures, 65° – 80° F, prevents legionella growth and provides comfortable water temperatures for handwashing, while requiring little or no energy use for water heating. Protection of the public’s health and safety should be the primary mission of the UPC, but the current requirement for lavatory hot water actually endanger public health, while creating additional financial and environmental burdens for all stakeholders.
Item #: 056
UPC 2021  Section: 601.3

SUBMITTER: Carlos Borja
Los Angeles County Public Health

RECOMMENDATION:
Revise text

601.0 General.

601.3 Identification of a Potable and Nonpotable Water System. Where potable water and nonpotable water systems are installed, each system shall be clearly identified in accordance with Section 601.3.1 through Section 601.3.5.

SUBSTANTIATION:
There is a growing consensus that believe identification of this piping should not be limited to piping "in buildings". As the Public Health agency having authority we review and approve Alternate Water Projects aka Onsite Nonpotable Water Systems which include water sources such as recycled/reclaimed water, treated and untreated graywater, rainwater and stormwater harvesting, industrial product water (condensate), foundation drainage and other nonpotable water sources. Pipeline identification is a compulsory requirement when reviewing and approving these types of projects especially for all buried lines that convey any type of water source, i.e. potable, nonpotable, fire, etc. The purpose is to prevent future cross connections. During construction, contractors typically view 601.3 as only applying for pipelines within a building structure, because of the wording "in buildings". This is contrary to the practical application for pipeline identification of all water conveyance pipelines on the project - from service connections to the premise building(s) and ultimately within the buildings. All water conveyance pipelines onsite must be adequately identified to prevent future plumbing changes that may result in an inadvertent cross connection to the potable water supply.
601.0 General.

601.3 Identification of a Potable and Nonpotable Water System. In buildings where potable water and nonpotable water systems are installed, each system shall be clearly identified in accordance with Section 601.3.1 through Section 601.3.5.

601.3.1 Potable Water. Green background with white lettering with the words, "POTABLE WATER."

601.3.2 Color and Information. Each system shall be identified with a colored pipe or band and coded with paints, wraps, and materials compatible with the piping.

Except as required by Section 601.3.3, nonpotable water systems shall have a yellow background with black uppercase lettering, with the words “CAUTION: NONPOTABLE WATER, DO NOT DRINK.” Each nonpotable system shall be identified to designate the liquid being conveyed, and the direction of normal flow shall be clearly shown. The minimum size of the letters and length of the color field shall comply with Table 601.3.2.

The background color and required information shall be indicated every 20 feet (6096 mm) but not less than once per room, and shall be visible from the floor level.

601.3.3 Alternate Water Sources. Alternate non-potable water source systems such as gray water, reclaimed water, rainwater, or on-site treated, shall have a purple (Pantone color No. 512, 522C, or equivalent) background with uppercase lettering and shall be field or factory marked as follows:

(1) Gray water systems shall be marked in accordance with this section with the words "CAUTION: NONPOTABLE GRAY WATER, DO NOT DRINK" in black letters.

(2) Reclaimed (recycled) water systems shall be marked in accordance with this section with the words: "CAUTION: NONPOTABLE RECLAIMED (RECYCLED) WATER, DO NOT DRINK" in black letters.

(3) On-site treated water systems shall be marked in accordance with this section with the words: "CAUTION: ON-SITE TREATED NONPOTABLE WATER, DO NOT DRINK" in black letters.

(4) Rainwater catchment systems shall be marked in accordance with this section with the words: "CAUTION: NONPOTABLE RAINWATER WATER, DO NOT DRINK" in black letters.

601.3.4 Fixtures. Where vacuum breakers or backflow preventers are installed with fixtures listed in Table 1701.1, identification of the discharge side shall be permitted to be omitted.

601.3.5 Outlets. Each outlet on the nonpotable water line that is used for special purposes shall be posted with black uppercase lettering as follows: "CAUTION: NONPOTABLE WATER, DO NOT DRINK."

603.5.11 Nonpotable Water Piping. In cases where it is impractical to correct individual cross-connections on the domestic waterline, the line supplying such outlets shall be considered a nonpotable water line. No drinking or domestic water outlets shall be connected to the nonpotable waterline. Where possible, portions of the nonpotable waterline shall be exposed, and exposed portions shall be properly identified as required in section 601.3 and in a manner satisfactory to the Authority Having Jurisdiction. Each outlet on the nonpotable waterline that is permitted to be used for drinking or domestic purposes shall be posted: "CAUTION: NONPOTABLE WATER, DO NOT DRINK."

SUBSTANTIATION:
This section is overly complicated with marking requirements. One warning is all that is needed for ANY non-potable water, and it is "CAUTION: NONPOTABLE WATER, DO NOT DRINK." Each of the currently listed sources could be of any quality, depending on the system, so there is no need to identify them specifically. Since a cistern is the most expensive...
component, multiple sources of non-potable water would likely be comingled, and then what do you do? The purpose of the marking is a warning to prevent cross contamination of the potable water system, not to identify the system. With one required marking, warehouses can maintain one factory product or label instead of five. Requiring green pipe really isn't necessary, especially in residential buildings and the white marking is not actually specified. If it is marked, it should at least be consistent. 603.5.11 should refer back to 601.3.
Item #: 058
UPC 2021 Section: 601.4

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Add new text

601.0 General.

601.4 System Design Considerations. The design of the water systems shall be in accordance with ASHRAE 188.

Exception: Single-family residential buildings.

Note: ASHRAE 188 meets the requirements for mandatory reference standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
Substantiation: There are factors that influence bacteriological growth in building water systems. These include the water’s age, temperature, the amount of residual disinfectant and the design of the water system. ASHRAE has developed and published standard 188 as an American National Standard to address Legionella risk mitigation. The requirements contained within this standard will work to mitigate the risks of legionellosis outbreaks from all building water systems.
Item #: 059
UPC 2021 Section: 601.4

SUBMITTER: Connor Barbaree
ASHRAE

RECOMMENDATION:
Revise text

601.0 General.

601.4 System Design. The design of building water supply and distribution systems shall be in accordance with ASHRAE 188 and shall conform to the requirements within this chapter.

TABLE 1701.1 REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASHRAE 188-2015</td>
<td>Legionellosis: Risk Management for Building Water Systems</td>
<td>Risk Management</td>
<td>601.4</td>
</tr>
</tbody>
</table>

Note: ASHRAE 188 meets the requirements for a mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
ASHRAE Standard 188 was developed with the intent of providing code officials and building operators information on how to manage the risk of legionellosis. ASHRAE Standard 188 was published on June 26, 2015, and is now publicly available as a final, published ANSI Standard. ASHRAE Standard 188 (2018) has been in continuous maintenance, and several addenda have been approved and published, as well as improvements in code compatible language which will be incorporated into the published 2018 standard. There are many design considerations in the ASHRAE standard that will help minimize Legionella bacteria growth in building water systems which can lead to Legionnaires Disease when water droplets are aerosolized from shower heads, and other building water systems and fixtures that aerosolize water droplets. Following the ASHRAE Standard will minimize the risk of a person contracting Legionnaires' disease. For more information on the standard, go here: http://www.techstreet.com/ashrae/products/1897561 See the following websites for more information: www.LegionellaPrevention.org, http://www.cdc.gov/legionella/about/ www.Legionella.com www.hcinfo.com http://www.who.int/water_sanitation_health/emerging/legionella.pdf
601.3.4 Fixtures. Where vacuum breakers or backflow preventers are installed with fixtures listed in Table 1701.1, identification of the discharge side shall be permitted to be omitted.

603.14 Protection from Fire Systems. Except as provided in Section 603.5.14.1 and Section 603.5.14.2, potable water supplies to fire protection systems that are normally under pressure, including but not limited to standpipes and automatic sprinkler systems, except in one- or two-family or townhouse residential sprinkler systems, piped in materials approved for potable water distribution systems shall be protected from backpressure and backsiphonage by one of the following testable devices:

(1) Double check valve backflow prevention assembly (DC)
(2) Double check detector fire protection backflow prevention assembly
(3) Reduced pressure principle backflow prevention assembly (RP)
(4) Reduced pressure detector fire protection backflow prevention assembly

Potable water supplies to fire protection systems that are not normally under pressure shall be protected from backflow and shall be in accordance with the requirements of the appropriate standards referenced in Table 1701.4.

701.5 Lead. (See Table 1701.1) Sheet lead shall comply with the following:

(1) For safe pans – not less than 4 pounds per square foot (lb/ft²) (19 kg/m²) or 1/16 of an inch (1.6 mm) thick.
(2) For flashings or vent terminals – not less than 3 lb/ft² (15 kg/m²) or 0.0472 of an inch (1.2 mm) thick.
(3) Lead bends and lead traps shall be not less than 1/8 of an inch (3.2 mm) in wall thickness.

906.6 Lead. (See Table 1701.4) Sheet lead shall comply with the following:

(1) For safe pans – not less than 4 pounds per square foot (lb/ft²) (19 kg/m²) or 1/16 of an inch (1.6 mm) thick.
(2) For flashings or vent terminals – not less than 3 lb/ft² (15 kg/m²) or 0.0472 of an inch (1.2 mm) thick.
(3) Lead bends and lead traps shall be not less than 1/8 of an inch (3.2 mm) in wall thickness.

1014.3.3 Design. Gravity interceptors shall be constructed in accordance with the applicable standard in Table 1701.4 or the design approved by the Authority Having Jurisdiction.

1101.4 Material Uses. Pipe, tube, and fittings conveying rainwater shall be of such materials and design as to perform their intended function to the satisfaction of the Authority Having Jurisdiction. Conductors within a vent or shaft shall be of cast-iron, galvanized steel, wrought iron, copper, copper alloy, lead, Schedule 40 ABS DWV, Schedule 40 PVC DWV, stainless steel 304 or 316L, [stainless steel 304 pipe and fittings shall not be installed underground and shall be kept not less than 6 inches (152 mm) aboveground], or other approved materials, and changes in direction shall be in accordance with the requirements of Section 706.0. ABS and PVC DWV piping installations shall be installed in accordance with applicable standards referenced in Table 1701.4 and Chapter 14 “Firestop Protection.” Except for individual single-family dwelling units, materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke-developed index of not more than 50, where tested in accordance with ASTM E84 or UL 723. These tests shall comply with all requirements of the standards to include the sample size, both for width and length. Plastic pipe shall not be tested filled with water.

C 101.4 Standards and Specifications. Components, materials, and equipment shall comply with standards and specifications listed in Table 1701.1 of this code and other national consensus standards applicable to plumbing systems and materials.

C 501.1 General. This section regulates the design and installation provisions for vacuum waste drainage systems. Plans for vacuum waste drainage systems shall be submitted to the Authority Having Jurisdiction for approval and shall be considered an engineered designed system. Such plans shall be prepared by a registered design professional to perform plumbing design work. Details are necessary to ensure compliance with the requirements of this section, together with a full description of the complete installation including quality, grade of materials, equipment, construction, and methods of assembly and installation. Components, materials, and equipment shall comply with standards and specifications listed in Table 1701.1 of this code or approved by the Authority Having Jurisdiction and other national consensus standards applicable to plumbing systems and materials. Where such standards and specifications are not available, alternate materials and equipment shall be approved in accordance with Section 301.3.

C 501.3 Fixtures. Fixtures utilized in a vacuum waste drainage system shall be in accordance with referenced standards listed in Table 1701.1 and comply with national consensus standards applicable to the fixture. Components shall be of corrosion resistant materials. The water closet outlet shall be able to pass a 1 inch (25.4 mm) diameter ball and shall have a smooth, impervious surface. The waste outlet and passages shall be free of obstructions, recesses, or chambers that are capable of permitting fouling. The mechanical valve and its seat shall be of such materials and design to provide a leakfree connection where at atmospheric pressure or under vacuum. The flushing mechanism shall be so designed as to ensure proper cleansing of the interior surfaces during the flushing cycle at a minimum operating flow rate. Mechanical seal mechanisms shall withstand completely from the path of the waste discharge during the flushing operation. Each mechanical seal vacuum water closet shall be equipped with a listed vacuum breaker. The vacuum breaker shall be mounted with the critical level or marking not less than 1 inch (25.4 mm) above the flood-level rim of the fixture. Vacuum breakers shall be installed on the discharge side of the last control valve in the potable water supply line and shall be located to be protected from physical damage and contamination.
H 501.13 Materials. The materials used for constructing a septic tank shall be in accordance with the following:

(1) Materials used in constructing a concrete septic tank shall be in accordance with applicable standards in Table 1701.1 and other national consensus standards.

(2) The minimum wall thickness of a steel septic tank shall be number 12 U.S. gauge (0.109 of an inch) (2.77 mm), and each such tank shall be protected from corrosion both externally and internally by an approved bituminous coating or by other acceptable means.

(3) Septic tanks constructed of alternate materials shall be permitted to be approved by the Authority Having Jurisdiction where in accordance with approved applicable standards. Wooden septic tanks shall be prohibited.

SUBSTANTIATION:
In the 2018 edition of the UPC, Table 1701.1 has been split into two separate tables. Therefore, the existing reference to those tables must be revised to provide the proper standard for the applications. Reference to Table 1701.1 in the sections above are being removed as they are unnecessary. All standards referenced in the body of the code are listed in Table 1701.1.
SUBMITTER: Herb Hoeptner
Rep: Self

RECOMMENDATION:
Revise text

<table>
<thead>
<tr>
<th>Device, Assembly, or Method</th>
<th>Applicable Standards</th>
<th>Pollution (Low Hazard)</th>
<th>Contamination (High Hazard)</th>
<th>Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeze resistant sanitary yard hydrants (air inlet valve and at least one check valve)</td>
<td>ASSE 1057</td>
<td>X</td>
<td>--</td>
<td>X</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

603.0 Cross-Connection Control.

603.5.17 Potable Water Outlets and Valves. Potable water outlets, freeze-proof non-sanitary yard hydrants, combination stop-and-waste valves, or other fixtures that incorporate a stop and waste feature that drains into the ground shall not be installed underground.

603.5.17.1 Freeze Resistant Sanitary Yard Hydrant. Freeze-resistant sanitary yard hydrants shall be capable of being installed underground.

227.0 - Y -
Yard Hydrant. A point-of-use valve used for non-potable water applications that is protected against freezing by draining residual water into the soil. Devices are normally installed vertically, below the frost line, and extend above grade.

Yard Hydrant Freeze Resistant Sanitary, A backflow prevention device with hose connection outlet for potable water applications. The device is normally installed in a vertical position extending from below the frost line to above grade. Residual water is stored below the frost line to prevent freezing.

SUBSTANTIATION:
Statement of Problem and Substantiation/Resolution Sanitary yard hydrants are normally used for irrigation but are also used for recreational vehicle (RV) potable water connections in camping sites and trailer parks. A 1057 device protects the water supply from cross-contamination with the soil. These devices do not behave as a weep-hole hydrant (such as a stop-and-waste device) as they do not have an opening into the soil to drain the excess water from the device. Devices capture water in an internal reservoir below the frost line and some designs only drain once the hose is disconnected. The purpose of this proposed change is to clarify the definition and installation of freeze resistant sanitary yard hydrants.

Definitions There is no current definition of Yard Hydrant or the subcategory, Sanitary Yard Hydrant. These are generally accepted definitions. Table 603.2 The appropriate location for describing the backflow prevention subassemblies for devices not listed in section 603.3 is in this table. Sanitary yard hydrants have at one or two check valves and one air inlet valve depending on the type. 603.5.17 This text currently can be misinterpreted to read that this device cannot be installed underground, when in fact the product is designed to be installed below the frost line.
Item #: 062
UPC 2021 Section: Table 603.2, 603.3, 603.3.10 (new)

SUBMITTER: Brianne Hall (Self); Cody Jackson (Woodford Manufacturing)
Rep: Self

RECOMMENDATION:
Revise text

<table>
<thead>
<tr>
<th>Device, Assembly, or Method</th>
<th>Applicable Standards</th>
<th>Pollution (Low Hazard)</th>
<th>Contamination (High Hazard)</th>
<th>Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual check backflow preventer</td>
<td>ASSE 1024</td>
<td>x</td>
<td>x</td>
<td>=</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Installation includes noncarbonated drink dispensers.</td>
</tr>
</tbody>
</table>

[portions of table not shown remain unchanged]

603.0 Cross-Connection Control.

603.3 Backflow Prevention Devices, Assemblies, and Methods. Backflow prevention devices, assemblies, and methods shall comply with Section 603.3.1 through Section 603.3.10.

603.3.10 Dual Check Backflow Preventer. A dual check backflow preventer consists of two independently acting check valves, forced loaded to a normally closed position.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1024-2004</td>
<td>Dual Check Backflow Preventers</td>
<td>Backflow Protection</td>
<td>Table 603.2</td>
</tr>
</tbody>
</table>

[portions of table not shown remain unchanged]

Note: ASSE 1024 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1024-2004</td>
<td>Dual Check Backflow Preventers</td>
<td>Backflow Protection</td>
</tr>
</tbody>
</table>

[portions of table not shown remain unchanged]

SUBSTANTIATION:
Dual check backflow preventers are generally accepted means of backflow protection in low hazard backpressure and backsiphonage situations. They are normally used on coffee machines and noncarbonated drink dispensers. Per the IAPMO and UA backflow prevention reference manual 3rd edition, they are also used at the outlet of residential water meters.
Item #: 063
UPC 2021 Section: UPC Table 603.2, 603.3, 603.3.10 (new), Table 1701.1, Table 1701.2

SUBMITTER: Linda Soares
TACO COMFORT SOLUTIONS, Inc.

RECOMMENDATION:
Revise text

<table>
<thead>
<tr>
<th>TABLE 603.2</th>
<th>BACKFLOW PREVENTION DEVICES, ASSEMBLIES, AND METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEVIC_ASSEMBLY_OR METHOD</td>
<td>APPLICABLE STANDARDS</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Backflow preventer with intermediate atmospheric vent</td>
<td>ASSE 1012</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

Notes:

1. See the description of devices and assemblies in this chapter.
2. Installation in pit or vault requires previous approval by the Authority Having Jurisdiction.
3. Refer to the general and specific requirement for installation.
4. Not to be subjected to operating pressure for more than 12 hours in a 24 hour period.
5. For deck-mounted and equipment-mounted vacuum breaker, see Section 603.5.13.
6. Shall be installed in accordance with Section 603.5.7.

603.3 Backflow Prevention Devices, Assemblies, and Methods.

Backflow prevention devices, assemblies, and methods shall comply with Section 603.3.1 through Section 603.3.10.

603.3.10 Backflow Preventer with Intermediate Atmospheric Vent. A backflow preventer with intermediate atmospheric vent consists of two independently acting check valves, forced loaded to a normally closed position, and an intermediate chamber with a means for automatically venting to atmosphere, force loaded to a normally open position.

<table>
<thead>
<tr>
<th>TABLE 1701.1</th>
<th>REFERENCED STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD NUMBER</td>
<td>STANDARD TITLE</td>
</tr>
<tr>
<td>ASSE 1012-2009</td>
<td>Backflow Preventers with an Intermediate Atmospheric Vent</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

Note: ASSE 1012 meets the requirements for a mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.
SUBSTANTIATION:
Backflow preventers with intermediate atmospheric vents are generally accepted means of backflow protection in low hazard backpressure and backsiphonage situations. Per the IAPMO and UA Backflow Prevention Reference Manual 3rd Edition, the devices are installed for residential, low-pressure boilers. ASSE 1012 devices have functional capabilities for preventing both backsiphonage and backpressure, and may operate under continuous or intermittent pressure conditions. These devices have 2 independently operating check valves separated by an intermediate chamber with a means for automatically venting it to the atmosphere and can be installed in the horizontal, vertical up or vertical down orientations. The check valves are force loaded to a normally closed position and the venting means is force loaded to a normally open position.
Item #: 064
UPC 2021 Section: UPC: Table 603.2, 603.5.10, Table 1701.1

SUBMITTER: Linda Soares
TACO COMFORT SOLUTIONS, Inc.

RECOMMENDATION: Revise text

### TABLE 603.2
BACKFLOW PREVENTION DEVICES, ASSEMBLIES, AND METHODS

<table>
<thead>
<tr>
<th>DEVICE, ASSEMBLY, OR METHOD</th>
<th>DEGREE OF HAZARD</th>
<th>INSTALLATION&lt;br&gt;(low hazard)</th>
<th>INSTALLATION&lt;br&gt;(high hazard)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POLLUTION (LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HAZARD)</td>
<td>BACK-</td>
<td>BACK-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SIPHONAGE</td>
<td>PRESSURE</td>
</tr>
<tr>
<td>Backflow preventer with</td>
<td>ASSE 1081</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>intermediate atmospheric</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vent and pressure reducing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>valve</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

Notes:

1. See the description of devices and assemblies in this chapter.
2. Installation in pit or vault requires previous approval by the Authority Having Jurisdiction.
3. Refer to the general and specific requirement for installation.
4. Not to be subjected to operating pressure for more than 12 hours in a 24 hour period.
5. For deck-mounted and equipment-mounted vacuum breaker, see Section 603.5.13.
6. Shall be installed in accordance with Section 603.5.7.

603.0 Cross-Connection Control.

603.5 Specific Requirements. (remaining text unchanged)

603.5.10 Steam or Hot Water Boilers. Potable water connections to steam or hot water boilers shall be protected from backflow by a double check valve backflow prevention assembly, backflow preventer with intermediate atmospheric vent and pressure reducing valve, or reduced pressure principle backflow prevention assembly in accordance with Table 603.2. Where chemicals are introduced into the system a reduced pressure principle backflow prevention assembly shall be provided in accordance with Table 603.2.

### TABLE 1701.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1081-2014</td>
<td>Performance Requirements for Backflow Preventers with Integral Pressure Reducing Boiler Feed Valve and Intermediate Atmospheric Vent Style for Domestic and Light Commercial Water Distribution Systems</td>
<td>Backflow Protection</td>
<td>Table 603.2</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: ASSE 1081 meets the requirements for a mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.
SUBSTANTIATION:
ASSE 1081 covers devices that have combined two products, one compliant to ASSE 1003 and the other to ASSE 1012. These devices have different hydrodynamic needs, hence the new standard for the complete device. It is comprised of a pressure reducing valve, two force-closed checks in series, and a forced-open intermediate vent between the checks. ASSE 1081 devices are installed in plumbing systems to fill and reduce static boiler pressure under normal conditions, as well as to prevent backflow into potable water supply lines within a premises when pressure is temporarily higher in the closed boiler loop than in the potable water piping. Since the valves are boiler feed valves, they are not installed directly into the potable water pipeline and are not intended for use as potable water products.
SUBMITTER: Brianne Hall
Rep: Self

RECOMMENDATION:
Revise text

603.0 Cross-Connection Control.

603.4 General Requirements. (remaining text unchanged)

603.4.2. Testing. The premise owner or responsible person shall have the backflow prevention assembly tested by a certified backflow assembly tester at the time of installation, repair, or relocation and not less than on an annual schedule thereafter, or more often where required by the Authority Having Jurisdiction. The periodic testing shall be performed in accordance with the procedures referenced in ASSE Series 5000 by a tester qualified in accordance with those standards. The test gauge used shall comply with ASSE 1064.

Table 1701.1
Referenced Standards Table

<table>
<thead>
<tr>
<th>Standard Number</th>
<th>Standard Title</th>
<th>Application</th>
<th>Referenced Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1064-2006(R2011)</td>
<td>Performance Requirements for Backflow Prevention Assembly Field Test Kits</td>
<td>Backflow Protection</td>
<td>603.4.2</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: ASSE 1064 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
Gauges that comply with ASSE 1064 are specifically designed for testing backflow devices describing the proper accuracy (linearity & repeatability) and precision, while compensating for varying operating conditions, EMI/FRI exposure, ambient temperatures, etc. Further, the gauges are required to be NIST-traceable, calibrated periodically, and are designed to be used in tandem with the current referenced standards in this section.
Item #: 066
UPC 2021 Section: 603.5.5

SUBMITTER: Samantha Liu
Rep: Self

RECOMMENDATION:
Revise text

603.0 Cross-Connection Control.

603.5 Specific Requirements. (remaining text unchanged)

603.5.5 Water Supply Inlets. Water supply inlets to tanks, vats, sumps, swimming pools, and other receptors shall be protected by one of the following means:

(1) An approved air gap.
(2) A listed vacuum breaker installed on the discharge side of the last valve with the critical level not less than 6 inches (152 mm) or in accordance with its listing.
(3) A backflow preventer suitable for the degree of hazard, installed in accordance with the requirements for that type of device or assembly as set forth in this chapter.

603.5.20 Swimming Pools, Spas, and Hot Tubs. Potable water supply to swimming pools, spas, and hot tubs shall be protected by an air gap or a backflow preventer suitable for the degree of hazard, installed in accordance with the requirements for that type of device or assembly as set forth in this chapter. A reduced pressure principle backflow preventer shall be provided when the following conditions exist:

(1) The unit is equipped with a submerged fill line.
(2) The potable water supply is directly connected to the unit circulation system.

SUBSTANTIATION:
The backflow protection device indicated in Section 603.5.5, with regards to swimming pools, is not the same as required in Section 603.5.20 for swimming pools, spas, and hot tubs. The proposed change removes “swimming pools” from Section 603.5.5 as swimming pools are already addressed in Section 603.5.20. Furthermore, Section 603.5.20 is modified to clarify when a reduced pressure principle backflow preventer is required. The proposed modification will add clear direction for the end user in regards to backflow prevention devices for swimming pools, spas, and hot tubs.
**Item #: 067**

UPC 2021  Section: 210.0, 225.0, 603.5.7, 603.5.7.1 (new)

**SUBMITTER:** Cody Jackson  
Woodford manufacturing

**RECOMMENDATION:**  
Revise text

### 603.0 Cross-Connection Control.

603.5.7 Outlets with Hose Attachments. Potable water outlets with hose attachments, other than water heater drains, boiler drains, wall hydrants, and clothes washer connections, shall be protected by a nonremovable hose bib type backflow preventer, a nonremovable hose bib type connection vacuum breaker, or by an atmospheric vacuum breaker installed not less than 6 inches (152 mm) above the highest point of usage located on the discharge side of the last valve.

603.5.7.1 Freeze Protection. In climates where freezing temperatures occur, a listed self-draining frost-proof hose bib with an integral backflow preventer or vacuum breaker dual check backflow preventer wall hydrant or a vacuum breaker wall hydrant with backflow protection compliant with ASSE 1019, ASSE 1053, or CSA B64.2.1.1 shall be used.

210.0  - H-

**Hose Bibb.** A faucet to which a hose may be attached.

225.0  - W-

**Wall Hydrant.** An assembly of pipes and valves generally installed into the exterior wall of a building to provide potable water access from inside the building. The device incorporates a hose connection at the outlet with integral backflow protection, and typically includes a feature to drain residual water when the valve is closed.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1019-2011 (R2016)</td>
<td>Wall Hydrant with Backflow Protection and Freeze Resistance</td>
<td>Backflow Protection</td>
<td>Table 603.2, 603.5.7</td>
</tr>
<tr>
<td>ASSE 1053-2004</td>
<td>Dual Check Backflow Preventer Wall Hydrants – Freeze Resistant Type</td>
<td>Backflow Protection</td>
<td>Table 603.2, 603.5.7</td>
</tr>
<tr>
<td>CSA B64.2.1.1-2011 (R2016)</td>
<td>Hose Connection Dual Check Vacuum Breakers (HCDVB)</td>
<td>Backflow Protection</td>
<td>Table 603.2, 603.5.7</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

**Note:** ASSE 1019, ASSE 1053, and CSA B64.2.1.1 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

**SUBSTANTIATION:**  
On definitions, “Hose bibb” and “wall hydrant” as referenced in Table 603.2 and various locations are not defined in the UPC. Both definitions are based on the ASSE Plumbing Dictionary, 6th Edition. On 603.5.7, wall hydrants are another example of an outlet connecting to a hose. Also, “hose bibb type backflow preventer” is not referenced in Table 603.2, but “hose connection backflow preventer” and “hose connection vacuum breaker” are. On new section 603.5.7.1, the requirement for freeze protection is a specialized category of outlets with hose attachments. The code should be clear as to the appropriate performance requirements. All 3 standards are currently referenced in Table 603.2 as accepted backflow prevention devices for this specific category.
Item #: 068
UPC 2021 Section: 603.5.7

SUBMITTER: Cody Jackson
Woodford manufacturing

RECOMMENDATION:
Add new text

603.0 Cross-Connection Control.

603.5.7 Outlets with Hose Attachments. Potable water outlets with hose attachments, other than water heater drains, boiler drains, and clothes washer connections, shall be protected by a nonremovable hose bibb-type backflow preventer, a nonremovable hose bibb-type vacuum breaker, or by an atmospheric vacuum breaker installed not less than 6 inches (152 mm) above the highest point of usage located on the discharge side of the last valve. In climates where freezing temperatures occur, a listed self-draining frost-proof hose bibb with an integral backflow preventer or vacuum breaker shall be used. The nonremovable feature on hose connection backflow preventers and hose connection vacuum breakers shall be fully activated and perform its intended function before use to the satisfaction of the Authority Having Jurisdiction.

SUBSTANTIATION:
There is a requirement in the ASSE 1011 and ASSE 1052 performance standards that hose connection vacuum breakers and hose connection back flow preventers include a feature to prevent the device’s removal. Unfortunately, in practice this does not occur. Non-removable add-on vacuum breakers and back flow preventers can be and are removed. When removed, a hose can be attached which eliminates the required back flow protection. We are concerned about another issue that we are hearing from the field. There are individuals that will connect an unprotected sill cock on the side of a house and either not use the vacuum breaker, or they will leave it so the vacuum breaker can be removed. It looks like the device is fully installed but it is not. Again, this is a problem because it leaves the hose bibb unprotected against back flow. This can be resolved when the backflow protection device is installed through enforcement. During inspection by the Authority Having Jurisdiction, one of the requirements should be that the inspector verifies that the non-removable feature is “on” and active. He can attempt to unseat the backflow preventer to verify that either the hose bibb threads are damaged or the screw is fully engaged and broken off. Again, this is a widespread issue that we see over and over again. A properly installed backflow preventer will improve the safety of the public.
SUBMITTER: Phillip H Ribbs
PHR Consultants

RECOMMENDATION:
Revise text

604.0 Materials.

604.1 Pipe, Tube, and Fittings. Pipe, tube, fittings, solvent cement, thread sealants, solders, and flux used in potable water systems intended to supply drinking water shall comply with NSF 61. Where pipe fittings and valves are made from copper alloys containing more than 15 percent zinc by weight and are used in plastic piping systems, they shall be resistant to dezincification and stress corrosion cracking in compliance with NSF 14.

Materials used in the water supply system, except valves and similar devices, shall be of a like material, except where otherwise approved by the Authority Having Jurisdiction.

Materials for building water piping and building supply piping shall comply with the applicable standards referenced in Table 604.1.

SUBSTANTIATION:
In the past, plumbing fixture fitting manufacturers have had to deal with inspectors improperly enforcing the requirements of NSF 14 on their products. In 2014, PMI received the attached interpretation from NSF to clarify the scope of NSF 14. Therefore, the first paragraph in Section 604.1 of the 2015 UPC ITM should be revised as follows to make it clear to the end user that the requirements only apply to pipe fittings and not fixture fittings.
**Item #: 070**

UPC 2021  Section: Table 604.1

**SUBMITTER:** Phillip H Ribbs  
PHR Consultants

**RECOMMENDATION:**  
Revise text

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>BUILDING SUPPLY PIPE AND FITTINGS</th>
<th>WATER DISTRIBUTION PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
</table>

(portions of table not shown remain unchanged)

**SUBSTANTIATION:**  
ASTM F877 is not a pipe standard. As of the 2011 edition of the standard, ASTM F877 no longer applied to "tubing" for classification or testing. For your information, the classification section of the 2011 edition of the standard now reads as follows: 5. Classification 5.1 Fittings—This specification classifies fittings including manifolds, intended for use in systems with PEX tubing, by a maximum continuous use temperature that shall be 180°F (82°C) and by nominal sizes from 1/8 inch through 6 inches on the basis of resistance to burst pressure, hydrostatic sustained pressure, excessive temperature pressure capability, and by thermocycling. Fittings shall be compatible with tubing made to the requirements of Specification F876. This is a case where a standard that was once applicable, has gone through a drastic change, and is no longer appropriate as a pipe standard.
Item #: 071  
UPC 2021  Section: Table 604.1  

**SUBMITTER:** Michael Cudahy  
Plastic Pipe and Fittings Association (PPFA)  

**RECOMMENDATION:**  
Revise text

### TABLE 604.1  
MATERIALS FOR BUILDING SUPPLY AND WATER DISTRIBUTION PIPING AND FITTINGS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>BUILDING SUPPLY PIPE AND FITTINGS</th>
<th>WATER DISTRIBUTION PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
</table>

(portion of table not shown remains unchanged)

**SUBSTANTIATION:**  
Delete ASTM F877 from the REFERENCED STANDARD(S) PIPE column. The REQUIREMENTS for piping have been removed from ASTM F877, and this is the only table in the model codes it currently remains. It is still a fittings standard.
Item #: 072
UPC 2021 Section: Table 604.1

SUBMITTER: Mark Fasel
Viega LLC

RECOMMENDATION:
Revise text

TABLE 604.1
MATERIALS FOR BUILDING SUPPLY AND WATER DISTRIBUTION PIPING AND FITTINGS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>BUILDING SUPPLY PIPE AND FITTINGS</th>
<th>WATER DISTRIBUTION PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless Steel</td>
<td>X</td>
<td>X</td>
<td>ASTM A269, ASTM A312, ASTM A554, ASTM A778</td>
<td>IAPMO PS 117</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

TABLE 1701.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM A554-2016</td>
<td>Standard Specification for Welded Stainless Steel</td>
<td>Pipe</td>
<td>Table 604.1</td>
</tr>
<tr>
<td></td>
<td>Mechanical Tubing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASTM A778-2016</td>
<td>Standard Specification for Welded, Unannealed</td>
<td>Pipe</td>
<td>Table 604.1</td>
</tr>
<tr>
<td></td>
<td>Austenitic Stainless Steel Tubular Products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAPMO PS 117, 2017</td>
<td>Press and Nail Connections</td>
<td>Fittings</td>
<td>Table 604.1</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

Note: ASTM A554, ASTM A778, and IAPMO PS 117 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

TABLE 1701.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO PS 117-2016</td>
<td>Press and Nail Connections</td>
<td>Fittings</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

SUBSTANTIATION:
IAPMO PS 117 (2012 version) was moved to Table 1701.2 Standards, Publications, Practices, and Guides (non-mandatory) in the 2016 code cycle because at the time it did not technically qualify as a consensus standard. PS 117 has since passed through the consensus process and has been republished as PS 117 2017 edition which meets the qualification of a consensus document. IAPMO PS 117-2017 editions Document Preface includes this note: (5) This Standard was developed in accordance with the principles of consensus, which is defined as substantial agreement; consensus implies much more than a simple majority, but not necessarily unanimity. It is consistent with this definition that a member of the IAPMO Standards Review Committee might not be in full agreement with all sections of this Standard. This Standard has multiple listees for both Copper and Stainless Steel press fittings and is widely recognized in the marketplace by AHJ’s and Installers alike. This Standard is also proposed to be added to Table 1701.1 Reference Materials. ASTM A778 and ASTM A554 are Stainless Steel standards that have been developed but not yet introduced into Table 604.1 for unannealed piping and tubing. The
current standards only allow annealed piping. Many stainless steel piping and tubing products are listed to both ASTM A778 as well as ASTM A554 which are referenced in many fitting standards currently.
Item #: 073
UPC 2021 Section: Table 604.1

SUBMITTER: Mark Fasel
Viega LLC

RECOMMENDATION:
Revise text

### TABLE 604.1
MATERIALS FOR BUILDING SUPPLY AND WATER DISTRIBUTION PIPING AND FITTINGS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>BUILDING SUPPLY PIPE AND FITTINGS</th>
<th>WATER DISTRIBUTION PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless Steel</td>
<td>X</td>
<td>X</td>
<td>ASTM A269, ASTM A312</td>
<td>ASTM F3226</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

### TABLE 1701.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM F3226/F3226M-2016</td>
<td>Standard Specification for Metallic Press-Connect Fittings for Pipe and Tubing Systems</td>
<td>Fittings</td>
<td>Table 604.1</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

Note: ASTM F3226 meets the requirements for a mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
ASTM F3226 was developed and published for Metallic Press-Connect fittings and should be recognized as an acceptable reference fitting standard to list the products to. This standard is an optional standard to test these fittings to and since PS 117 was removed from the list of recognized standards last cycle. ASTM F3226 is also being recognized by other plumbing codes and standards as well. This will help keep continuity between the standards recognized in North America.
**TABLE 604.1**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>BUILDING SUPPLY PIPE AND FITTINGS</th>
<th>WATER DISTRIBUTION PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
</table>

(portion of table not shown remains unchanged)

**TABLE 1701.1**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO IGC 287-2012</td>
<td>Chlorinated Polyvinylchloride (CPVC) Pipe, Tubing, and Fittings for Hot and Cold Water Distribution Systems</td>
<td>Fittings</td>
<td>Table 604.1</td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

**Note:** IAPMO IGC 287 meets the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

**SUBSTANTIATION:**

IAPMO IGC 287 should be among those standards cited for CPVC Pipe or CPVC Fittings as indicated in the proposal for change. The scope of IAPMO IGC 287 covers SDR 11 (standard dimension ratio 11) chlorinated polyvinylchloride (CPVC) pipe, tubing, and fittings for use in hot and cold water distribution systems that operate at a maximum working pressure of 690 kPa (100 psig) and a maximum temperature of 22 °C (160°F). The fittings covered in this Standard comprise socket fittings, street fittings, and plastic-to-metal transition fittings. In addition to the standard requirements, a pullout test and quality evaluation for compliance is applied to adhesive joints made between pipe and the fittings covered in IGC 287 in accordance with ASTM F493 to ensure the integrity of joint.
Item #: 075
UPC 2021 Section: Table 604.1

SUBMITTER: Ronald George, CPD, President
Plumb-Tech Design & Consulting Services LLC
Rep: Self

RECOMMENDATION:
Revise text

### TABLE 604.1
MATERIALS FOR BUILDING SUPPLY AND WATER DISTRIBUTION PIPING AND FITTINGS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>BUILDING SUPPLY PIPE AND FITTINGS</th>
<th>WATER DISTRIBUTION PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galvanized Steel</td>
<td>✗</td>
<td>✗</td>
<td>ASTM A53</td>
<td>—</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

SUBSTANTIATION:
This code change is to Remove Galvanized Steel as a material choice for Pipe and Fittings. Galvanized piping is a poor choice for potable water systems material. Many recently constructed buildings have used galvanized piping and the water is coming out of fixtures in the building looking like rust colored chocolate milk. This is unacceptable for the health and safety of the public. Currently, this inferior pipe material is allowed by code for potable water supply and distribution. Galvanized pipe and fittings would be acceptable for process water systems, downstream of a backflow preventer, but Galvanized pipe should not be used in potable water supply or distribution systems. There are many other pipe material choices like stainless steel or Plastic that offer superior corrosion resistance and chemical compatibility with the growth of recent requirements for supplementary or secondary water treatment systems which have been destroying galvanized piping systems.
Item #: 076
UPC 2021 Section: 605.5 - 605.5.2

SUBMITTER: Ronald George, CPD, President
Plumb-Tech Design & Consulting Services LLC
Rep: Self

RECOMMENDATION:
Delete text without substitution

605.0 Joints and Connections.

605.5 Galvanized Steel Pipe and Joints. Galvanized steel pipe and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 605.5.1 or Section 605.5.2.

605.5.1 Mechanical Joints. Mechanical joints shall be made with an approved and listed elastomeric gasket.

605.5.2 Threaded Joints. Threaded joints shall be made with pipe threads that comply with ASME B1.20.1. Thread sealant tape or compound shall be applied only on male threads, and such material shall be of approved types, insoluble in water, and nontoxic.

(SUBSTANTIATION)
Galvanized pipe and fittings should not be used on potable water systems because they corrode and cause rusty water.
Item #: 077  
UPC 2021  Section: 604.6  

SUBMITTER: Ronald George, CPD, President  
Plumb-Tech Design & Consulting Services LLC  
Rep: Self  

RECOMMENDATION:  
Delete text without substitution  

604.0 Materials.  

**604.6 Cast-Iron Fittings:** Cast-iron fittings up to and including 2 inches (50 mm) in size, where used in connection with potable water piping, shall be galvanized.  

(renumber remaining sections)  

**SUBSTANTIATION:**  
Galvanized piping is a poor choice for potable water systems. Many newly constructed hospital facilities have used galvanized piping and the water is coming out of surgeons scrub sinks and other fixtures in the building looking like rust colored chocolate milk. This is totally unacceptable for the health and safety of the public, but the pipe material is allowed by code for potable water supply and distribution. Galvanized pipe and fittings would be acceptable for process water systems, downstream of a backflow preventers, but should not be used in potable water supply or distribution systems.
SUBMITTER: Michael Cudahy
Plastic Pipe and Fittings Association (PPFA)

RECOMMENDATION:
Revise text

605.2 CPVC Plastic Pipe and Joints. (remaining text unchanged)

605.2.2 Solvent Cement Joints. Solvent cement joints for CPVC pipe and fittings shall be clean from dirt and moisture. Solvent cements shall comply with ASTM F493, those requiring the use of a primer shall be orange in color. The primer shall be colored and shall comply with ASTM F656. A two-step method of joining pipe and fittings shall be made in accordance with ASTM D2855.

Listed solvent cement yellow or red in color shall be permitted for pipe and fittings that comply with ASTM D2846, 1/2 of an inch (15 mm) through 2 inches (50 mm) in diameter or ASTM F442, 1/2 of an inch (15 mm) through 3 inches (80 mm) in diameter. Apply primer where required inside the fitting and to the depth of the fitting on pipe. Apply liberal coat of cement to the outside surface of pipe to depth of fitting and inside of fitting. Place pipe inside fitting to forcefully bottom the pipe in the socket and hold together until joint is set.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM D2855-2015</td>
<td>Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets</td>
<td>Joints</td>
<td>705.6.2</td>
</tr>
</tbody>
</table>

Note: ASTM D2855 meets the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
ASTM D2855 now includes CPVC two step installation practice. The language could also be cleaned up a bit in the section. ASTM D2855 is Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets. ASTM D2855 is already in the plumbing code.
Item #: 079  
UPC 2021  Section: 605.2.2  

SUBMITTER: Gary Sample  
Georg Fischer Harvel LLC  

RECOMMENDATION:  
Revise text  

605.0 Joints and Connections.  

605.2.2 Solvent Cemented Joints. Solvent cement joints for CPVC pipe and fittings shall be clean from dirt and moisture. Solvent welded joints shall be made in accordance with the pipe manufacturer’s installation instructions. Solvent cemented joints shall be permitted both above or below ground. Solvent cements shall comply with ASTM F493, requiring the use of a primer shall be orange in color. The primer shall be colored and shall comply with ASTM F656. Listed solvent cement that complies with ASTM F493 and that does not require the use of primers, yellow or red in color, shall be permitted for pipe and fittings that comply with ASTM D2846, 1/2 of an inch (15 mm) through 2 inches (50 mm) in diameter or ASTM F442, 1/2 of an inch (15 mm) through 3 inches (80 mm) in diameter, shall be yellow in color. Where pipe manufacturer’s solvent welding installation instructions allow, these joints shall not require the use of primer. The maximum rated pressures shall not exceed 400 pounds per square inches (psi)(2758 kPa) at 73°F (23°C) and 100 psi (689 kPa) at 180°F (82°C). Pipe and fittings shall comply with the applicable standards referenced in Table 604.1. Apply primer where required inside the fitting and to the depth of the fitting on pipe. Apply liberal coat of cement to the outside surface of pipe to depth of fitting and inside of fitting. Place pipe inside fitting to forcefully bottom the pipe in the socket and hold together until the joint is set.  

SUBSTANTIATION:  
We want to mirror recommendations between the IPC and the UPC. The current IPC wording allows manufacturer to define the necessity of two step solvent cement with their pipe and fittings. This proposal adds similar wording and clearly defines the maximum pressure and temperature for one step systems, size range and standards for solvent welded CPVC pipe currently used in water distribution systems.
Item #: 080
UPC 2021  Section: 605.6.1

SUBMITTER: Phillip H Ribbs
PHR Consultants

RECOMMENDATION:
Revise text

605.0 Joints and Connections.

605.6 PE Plastic Pipe/Tubing and Joints. (remaining text unchanged)

605.6.1 Heat-Fusion Joints. Heat-fusion joints between PE pipe or tubing and fittings shall be assembled in accordance with Section 605.6.1.1 through Section 605.6.1.3 using butt, socket, or electro-fusion heat methods.

SUBSTANTIATION:
As currently written, this section indicates that all methods (butt, socket, and electrofusion) are required for assembling PE pipe. The modification will clarify that one of the three methods may be used for heat fusion joints.
Item #: 081
UPC 2021  Section: Table 604.1 and 605.11.4

SUBMITTER: Richard Houle  
Reliance Worldwide Corporation

RECOMMENDATION: 
Revise text

605.0 Joints and Connections.
605.11 Polypropylene (PP) Piping and Joints. (remaining text unchanged)

605.11.4 Push Fit Fittings. Push fit fittings for PP pipe shall comply with ASSE 1061 and shall have an approved elastomeric o-ring that forms the joint. Pipe shall be cut square, chamfered, reamed and free from debris. The fitting shall be installed in accordance with the manufacturer's installation instructions.

<table>
<thead>
<tr>
<th>Material</th>
<th>Building Supply Pipe and Fittings</th>
<th>Water Distribution Pipe and Fittings</th>
<th>Reference Standard(s) Pipe</th>
<th>Reference Standard(s) Fittings</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP</td>
<td>X</td>
<td>X</td>
<td>ASTM F2389, CSA B137.11</td>
<td>ASTM F2389, CSA B137.11, ASSE 1061</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: ASSE 1061 meets the requirements for a mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION: 
Push fit fittings, complying with ASSE 1061, have been developed specifically for PP pipe. These fittings will provide an additional installation alternative to the industry. ASSE 1061 fittings are a proven technology and have been code approved for copper, PEX and CPVC since 2006. More recently for PE-RT.
SUBMITTER: Michael Cudahy  
Plastic Pipe and Fittings Association (PPFA)

RECOMMENDATION:
Revise text

605.12.2 Solvent Cement Joints. A two-step method of joining pipe and fittings shall be made in accordance with ASTM D2855. Solvent cement joints for PVC pipe and fittings shall be clean from dirt and moisture. Pipe shall be cut square and pipe shall be deburred. Where surfaces to be joined are cleaned and free of dirt, moisture, oil, and other foreign material, apply primer purple in color that complies with ASTM F656. Primer shall be applied to the surface of the pipe and fitting is softened. Solvent cement that complies with ASTM D2564 shall be applied to all joint surfaces. Joints shall be made while both the inside socket surface and outside surface of pipe are wet with solvent cement. Hold joint in place and undisturbed for 1 minute after assembly.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM D2855-2015</td>
<td>Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets</td>
<td>Joints</td>
<td>605.6.2</td>
</tr>
</tbody>
</table>

Note: ASTM D2855 meets the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
ASTM D2855 is Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets ASTM D2855 is already in the plumbing code.
604.0 Materials.

604.7 Malleable Iron Fittings. Malleable iron water fittings shall be galvanized.

(Substitute text without substitution)

(SUBSTANTIATION:)
Galvanized piping is a poor choice for potable water systems. Many newly constructed hospital facilities have used galvanized piping and the water is coming out of surgeons scrub sinks and other fixtures in the building looking like rust colored chocolate milk. This is unacceptable for the health and safety of the public, but the pipe material is allowed by code for potable water supply and distribution. This code change is to remove the material from the plumbing code. Galvanized pipe and fittings would be acceptable for process water systems, downstream of a backflow preventer, but should not be used in potable water supply or distribution systems.)
Item #: 084
UPC 2021 Section: 606.8, Table 1701.1

SUBMITTER: Tim Collings
Self

RECOMMENDATION:
Revise text

606.0 Valves

606.8 Leak Detection Devices. Leak detection devices for water supply and distribution shall comply with IAPMO IGC 115 or IAPMO IGC 349. Leak detection devices shall not be installed on fire protection systems.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO IGC 115-2013e1</td>
<td>Automatic Water Leak Detection Devices</td>
<td>Miscellaneous</td>
<td>606.8</td>
</tr>
<tr>
<td>IAPMO IGC 349-2018</td>
<td>Electronic Plumbing Supply System Integrity Protection Devices</td>
<td>Miscellaneous</td>
<td>606.8</td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

Note: IAPMO IGC 115 and IAPMO IGC 349 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
Leak detection systems and devices compliant with IGC 115 have been tested and in use for over 10 years. With the development of "Smart" leak detection devices covered by IGC 349 the range of applications for these systems and the number of installations continues to grow. This proposal will definitively limit application of these devices and assists the end user in selection of an approved device for installation and ensure the health and safety of the public through code enforcement.
Item #: 085
UPC 2021 Section: 608.0

SUBMITTER: Jeremy Brown
NSF International

RECOMMENDATION:
Revise text

**608.0 Pumps.**

608.1 General. Pumps shall be installed to maintain prime and installed in accordance with the manufacturer's installation instructions.
608.2 Access. Pumps shall be accessible for repairs.
608.3 Potable Water Pumps. Pumps intending to supply drinking water shall be in accordance with NSF 61.

(renumber remaining sections)

<table>
<thead>
<tr>
<th>TABLE 1701.1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REFERENCED STANDARDS</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTION(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF 61-2016</td>
<td>Drinking Water System Components – Health Effects</td>
<td>Miscellaneous</td>
<td>615.1, 617.1, 604.1, 604.9, 606.1, 607.2, 608.2, 608.3</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

**Note:** NSF 61 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

**SUBSTANTIATION:**
The code currently does not have provisions for pumps. This is a start at adding a new section to address pump issues. This proposal also introduces requirements for pumps to meet NSF/ANSI Standard 61 Drinking Water System Components-Health Effects. This is the American National Standard addressing the chemical leaching of chemical contaminants from system components. This standard is already required for pipe, fittings, faucets, valves, and other products contacting drinking water. This requirement should be extended to pumps as well. There are many pumps currently available on the market that meet this requirement.
Session Timeout (minutes): 120

Proposals
Edit Proposal

Item #: 086
UPC 2021 Section: UPC 218.0, 608.2

SUBMITTER: Linda L. Soares
TACO COMFORT SOLUTIONS, Inc.

RECOMMENDATION:
Revise text

608.0 Water Pressure, Pressure Regulators, Pressure Relief Valves, and Vacuum Relief Valves.

608.2 Excessive Water Pressure. Where static water pressure in the water supply piping is exceeding 80 psi (552 kPa), an approved-type pressure reducing valve compliant with ASSE 1003, or method acceptable to the Authority Having Jurisdiction, preceded by an adequate strainer shall be installed and the static pressure reduced to 80 psi (552 kPa) or less. Pressure reducing valves equal to or exceeding 1 1/2 inches (40 mm) shall not require a strainer. Such pressure reducing valves shall control the pressure to water outlets in the building unless otherwise approved by the Authority Having Jurisdiction. Each such pressure reducing valve and strainer shall be accessible aboveground or in a vault equipped with a properly sized and sloped boresighted drain to daylight, shall be protected from freezing, and shall have the strainer readily accessible for cleaning without removing the pressure reducing valve or strainer body or disconnecting the supply piping. Pipe size determinations shall be based on 80 percent of the reduced pressure where using Table 610.4. An approved expansion tank shall be installed in the cold water distribution piping downstream of each such regulator to prevent excessive pressure from developing due to thermal expansion and to maintain the pressure setting of the regulator. Expansion tanks used in potable water systems intended to supply drinking water shall comply with NSF 61. The expansion tank shall be properly sized and installed in accordance with the manufacturer’s installation instructions and listing. Systems designed by registered design professionals shall be permitted to use approved pressure relief valves in lieu of expansion tanks provided such relief valves have a maximum pressure relief setting of 100 psi (689 kPa) or less.

218.0 - P -

Pressure Reducing Valve. Any device by means of which pressure may be reduced and controlled, where the inlet pressure is reduced to a lower pressure set point and tolerance.

Pressure Regulator (Hydraulic). See Pressure Reducing Valve.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
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<tr>
<td>ASSE 1003-2009</td>
<td>Water Pressure Reducing Valves for Domestic Water Distribution Systems</td>
<td>Valves</td>
<td>608.2</td>
</tr>
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</table>

(portion of table not shown remain unchanged)

Note: ASSE 1003 meets the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1003-2009</td>
<td>Water Pressure Reducing Valves for Domestic Water Distribution Systems</td>
<td>Valves</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

SUBSTANTIATION:
218.0 Pressure reducing valves (PRV’s) reduce the incoming pressure and control it to a given setpoint. This definition is based off of the ASSE Plumbing Dictionary 6th Edition definition for pressure regulators and pressure reducing valves. Pressure regulators are generally found in pneumatic systems, including steam systems, however both terms are used interchangeably in practice when referring to PRV’s in hydraulic systems hence having both references. 608.2 It is currently unclear what the criteria for acceptance are for PRV’s other than being “an approved type.” A device compliant with ASSE 1003 is required to control the downstream pressure to the setpoint, and only vary by 1psi for every change in 10psi of the inlet pressure. As an alternative to ASSE 1003, the UPC already states that other viable options are available by way of Section 301.2, or as proposed here: “or method acceptable to the AHJ.” ASSE 1003-compliant devices are self-contained, direct acting, single diaphragm types. Devices are permitted to have an integral strainer, separate strainer connected to the valve inlet, or be without strainer. Devices are permitted to be with or without an integral by-pass relief valve. Example tests performed within ASSE 1003 are a hydrostatic test, a maximum temperature test, the ability to reduce pressure from 250psi to 25psi, the ability to control the reduced pressure to 10% of line inlet variations, a flow capacity test, an adjustment pressure range test, and a bypass relief valve test.
SUBMITTER: April Trafton
Donald F. Dickerson Associates

RECOMMENDATION:
Revise text

608.0 Water Pressure, Pressure Regulators, Pressure Relief Valves, and Vacuum Relief Valves.

608.3 Expansion Tanks, and Combination Temperature and Pressure-Relief Valves. A water system provided with a check valve, backflow preventer, or other normally closed device that prevents dissipation of building pressure back into the water main, independent of the type of water heater used, shall be provided with an approved, listed, and adequately sized expansion tank or other approved device having a similar function to control thermal expansion. Pre-pressurized water expansion tanks shall comply with IAPMO Z1088. Such expansion tank or other approved device shall be installed on the building side of the check valve, backflow preventer, or other device and shall be sized and installed in accordance with the manufacturer's installation instructions.

A water system containing storage water heating equipment shall be provided with an approved, listed, adequately sized combination temperature and pressure-relief valve, except for listed nonstorage instantaneous heaters having an inside diameter of not more than 3 inches (80 mm). Each such approved combination temperature and pressure-relief valve shall be installed on the water-heating device in an approved location based on its listing requirements and the manufacturer’s installation instructions. Each such combination temperature and pressure-relief valve shall be provided with a drain in accordance with Section 608.5.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO Z1088-2013</td>
<td>Pre-Pressurized Water Expansion Tanks</td>
<td>Miscellaneous</td>
<td>608.3</td>
</tr>
</tbody>
</table>

Note: IAPMO Z1088 meets the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
IAPMO Z1088 establishes minimum requirements for pre-pressurized water expansion tanks intended for use in potable and nonpotable water systems. There are more than 10 manufacturers which have been tested and listed to Z1088 and it should be included as the referenced standard for this product to clearly inform the end user of the code that these devices are approved and to ensure the health and safety of the public through code enforcement.
608.3 Pressure Controls. Pressure controls shall comply with Section 608.3.1.

608.3.1 Thermal Expansion Tanks, and Combination Temperature and Pressure-Relief Valves. Where a water system is provided with a check valve, backflow preventer, pressure reducing valve, or other normally closed device on the building water supply pipe that prevents dissipation of water pressure within the building distribution piping back into the water main, creating a closed piping system during periods of non-use and independent of the type of water heater used, shall be provided with an approved, listed, and adequately sized thermal expansion tank or other approved device having a similar function to control thermal expansion. Such expansion tank or other approved device shall be installed on the building side of the check valve, backflow preventer, pressure reducing valve, or other device and shall be sized and installed in accordance with the manufacturer’s installation instructions.

Thermal expansion tanks shall comply with NSF 61 and shall be rated for the maximum system pressure. Thermal expansion tanks shall incorporate a flow thru-design to prevent having a dead-leg of stagnant water.

A water system containing storage water heating equipment shall be provided with an approved, listed, adequately sized combination temperature and pressure-relief valve, except for listed nonstorage instantaneous heaters having an inside diameter of not more than 3 inches (80 mm). Each such approved combination temperature and pressure-relief valve shall be installed on the water-heating device in an approved location based on its listing requirements and the manufacturer’s installation instructions. Each such combination temperature and pressure-relief valve shall be provided with a drain in accordance with Section 608.5.

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>NSF 61-2016</td>
<td>Drinking Water System Components – Health Effects</td>
<td>Miscellaneous</td>
<td>415.1, 417.1, 604.1, 604.9, 606.1, 607.2, 608.2, 608.3.1</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: NSF 61 meets the requirements for a mandatory reference standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
This code change is intended to add important requirements for thermal expansion tanks. Note to Staff: This code change can be combined with my earlier code change on the same section. Please call to discuss merging the two changes or they can be heard independent of each other. This change added flow-thru design for the protection from stagnant water with contributes to Legionella bacteria growth.
608.3 Pressure Controls. Pressure controls shall comply with Section 608.3.1 and Section 608.3.2.

608.3.1 Thermal Expansion Tanks, and Combination Temperature and Pressure-Relief Valves. A water system provided with a check valve, backflow preventer, pressure reducing valve, or other normally closed device that prevents dissipation of building pressure back into the water main, independent of the type of water heater used, shall be provided with an approved, listed, and adequately sized expansion tank or other approved device having a similar function to control thermal expansion. Such expansion tank or other approved device shall be installed on the building side of the check valve, backflow preventer, pressure reducing valve, or other device and shall be sized and installed in accordance with the manufacturer’s installation instructions.

608.3.2 Combination Temperature and Pressure-Relief Valves. A water system containing storage water heating equipment shall be provided with an approved, listed, adequately sized combination temperature and pressure-relief valve with the temperature probe extending into the top 6 inches (152 mm) of the tank. The device and shall be sized and installed in accordance with the manufacturer’s installation instructions, except for listed nonstorage instantaneous heaters having an inside diameter of not more than 3 inches (80 mm). Each such approved combination temperature and pressure-relief valve shall be installed on the water heating device in an approved location based on its listing requirements and the manufacturer’s installation instructions. Each such combination temperature and pressure-relief valve shall be provided with a drain in accordance with Section 608.5.

SUBSTANTIATION:
This code change is to clean up the language of this section, by splitting these two different devices into separate code sections. This will allow them to be listed in the index.
Item #: 090
UPC 2021  Section: 608.3.3

SUBMITTER: Ronald George, CPD, President
Plumb-Tech Design & Consulting Services LLC
Rep: Self

RECOMMENDATION:
Add new text

608.0 Water Pressure, Pressure Regulators, Pressure Relief Valves, and Vacuum Relief Valves.

608.3.3 Hydro-Pneumatic Tanks for Domestic Water Pressure Booster Pump Systems. Hydro-pneumatic tanks for domestic water pressure booster pump systems shall be rated for the maximum system pressure and shall have a flow thru-design to prevent having a dead-leg of stagnant water. Hydro-pneumatic tanks for pressure booster systems shall be approved, listed, and sized to allow the booster pumps to shut-down during off-peak hours of operation. The Hydro-pneumatic tank and lining material shall comply with NSF 61 for potable water systems.

<table>
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<td>Miscellaneous</td>
<td>415.1, 417.1, 604.1,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>604.9, 606.1, 607.2,</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>608.2, 608.3.3</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: NSF 61 meets the requirements for a mandatory reference standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
This is a proposed new section to address Hydro-pneumatic tanks that are commonly associated with domestic water pressure booster systems.
608.0 Water Pressure, Pressure Regulators, Pressure Relief Valves, and Vacuum Relief Valves.

608.3 Leak Detection Devices. A leak detection device capable of measuring flow rates down to 0.25 gallons per minute (gpm) (0.016 L/s) shall be installed after the pressure reducing valve, where required. Where a pressure reducing valve is not required, a leak detection device shall be installed after the main water shut off valve. All water contact components shall be third party certified to comply with NSF 61. Where the device includes an automatic flow control valve, the valve shall comply with the requirements of Section 606.1. The leak detection system shall include an integrated automatic notification system for alerting users of potential leaks.

608.3.1 Automatic Valves in Fire Suppression Systems. Where a fire suppression system is installed, the flow control valve shall be installed where it will not shut off flow to the fire suppression system. An automatic flow control valve shall not be installed where a multipurpose fire suppression system is installed.

(renumber remaining sections)

<table>
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</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: NSF 61 meets the requirements for a mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
Water leaks in homes account for a significant amount of wasted water, whether it is from a leaking toilet, dripping faucet or a breach in the plumbing system. Water damages in homes is the number 1 cause of insurance claims. A leak in a home, whether caused from a nail penetrating one of the water distribution pipes or a leaking toilet can be the source of significant damage in a home requiring mold remediation, and significant repairs to a home. By detecting potential leaks early, not only can damage be minimized but also save a significant amount of one of our most precious resources. This device can also save significant water damage when installed during construction. Breaches to the plumbing system can be identified the minute a breach is made during the construction process. A new home can be turned over to the new owners with proof that the plumbing system has not been compromised during construction.
Item #: 092
UPC 2021  Section: 608.5

SUBMITTER: Phillip H Ribbs
PHR Consultants

RECOMMENDATION:
Revise text

608.0 Water Pressure, Pressure Regulators, Pressure Relief Valves, and Vacuum Relief Valves.

608.5 Discharge Piping. The discharge piping serving a temperature relief valve, pressure relief valve, or combination of both shall have no valves, obstructions, or means of isolation and be provided with the following:

(1)  Equal to Not less than the size of the valve outlet and shall discharge full size to the flood level of the area receiving the discharge and pointing down.

(2)  Materials shall be rated at not less than the operating temperature of the system and approved for such use or shall comply with ASME A112.4.1.

(3)  Discharge pipe shall discharge independently by gravity through an air gap into the drainage system or outside of the building with the end of the pipe not exceeding 2 feet (610 mm) and not less than 6 inches (152 mm) above the ground and pointing downwards.

(4)  Discharge in such a manner that does not cause personal injury or structural damage.

(5)  No part of such discharge pipe shall be trapped or subject to freezing.

(6)  The terminal end of the pipe shall not be threaded.

(7)  Discharge from a relief valve into a water heater pan shall be prohibited.

(8)  The discharge termination point shall be readily observable.

SUBSTANTIATION:
The proposed modifications to item (1) is necessary as there are cases where PEX or PE-RT fitting require insert fittings that will reduce the inner diameter of the PEX tubing. Allowing the piping to be greater than the valve outlet will keep the PEX tubing inner diameter from being smaller than the valve outlet. Furthermore, item (8) makes it clear that the termination point of the drainage line must be visible in order to detect leaks or failed valves.
**SUBMITTER:** kurt w Steenhoek  
United Association

**RECOMMENDATION:**  
Revise text

**609.0 Installation, Testing, Unions, and Location.**

**609.9 Disinfection of Potable Water System.** New or repaired potable water systems shall be disinfected prior to use where required by the Authority Having Jurisdiction. The method to be followed shall be that prescribed by the Health Authority or, in case no method is prescribed by it, the following:

1. The pipe system shall be flushed with clean, potable water until potable water appears at the points of the outlet.
2. The system or parts thereof shall be filled with a water-chlorine solution containing not less than 50 parts per million of chlorine, and the system or part thereof shall be valved-off and allowed to stand for 24 hours; or, the system or part thereof shall be filled with a water-chlorine solution containing not less than 200 parts per million of chlorine and allowed to stand for 3 hours.
3. Following the allowed standing time, the system shall be flushed with clean, potable water until the chlorine residual in the water coming from the system does not exceed the chlorine residual in the flushing water.
4. The procedure shall be repeated where it is shown by a bacteriological examination made by an approved agency that contamination persists in the system.

Healthcare facilities shall have the potable water systems tested according to their water management program and ASHRAE 188.

**TABLE 1701.1 REFERENCED STANDARDS**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
</table>

(portion of table not shown remain unchanged)

**Note:** ASHRAE 188 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

**SUBSTANTIATION:**

Many water systems in the U.S. today are facing daunting challenges from at least three major sources. Lead poisoning, highlighted by the tragedy and travesty in Flint, Michigan, is a big part of the problem. Another is a recent spike in cases involving the water-borne and often deadly Legionnaire’s disease, which is caused by legionella bacteria. A third significant area of risk involves water systems tainted by dangerous chemicals or other compounds that become unsafe once they get in water systems and interact with otherwise harmless substances. Legionella disease (LD), a severe sometimes fatal pneumonia, can occur in persons who inhale aerosolized droplets of water contaminated with the bacterium Legionella. In a recent review of LD outbreaks in the United States occurring in 2000–2014, 19% of outbreaks were associated with long-term care facilities and 15% with hospitals. The rate of reported cases of legionella, which comprises both LD and Pontiac fever (a milder, self-limited, influenza-like illness) has increased 286% in the US during 2000–2014, with approximately 5,000 cases reported to the Centers for Disease Control and Prevention (CDC) in 2014. Approximately 9% of reported legionella cases are fatal. The Centers for Medicare & Medicaid Service (CMS) is aware of multiple recent LD outbreaks in hospitals and long-term care facilities as reported by the CDC, state and local health departments, or investigated by State Survey Agencies (SA). Outbreaks generally are linked to environmental reservoirs in large or complex water systems, including those found in healthcare facilities such as hospitals and long-term care facilities. In manmade water systems, Legionella can grow and spread to susceptible hosts, such as persons who are at least 50 years old, smokers, and those with underlying medical conditions such as chronic lung disease or immunosuppression. Legionella can grow in parts of building water systems that are continually wet, and certain devices can spread contaminated water droplets via aerosolizing. Examples of these system components and devices include: • Hot and cold water storage tanks • Water heaters • Water-hammer arrestors • Pipes, valves, and fittings • Expansion tanks • Water filters • Electronic and manual faucets • Aerators • Faucet flow restrictors • Showerheads and hoses • Centrally-installed misters, atomizers, air washers, and humidifiers • Nonsteam aerosol-generating humidifiers • Eyewash stations • Ice machines • Hot tubs/saunas • Decorative fountains • Cooling towers • Medical devices (such as CPAP machines, hydrotherapy equipment, bronchoscopes, heater-cooler units) Healthcare facilities are expected to comply with CMS requirements to protect the health and safety of its patients effective immediately.
Item #: 094
UPC 2021 Section: 609.10, Table 1701.1

SUBMITTER: Tim Collings
Self

RECOMMENDATION:
Revise text

609.0 Installation, Testing, Unions, and Location.

609.10 Water Hammer. Building water supply systems where quick-acting valves are installed shall be provided with water hammer arrester(s) to absorb high pressures resulting from the quick closing of these valves. Water hammer arresters shall be approved mechanical devices that comply with ASSE 1010, IAPMO IGC 168, or PDI-WH 201 and shall be installed as close as possible to quick-acting valves.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO IGC 168-2012</td>
<td>Supply Stops with Integral Water Hammer Arresters</td>
<td>Appliances</td>
<td>609.10</td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

Note: IAPMO IGC 168 meets the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
Currently, there are many water hammer arrestors installed in the field that include an integral supply stop. The current referenced standards, ASSE 1010 and PDI-WH 201, address water hammer arresters without a supply stop. This proposal introduces IGC 168 which covers water hammer arrestors that are integral to supply stops. The supply stop with water hammer arrester is evaluated as a single product under IGC 168.
**Item #: 095**

UPC 2021  Section: Table 610.3

**SUBMITTER:** John Stuart Lansing, CPDT, LEED Green Associate
American Society of Plumbing Engineers

**RECOMMENDATION:**
Revise text

<table>
<thead>
<tr>
<th>APPLIANCES, APPURTENANCES OR FIXTURES</th>
<th>MINIMUM FIXTURE BRANCH PIPE SIZE</th>
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<th>PUBLIC</th>
<th>ASSEMBLY</th>
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<td>(inches)</td>
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<tr>
<td>Lavatory</td>
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<td>1.0</td>
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<td></td>
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</tr>
<tr>
<td>Bar</td>
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<td>1.0</td>
<td>2.0</td>
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</tr>
<tr>
<td>Clinical Faucet</td>
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<td>3.0</td>
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<tr>
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<td>Kitchen, domestic with or without dishwasher</td>
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<tr>
<td>Service or Mop Basin</td>
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</tr>
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<td>Washup, each set of faucets</td>
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<td>2.0</td>
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</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

**SUBSTANTIATION:**
As maximum flow rates have been reduced, the minimum allowable pipe sizes have remained unchanged. The reduced flow rates of fixtures have increased wait times, which leads to passive water-use as users are waiting for hot water. Allowing 3/8” fixture branch pipe sizes will decrease hot water wait time by up to 40%. For instance, a 1/2 inch supply branch that extends 10 feet from a recirculated branch line will take 15 seconds before delivering to a fixture flowing at 0.5 gpm. In contrast, a 3/8 inch supply branch will take 9 seconds. The proposed allowable reduction will reduce both water-use and wasted energy for heating water in addition to increasing user experience with negligible pressure loss from friction. See comparison attached table.
Item #: 096  
UPC 2021  Section: Table 610.3

SUBMITTER:  Jay Peters  
Codes and Standards International  
Rep: Falcon Waterfree Technologies

RECOMMENDATION:  
Revise text

TABLE 610.3  
WATER SUPPLY FIXTURE UNITS (WSFU) AND MINIMUM FIXTURE BRANCH PIPES SIZES

<table>
<thead>
<tr>
<th>APPLIANCES, APPURTENANCES, OR FIXTURES</th>
<th>MINIMUM FIXTURE BRANCH PIPE SIZE (inches)</th>
<th>PRIVATE</th>
<th>PUBLIC</th>
<th>ASSEMBLY</th>
</tr>
</thead>
<tbody>
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<td>Urinal, Hybrid</td>
<td>1/2</td>
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<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Urinal with Drain Cleansing Action</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

SUBSTANTIATION:  
This term was updated from Hybrid Urinal to correspond with the new terminology added to the ASME A112.19.19-2016 for this type of fixture and is merely a correlation issue.
Item #: 097
UPC 2021  Section: 223.0

SUBMITTER: Jay Peters
Codes and Standards International
Falcon Waterfree Technologies

RECOMMENDATION:
Revise text

223.0 – U –

Urinal, Hybrid. A urinal that conveys waste into the drainage system without the use of water for flushing, and automatically performs a drain-cleansing action after a predetermined amount of time.

Urinal with Drain Cleansing Action. A non-water urinal that performs a drain cleansing action automatically after a preset unit of time or predetermined amount of usage and is able to extract waste without the drain-cleansing action.

SUBSTANTIATION:
The original text for Hybrid Urinal was based on the IAPMO IGC for Hybrid Urinals. Since then, the technology has been added into the ASME A112.19.19-2016 standard and the IAPMO IGC has been discontinued. This proposal updates the language in the code to correlate with the language in the updated ANSI standard for consistency. NOTE: There is a companion change to update the term into the corresponding WSFU and DFU tables; 610.3 and 702.1, respectively.
SUBMITTER: Jason M Shank  
Plumbers Local 55/MCA JATC

RECOMMENDATION:  
Add new text

611.0 Drinking Water Treatment Units.

611.1 Application. Drinking water treatment units shall comply with NSF 42 or NSF 53. Water softeners shall comply with NSF 44. Ultraviolet water treatment systems shall comply with NSF 55. Reverse osmosis drinking water treatment systems shall comply with NSF 58. Drinking water distillation systems shall comply with NSF 62. Alkaline water treatment devices shall comply with IAPMO IGC 322.

<table>
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<th>REFERENCED SECTIONS</th>
</tr>
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<tr>
<td>IAPMO IGC 322-2018</td>
<td>Alkaline Water – Drinking Water Treatment Units</td>
<td>Miscellaneous</td>
<td>611.1</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: IAPMO IGC 322 meets the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:  
There has been a health trend in the market for drinking alkaline water, water with a pH above 7.0. There are many claimed health benefits including neutralizing stomach acid and increasing oxygen levels in the blood. Currently these water treatment products have not had any formal procedures in order to ensure their claims of effectiveness with regards to the level of alkalinity. Note that the goal is not to make health claims regarding positive health benefits, only that the products dispense alkaline water for safe consumption resulting in non-detrimental effects to health. IGC 322 references the appropriate structural integrity, aesthetic and health effect standards (NSF 42 and 53) and electrical requirements from CSA and UL (CSA C22.2 No. 14, CSA C22.2 No. 68, CSA C22.2 No. 60335-1, UL 979, UL 1951, UL 60335-1, CSA C22.2 No. 223, and UL 1310). Given incoming challenge water, IGC 322 gives the output performance requirements for flow rate and Oxidation Reduction Potential at given pH levels. Table 1701.1 Standard Number Standard Title Application Referenced Sections IAPMO IGC 322 Alkaline Water – Drinking Water Treatment Units Water Treatment 611.1
Item #: 099
UPC 2021  Section: 611.0, 611.1, Table 1701.1

SUBMITTER: Vincent Kent
Abendroth Water Conditioning

RECOMMENDATION:
Revise text

611.0 Drinking Water-Conditioning or Treatment Units Devices.

611.1 Application. Point-of-use and point-of-entry water-conditioning or -treatment devices shall comply with the appropriate standards per this section. Drinking Aesthetic water treatment devices shall comply with NSF 42. Water treatment devices reducing potential health hazards shall comply with NSF 53. Water softeners shall comply with NSF 44. Ultraviolet water treatment systems shall comply with NSF 55. Reverse osmosis drinking water treatment systems shall comply with NSF 58. Drinking water distillation systems shall comply with NSF 62. Scale reduction devices shall comply with IAPMO/ANSI Z601.

### TABLE 1701.1

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
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<tbody>
<tr>
<td>IAPMO/ANSI Z601-2018 (draft)</td>
<td>Scale Reduction Devices</td>
<td>Water Conditioning, Water Treatment</td>
<td>611.1</td>
</tr>
</tbody>
</table>

Note: IAPMO/ANSI Z601 is a working draft and is not completed at the time of this monograph.

SUBSTANTIATION:

611.0 – Changing the heading of the section to be consistent with what is used and installed in the industry today. 611.1 – Updated language to describe the current standards appropriately for all POE and POU treatment devices. The Z601 standard gives the performance criteria for any scale reduction device intended for tank-type and tank-less water heaters as well as ion exchangers. It covers material safety, structural integrity, and various safety requirements. Products are being installed today in plumbing systems that have not been tested for scale reduction performance or safety. This standard fills that gap to ensure product can safely be installed and perform as marketed.
Item #: 100
UPC 2021  Section: UPC 611.5

SUBMITTER: Kurt W Steenhoek
United Association

RECOMMENDATION:
Revise text

611.0 Drinking Water Treatment Units.

611.5 Service  Drinking water treatment units shall be installed, maintained, or repaired by a technician certified to ASSE 22000 or as otherwise required by the Authority Having Jurisdiction.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
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<tr>
<td>ASSE 22000-2017</td>
<td>Professional Qualifications Standard for Water Treatment Equipment Personnel</td>
<td>Certification</td>
<td>611.5</td>
</tr>
</tbody>
</table>

Note: ASSE 22000 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
Statement of Problem and Substantiation/Resolution With stories of poor water quality making headlines across the country, and increasing consumer demand for water treatment systems, the need for qualified, knowledgeable professionals to install and maintain water treatment systems has never been higher. The ASSE Series 22000 is the first standard and third-party certification for water treatment equipment installers. Currently, some of these devices are being installed improperly as many lack the necessary knowledge to properly set up water treatment equipment, and many water treatment dealers lack the necessary knowledge to properly size and plumb water treatment systems. The ASSE Series 22000 is an industry-composed standard, developed by both water treatment and plumbing professionals. There is also an industry-developed certification program to provide water treatment installers with the necessary skills, and code and technological competencies to safely and correctly install and maintain water treatment equipment. This certification program and standard results in properly trained professionals, properly operating water treatment equipment, and safer, healthier and happier water consumers. The ASSE Series 22000 applies to individuals who are responsible for installations, flow-rate sizing, testing, repair, and maintenance of water treatment equipment. This equipment is located in commercial and residential points-of-entry and points-of-use. The standard covers how to specify the correct equipment to be used, as well as the maintenance schedules for each water treatment unit.
SUBMITTER: Michael Cudahy
Plastic Pipe and Fittings Association (PPFA)

RECOMMENDATION:
Revise text

612.0 Residential Fire Sprinkler Systems.

612.1 Where Required. Where residential sprinkler systems are required in one and two-family dwellings or townhouses, the systems shall be installed by personnel, installer, or both, certified in accordance with ASSE Series 7000 or who possess documented manufacturer training in accordance with this section or NFPA 13D. This section shall be considered equivalent to NFPA 13D. Partial residential sprinkler systems shall be permitted to be installed in buildings not required to be equipped with a residential sprinkler system.

SUBSTANTIATION:
While this may be less of an issue down the road, there is probably still a shortage of certifications to ASSE 7000 in the marketplace, but there will always be some manufacturer training programs that can help fill in the gap as an alternative and offer specialized knowledge for systems until the gap is closed. We offer this as a way to close the gap.
Item #: 102
UPC 2021 Section: 225.0, 312.1, 407.3, etc

SUBMITTER: Gary Klein
Gary Klein and Associates, Inc.
Rep: Self

RECOMMENDATION:
Revise text

225.0 Water Heater or Hot Water Heating Boiler. An appliance designed primarily to supply hot water for domestic or commercial purposes and equipped with automatic controls limiting water temperature to a maximum of 210°F (99°C).

312.0 Protection of Piping, Materials, and Structures.
312.1 General. Piping passing under or through walls shall be protected from breakage. Piping passing through or under cinders or other corrosive materials shall be protected from external corrosion in an approved manner. Approved provisions shall be made for expansion of hot-water piping. Voids around piping passing through concrete floors on the ground shall be sealed.

407.3 Limitation of Hot Water Temperature for Public Lavatories. Hot water delivered from public-use lavatories shall be limited to a maximum temperature of 120°F (49°C) by a device that complies with ASSE 1070/ASME A112.1070/CSA B125.70. The water heater thermostat shall not be considered a control for meeting this provision.

409.4 Limitation of Hot Water Temperature in Bathtubs and Whirlpool Bathtubs. The maximum hot water temperature discharging from the bathtub and whirlpool bathtub filler shall be limited to 120°F (49°C) by a device that complies with ASSE 1070/ASME A112.1070/CSA B125.70. The water heater thermostat shall not be considered a control for meeting this provision.

410.3 Limitation of Water Temperature in Bidets. The maximum hot water temperature discharging from a bidet shall be limited to 110°F (43°C) by a device that complies with ASSE 1070/ASME A112.1070/CSA B125.70. The water heater thermostat shall not be considered a control for meeting this provision.

505.2 Safety Devices. Storage-type water heaters and hot water boilers deriving heat from fuels or types of energy other than gas, shall be provided with, in addition to the primary temperature controls, an over-temperature safety protection device that complies with and is installed in accordance with nationally recognized applicable standards for such devices and a combination temperature and pressure-relief valve.

601.2 Hot and Cold Water Required. Except where not deemed necessary for safety or sanitation by the Authority Having Jurisdiction, each plumbing fixture shall be provided with an adequate supply of potable running water piped thereto in an approved manner, so arranged as to flush and keep it in a clean and sanitary condition without danger of backflow or cross-connection. Water closets and urinals shall be flushed using an approved flush tank or flushometer valve.

609.11 Pipe Insulation. Insulation of domestic hot-water piping shall be in accordance with Section 609.11.1 and Section 609.11.2. Where chemicals are introduced into the system a reduced pressure backflow prevention assembly or reduced pressure principle backflow prevention assembly in accordance with Table 603.2.

609.11.1 Insulation Requirements. Domestic hot-water piping shall be insulated.

609.11.2 Pipe Insulation Wall Thickness. Hot-water pipe insulation shall have a minimum wall thickness of not less than the diameter of the pipe for a pipe up to 2 inches (50 mm) in diameter. Insulation wall thickness shall be not less than 2 inches (51 mm) for a pipe of 2 inches (50 mm) or more in diameter.

Exceptions:
(1) Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration.
(2) Hot-water Hot-water piping between the fixture control valve or supply stop and the fixture or appliance shall not be required to be insulated.

610.12.1 Copper Tube Systems. Maximum velocities in copper and copper alloy tube and fitting systems shall not exceed 8 feet per second (ft/s) (2.4 m/s) in cold-water cold-water and 5 ft/s (1.5 m/s) in hot-water hot-water.

610.12.2 Tubing Systems Using Copper Fittings. Maximum velocities through copper and copper alloy fittings in tubing other than copper shall not exceed 8 ft/s (2.4 m/s) in cold-water cold-water and 5 ft/s (1.5 m/s) in hot-water hot-water.
TABLE 610.3
WATER SUPPLY FIXTURE UNITS (WSFU) AND MINIMUM FIXTURE BRANCH PIPE SIZES

Notes:
1 Size of the cold branch pipe, or both the hot and cold branch pipes.
2 Appliances, appurtenances, or fixtures not referenced in this table shall be permitted to be sized by reference to fixtures having a similar flow rate and frequency of use.
3 The listed fixture unit values represent their load on the cold water building supply. The separate cold-water and hot-water fixture unit value for fixtures having both cold and hot water connections shall be permitted to be each taken as three-quarters of the listed total value of the fixture.
4 The listed minimum supply branch pipe sizes for individual fixtures are the nominal (I.D.) pipe size.
5 For fixtures or supply connections likely to impose continuous flow demands, determine the required flow in gallons per minute (gpm) (L/s), and add it separately to the demand in gpm (L/s) for the distribution system or portions thereof.
6 Assembly (Public Use (See Table 422.1)).
7 Where sizing flushometer systems, see Section 610.10.
8 Reduced fixture unit loading for additional hose bibbs is to be used where sizing total building demand and for pipe sizing where more than one hose bibb is supplied by a segment of water distribution pipe. The fixture branch to each hose bibb shall be sized on the basis of 2.5 fixture units.

1309.6.7 On-Site Reclining. The interior surfaces of tube ends, fittings, and other components that were cleaned for oxygen service by the manufacturer, but that became contaminated prior to being installed, shall be permitted to be reclined on-site by the installer by thoroughly scrubbing the interior surfaces with a clean, hot-water-alkaline solution, such as sodium carbonate or trisodium phosphate, using a solution of 1 pound (0.5 kg) of sodium carbonate or trisodium phosphate to 3 gallons (11 L) of potable water and thoroughly rinsing them with clean, hot, potable water. Other aqueous cleaning solutions shall be permitted to be used for on-site reclining provided that they are as recommended in the mandatory requirements of CGA G-4.1. [NFPA 99:5.1.10.4.3.10, 5.1.10.4.3.11]

APPENDIX A

TABLE A 103.1
WATER SUPPLY FIXTURE UNITS (WSFU) AND MINIMUM FIXTURE BRANCH PIPE SIZES

Notes:
1 Size of the cold branch pipe, or both the hot and cold branch pipes.
2 Appliances, appurtenances, or fixtures not included in this table shall be permitted to be sized by reference to fixtures having a similar flow rate and frequency of use.
3 The listed fixture unit values represent their load on the cold-water building supply. The separate cold-water and hot-water fixture unit value for fixtures having both cold and hot water connections shall be permitted to be three-quarters of the listed total value of the fixture.
4 The listed minimum supply branch pipe sizes for individual fixtures are the nominal (I.D.) pipe size.
5 For fixtures or supply connections likely to impose continuous flow demands, determine the required flow in gallons per minute (gpm) (L/s) and add it separately to the demand in gpm (L/s) for the distribution system or portions thereof.
6 Assembly (Public Use (see Table 422.1)).
7 Reduced fixture unit loading for additional hose bibbs is to be used where sizing total building demand and for pipe sizing where more than one hose bibb is supplied by a segment of water distribution pipe. The fixture branch to each hose bibb shall be sized by 2.5 fixture units.

APPENDIX L
Recirculation System. A system of hot-water hot-water supply and return piping with shutoff valves, balancing valves, circulating pumps, and a method of controlling the circulating system.

L 501.1 Scope. The provisions of this section shall establish the means of conserving potable and nonpotable water and energy associated with the generation and use of hot-water hot-water in a building. This includes provisions for the hot-water hot-water distribution system, which is the portion of the potable water distribution system between a water heating device and the plumbing fixtures, including dedicated return piping and appurtenances to the water heating device in a recirculation system.

L 501.2 Insulation. Hot-water hot-water supply and return piping shall be thermally insulated. The wall thickness of the insulation shall be equal to the nominal diameter of the pipe up to 2 inches (50 mm). The wall thickness shall not be less than 2 inches (51 mm) for nominal pipe diameters exceeding 2 inches (50 mm). The conductivity of the insulation [k-factor (Btu•in/(h•ft•°F))] measured radially, shall not be more than 0.28 [Btu/hr•ft•°F] [0.04 W/(m•K)]. Hot-water hot-water piping to be insulated shall be installed such that insulation is continuous. Pipe insulation shall be installed to within 1/2 of an inch (6.4 mm) of appliances, appurtenances, fixtures, structural members, or a wall where the pipe passes through to connect to a fixture within 24 inches (610 mm). Building cavities shall be large enough to accommodate the combined diameter of the pipe, the insulation, and other objects in the cavity that the piping shall cross. Pipe supports shall be installed on the outside of the pipe insulation.

Exceptions:
(1) Where the hot-water hot-water pipe is installed in a wall that is not of a width to accommodate the pipe and insulation, the insulation thickness shall be permitted to have the maximum thickness that the wall is capable of accommodating and not less than 1/2 of an inch (12.7 mm) thick.
(2) Hot-water hot-water supply piping exposed under sinks, lavatories, and similar fixtures.
(3) Where hot-water hot-water distribution piping is installed within an attic, crawlspace, or wall insulation.
(a) In attics and crawlspaces, the insulation shall cover the pipe not less than 5/16 inches (140 mm) further away from the conditioned space.
(b) In walls, the insulation shall completely surround the pipe with not less than 1 inch (25.4 mm) of insulation.
(c) Where burial within the insulation will not completely or continuously surround the pipe, then these exceptions do not apply.

L 503.1 For Low-Rise Residential Buildings. Circulating hot-water hot-water systems shall be arranged so that the circulating pump(s) are capable of being turned off (automatically or manually) where the hot-water hot-water system is not in operation. [ASHRAE 90.2:7.2]

L 501.5 Temperature Maintenance Controls. Systems designed to maintain usage temperatures in hot-water pipes, such as recirculating hot-water hot-water systems or heat trace, shall be equipped with automatic time switches or other controls that are capable of being set to switch off the usage temperature maintenance system during extended periods where hot water is not required. [ASHRAE 90.1:4.4.2]

L 501.6 System Balancing. Systems with multiple recirculation zones shall be balanced to distribute hot-water hot-water uniformly, or they shall be operated with a pump for each zone. The circulation pump controls shall comply with the provisions of Section L 501.4.

L 502.1 General. The service water heating system for single-family houses, multi-family structures of three stories or fewer above grade, and modular houses shall comply with Section L 502 through Section L 502.7.3. The service water heating system of all other buildings shall comply with Section L 503.

L 502.5 Insulation. Insulation for hot-water hot-water and return piping shall comply with the provisions of Section L 501.2.

L 502.7 Maximum Volume of Hot Water Hot Water. The maximum volume of water contained in hot-water hot-water distribution pipes shall be in accordance with Section L 502.7.1 or Section L 502.7.2. The water volume shall be calculated using Table L 502.7.

L 502.7.1 Maximum Volume of Hot Water Hot Water Without Recirculation or Heat Trace. The maximum volume of water contained in hot-water hot-water distribution pipe between the water heater and any fixture fitting shall not exceed 32 ounces (oz) (946 mL). Where a fixture fitting shutoff valve (supply stop) is installed ahead of the fixture fitting, the maximum volume of water is permitted to be calculated between the water heater and the fitting shutoff valve (supply stop).

L 502.7.2 Maximum Volume of Hot Water Hot Water with Recirculation or Heat Trace. The maximum volume of water contained in the branches between the recirculation loop or electrically heat traced pipe, and the fixture fitting shall not exceed 16 oz (473 mL). Where a fixture fitting shutoff valve (supply stop) is installed ahead of the fixture fitting, the maximum volume of water is permitted to be calculated between the recirculation loop or electrically, heat traced pipe and the fixture fitting shutoff valve (supply stop).

Exception: Whirlpool bathtubs or bathtubs that are not equipped with a shower are exempted from the requirements of Section L 502.7.

L 502.7.3 Hot Water Hot Water System Submeters. Where a hot-water hot-water pipe from a circulation loop or electric heat trace line is equipped with a submeter, the hot-water hot-water distribution system downstream of the submeter shall have either an end-of-line hot-water hot-water circulation pump or shall be electrically heat traced. The maximum volume of water in a branch from the circulation loop or electric heat trace line downstream of the submeter shall not exceed 16 oz (473 mL). Where there is no circulation loop or electric heat trace line downstream of the submeter, the submeter shall be located within 2 feet (610 mm) of the central hot-water hot-water system; or the branch line to the submeter shall be circulated or heat traced to within 2 feet (610 mm) of the submeter. The maximum volume from the submeter to each fixture shall not exceed 32 oz (946 mL).

The circulation pump controls shall comply with the provisions of Section L 501.4.

L 503.0 Service Hot Water Heating – Other Than Low-Rise Residential Buildings.
L 503.1 General. The service hot-water heating system, other than single family houses, multifamily structures of three stories or fewer above grade, and modular houses shall comply with this section.

L 503.2 Equipment Efficiency. Water-heating equipment, hot-water supply boilers used solely for heating potable water, pool heaters, and hot-water hot-water storage tanks shall comply with the criteria listed in Table L 503.3.2. Where multiple criteria are listed, all criteria shall be met. The omission of minimum performance requirements for certain classes of equipment does not preclude the use of such equipment where appropriate. Equipment not listed in Table L 503.3 has no minimum performance requirements.

Exceptions: Water heaters and hot-water supply boilers having more than 140 gallons (530 L) of storage capacity are not required to meet the standby loss (SL) requirements of Table L 503.3 where:
(1) The tank surface is thermally insulated to R-12.5.
(2) A standing pilot light is not installed.
(3) Gas- or oil-fired storage water heaters have a flue damper or fan-assisted combustion. [ASHRAE 90.1:4.4.2]

L 503.3.4 Hot Water Hot Water System Design. Hot-water hot-water systems shall comply with Section L 503.3.4(1) and Section L 503.3.4(2).
(1) Recirculation systems shall comply with the provisions of Section L 501.3.
(2) The maximum volume of water contained in hot-water hot-water distribution lines between the water heater and the fixture stop or connection to showers, kitchen faucets, and lavatories shall be determined in accordance with Section L 502.7.

### TABLE L 503.3

| Minimum Piping Insulation Thicknesses for Heating and Hot-Water Systems |
|--------------------------|--------------------------|
| (Steam, Steam Condensate, Hot-Water Heating, and Domestic Water Systems)  |
| [ASHRAE 90.1: TABLE 6.8.3-1] |

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Steam and below the average local frost depth. The cover shall be not less than 12 inches (305 mm) below finish grade.

Table 1 shows that at 7.7 gpm, the hot water branch at the water heater provided the following are true:

1. For insulation outside the stated conductivity range, the minimum thickness (T) shall be determined as follows:

   \[ T = r \left( 1 + \frac{K}{k} \right) - 1 \]

   Where:  
   \[ T = \text{minimum insulation thickness (inches) (mm)} \]
   \[ r = \text{actual outside radius of pipe (inches) (mm)} \]
   \[ K = \text{insulation thickness listed in this table for applicable fluid temperature and pipe size} \]
   \[ k = \text{conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature [Btu/(h•ft•°F)] [W/moK]} \]
   \[ \delta = \text{the upper value of the conductivity range listed in this table for the applicable fluid temperature} \]

2. These thicknesses are based on energy efficiency considerations only. Additional insulation is sometimes required to provide that the insulation thickness is not a thickness less than 1 inch (25.4 mm).

3. For direct-buried heating and hot-water piping, reduction of insulation thickness shall be performed where documentation is provided showing that the pipe with the proposed insulation has no more heat transfer per foot (m) than a steel pipe of the same size with the insulation thickness shown in Table L 503.3.3.

4. Table L 503.3.3 is based on steel pipe. Non-metallic pipes, Schedule 80 thickness or less shall use the table values. For other non-metallic pipes having a thermal resistance more than that of steel pipe, reduced insulation thickness shall be permitted where documentation is provided showing that the pipe with the proposed insulation has no more heat transfer per foot (m) than a steel pipe of the same size with the insulation thickness shown in Table L 503.3.3.

L 503.4.4 Heat Recovery for Service Water Heating.

Condenser heat recovery systems shall be installed for heating or preheating of service hot water provided the following are true:

1. The facility operates 24 hours a day.
2. The total installed heat rejection capacity of the water-cooled systems exceeds 6 000 000 Btu/h (1758 kW) of heat rejection.
3. The design service water-heating load exceeds 1 000 000 Btu/h (293 kW). [ASHRAE 90.1:6.5.6.2.1]

APPENDIX M

M 102.8 Examples Illustrating Use of Water Demand Calculator with Appendix A.

Example 4: Sizing Branches and Risers – For individual hot and cold branches, repeat Steps 1 and 2. For example, for the hot-water hot-water branch at the water heater [Figure 1, Pipe Section 3], enter all the fixtures and appliances that use hot water into the Water Demand Calculator (toilets will be excluded) as seen in Figure 5. Use the calculated demand load to find the pipe size in Step 2. Table 1 shows that at 7.7 gpm, the hot-water hot-water branch shall be 3/4 inch (20 mm) in diameter. For each additional hot and cold branch [Figure 1, Pipe Sections 1 and 2], enter the number of fixtures and appliances served by that branch into the WDC and use that demand in Step 2 to determine the branch size. If the branch serves a hose bibb, add the demand of the hose bibb to the calculated demand flow for the branch. As discussed in Example 2, the hose bibb is not to be entered into WDC, since the Calculator is for indoor uses only. When there is only one fixture or appliance served by a fixture branch, the demand flow shall not exceed the fixture flow rate in Column [E] of the Water Demand Calculator. The fixture flow rate would be used in Step 2 to determine the size of the fixture branch and supply.

M 102.8 Examples Illustrating Use of Water Demand Calculator with Appendix A.

FIGURE 5

WATER DEMAND CALCULATOR FOR THE HOT-WATER HOT-WATER BRANCH (EXAMPLE 4).

The following sections did not seem to need revision at the time of submission. They are included in the proposal in the event that is determined to be appropriate to make revisions during the 2021 UPC process.

The two different spellings are color coded to assist finding them in the text.

Hot, Water, Hot-Water

210.0 – H – Hot Water. Water at a temperature exceeding or equal to 120°F (49°C).

219.0 – Q – Remote Outlet. Where used for sizing water piping, it is the furthest outlet dimension, measuring from the meter, either the developed length of the cold-water piping or through the water heater to the furthest outlet on the hot-water piping.

4175 Separate Controls for Hot and Cold Water.

Where two separate handles control the hot and cold water, the left-hand control of the faucet where facing the fixture fitting outlet shall control the hot water. Faucets and diverters shall be connected to the water distribution system so that hot water corresponds to the left side of the fixture fitting. Single-handle mixing valves installed in showers and tub-shower combinations shall have the flow of hot water corresponding to the markings on the fixture fitting.

504.5 Temperature-Limiting Devices. A water heater installation or a hot water storage vessel installation shall be provided with overtemperature protection by means of an approved, listed device installed in accordance with the terms of its listing and the manufacturer’s installation instructions.

608.7 Vacuum Relief Valves. Where a hot-water storage tank or an indirect water heater is located at an elevation above the fixture outlets in the hot-water system, a vacuum relief valve that complies with CSA Z21.22 shall be installed on the storage tank or heater.

609.0 Installation, Testing, Unions, and Location.

609.1 Installation. Water piping shall be adequately supported in accordance with Table 313.3. Barred ends shall be reamed to the full bore of the pipe or tube. Changes in direction shall be made by the appropriate use of fittings, except that changes in direction in copper or copper alloy tubing shall be permitted to be made with bends, provided that such bends are made with bending equipment that does not deform or create a loss in the cross-sectional area of the tubing. Changes in direction are allowed with flexible pipe and tubing without fittings in accordance with the manufacturer’s instructions. Provisions shall be made for expansion in hot-water piping. Piping, equipment, appurtenances, and devices shall be installed in a workmanlike manner in accordance with the provisions and intent of the code. Building supply yard piping shall be not less than 12 inches (305 mm) below the average local frost depth. The cover shall be not less than 12 inches (305 mm) below finish grade.

810.0 Steam and Hot Water Drainage Condensers and Sumps.

810.1 High-Temperature Discharge. No steam pipe shall be directly connected to plumbing or drainage system, nor shall water having a temperature above 140°F (60°C) be discharged under pressure directly into a drainage system. Pipes from boilers shall discharge by means of indirect waste piping as determined by the Authority Having Jurisdiction or the boiler manufacturer’s recommendations. Such pipes shall be permitted to be indirectly connected by discharging into an open or closed condenser or an intercepting sump of an approved type that will prevent the entrance of steam or such water under pressure into the drainage system. Closed condensers or sumps shall be provided with a vent that shall be taken off the top and extended separately, full size above the roof. Condensers and sumps shall be properly trapped at the outlet with a deep seal trap extending to within 6
inches (152 mm) of the bottom of the tank. The top of the deep seal trap shall have a \(1/2\) of an inch (19.1 mm) opening located at the highest point of the trap to serve as a siphon breaker. Outlets shall be taken off from the side in such a manner as to allow a waterline to be maintained that will permanently occupy not less than one-half the capacity of the condenser or sump. Inlets shall enter above the waterline. Wearing plates or baffles shall also be installed in the tank to protect the shell. The sizes of the blowoff line inlet, the water outlets, and the vent shall be as shown in Table 810.1. The contents of condensers receiving steam or hot water under pressure shall pass through an open sump before entering the drainage system.

A 105.3 Hard Water. Chart A 105.1(2) shall be used for ferrous pipe with the most favorable water supply in regards to corrosion and caking. Where the water is hard or corrosive, Chart A 105.1(3) or Chart A 105.1(4) will be applicable. For extremely hard water, it will be advisable to make additional allowances for the reduction of the capacity of hot-water lines in service.

A 108.0 Sizing.

A 108.1 Example. Assume an office building of four stories and basement; pressure on the building side of the pressure reducing valve of 55 psi (379 kPa) (after an allowance for reduced pressure falloff at peak demand); an elevation of highest fixture above the pressure-reducing valve of 45 feet (13 716 mm); a developed length of pipe from the pressure reducing valve to the most distant fixture of 200 feet (60 960 mm); and fixtures to be installed with flush valves for water closets and stall urinals as follows:

Where the pipe material and water supply are such that Chart A 105.1(2) applies, the required diameter of the building supply is \(3^{1/2}\) inches (90 mm), and the required diameter of the branch to the hot-water heater is \(1^{1/2}\) inches (40 mm). The sizes of the various branches and risers shall be permitted to be determined in the same manner as the size of the building supply or the branch to the hot-water system, by estimating the demand for the riser or branch from Chart A 103.1(1) or Chart A 103.1(2) and applying the total demand estimate from the branch, riser, or section thereof to the appropriate flowchart.

L 503.3.7 Heat Traps. Vertical pipe risers serving storage water heaters and storage tanks not having integral heat traps and serving a nonrecirculating system shall have heat traps on both the inlet and outlet piping as close as practical to the storage tank. A heat trap is a means to counteract the natural convection of heated water in a vertical pipe run. The means is either of the following:

1. A device specifically designed for the purpose or an arrangement of tubing that forms a loop of 360 degrees (6.28 rad).
2. Piping that, from the point of connection to the water heater (inlet or outlet) includes a length of piping directed downward before connection to the vertical piping of the supply water or hot-water distribution system, as applicable. [ASHRAE 90.1:7.4.6]

L 503.4.3 Buildings with High-Capacity Service Water Heating Systems. New buildings with gas service hot-water systems with a total installed gas heating input capacity of 1 000 000 Btu/h (293 kW) or more, shall have gas service water-heating equipment with a thermal efficiency \((\text{Et})\) of not less than 90 percent. Multiple units of gas hot-water heating equipment shall be permitted to comply with this requirement where the water-heating input provided by the equipment, with thermal efficiency \((\text{Et})\) of more or less than 90 percent, provides an input capacity-weighted average thermal efficiency of not less than 90 percent.

Exceptions:

1. Where 25 percent of the annual service water-heating requirement is provided by site-solar or site-recovered energy.
2. Water heaters installed in individual dwelling units.
3. Individual gas water heaters with input capacity, not more than 100 000 Btu/h (29.3 kW). [ASHRAE 90.1:7.5.3]

L 503.4.5 Capacity. The required heat recovery system shall have the capacity to provide the smaller of:

1. Sixty percent of the peak heat-rejection load at design conditions.
2. Preheat of the peak service hot-water draw to 85°F (29°C).

### Table L 503.3.2 PERFORMANCE REQUIREMENTS FOR WATER-HEATING EQUIPMENT

<table>
<thead>
<tr>
<th>MINIMUM EFFICIENCY REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ASHRAE 99.1: TABLE 7A]</td>
</tr>
</tbody>
</table>

Notes:

1. Thermal efficiency \((\text{Et})\) is a minimum requirement, while standby loss \((\text{SL})\) is maximum Btu/h (kW) based on a 70°F (21°C) temperature difference between stored water and ambient requirements. In the SL equation, \(f\) is the inlet volume in gallons and \(Q\) is the nameplate input rate in Btu/h (kW). \(f\) \(\times \) is the measured volume in the tank in gallons.
2. ASHRAE 90.1 contains a complete specification, including the year version, of the referenced test procedure.
4. Instantaneous water heaters with input rates below 200 000 Btu/h (58.6 kW) shall be in accordance with these requirements where the water heater is designed to heat water to temperatures of 180°F (82°C) or higher.
5. Electric water heaters with input rates less than 40 946 Btu/h (12 kW) shall be in accordance with these requirements where the water heater is designed to heat water to temperatures of 180°F (82°C) or higher.
6. Refer to Section L 503.4.3 for additional requirements for gas storage and instantaneous water heaters and gas hot water supply boilers.
7. In the U.S., the efficiency requirements for water heaters or gas pool heaters in this category or subcategory are specified by the U.S. Department of Energy. Those requirements and applicable test procedures are found in the Code of Federal Regulations 10 CFR Part 430.

*portion of table not shown remain unchanged*

### SUBSTANTIATION:

There are many cases where the words “hot water” or “hot-water” are used in the 2018 UPC. Sometimes it means the same thing as is stated in the definition, “water at a temperature exceeding or equal to 120°F (49°C),” but that is not always the case. This lack of clarity can be confusing and could lead to difficulties in interpretation. The purpose of this proposal is to clarify the meaning in each section where “hot water” or “hot-water” appears. Here are the reason statements for three of the proposed sections where the wording appears to be in conflict with the definition of hot water. 407.3 This section says that the hot water temperature at public lavatories shall be limited to 120°F, but this is where hot water begins. It seems that the intent is to ensure that the water temperature never exceed 120°F. Removing the word “hot” from the paragraph seems to eliminate the conflict without changing the intent. 409.4 This section says that the hot water temperature discharged into bathtubs and whirlpool bathtubs shall be limited to 120°F, but this is where hot water begins. It seems that the intent is to ensure that the water temperature never exceed 120°F. Removing the word “hot” from the paragraph seems to eliminate the conflict without changing the intent. The reasoning for the proposed changes in the other sections generally follows the patterns already found in the section in the UPC that use the phrase “hot-water”. What follows are two lists, one with provisions using “hot water” the other with provisions using “hot-water”. The italicized sections do not appear to need revision. I believe this to be the case for all sections listed under “hot-water”. The complete texts of the sections that do not appear to need revision are shown after these lists. Listing of Sections with “Hot Water” 210.0 Hot Water 225.0 Water Heater or Hot Water Heating Boiler 312.1 General 407.3 Limitation of Hot Water Temperature for Public Lavatories. 409.4 Limitation of Hot Water in Bathrooms and Whirlpool Bathtubs 410.3 Limitation of Water Temperature in Bidets 417.5 Separate Controls for Cold and Hot Water 504.5 Temperature-Limiting Devices 502.2 Safety Devices 601.2 Hot and Cold Water Required 603.4.5 Hot Water Backflow Preventors 603.5.10 Steam or Hot Water Boilers 609.11 Pipe Insulation 609.11.1 609.11.2 610.12.1 Copper Tube Systems 610.12.2 Tubing Systems Using Copper Fittings Table 610.3 Water Supply Fixture Units (WDFU) and Minimum Fixture Branch Pipe Sizes Table 612.3.3.1 Locations Where Intermediate Temperature Sprinklers are Required 810.0 Steam and Hot Water Drainage Condensers and Sumps 810.1 309.6.7 On-Site Recleaning Table A 103.1 Water Supply Fixture Units (WDFU) and Minimum Fixture Branch Pipe Sizes A 108.1 Example (in the table) Appendix L Recirculation System L 501.1 Scope L 501.2 Insulation L 501.3 For Low-Rise Residential Buildings L 501.5 Temperature Maintenance Controls L 501.6 System Balancing L 502.0 Service Hot Water – Low Rise Residential Buildings L 502.5 Insulation L 502.7 Maximum Volume of Hot Water 502.7.1 L 502.7.2 L 502.7.3 L 503.0 Service Hot Water – Other Than Low-Rise Residential Buildings L 503.1 General L 503.2 Equipment Performance L 503.3.4 Minimum Piping Insulation Thickness for Heating and Hot-Water Systems M 102.8.2 Examples Illustrating Use of Water Demand Calculator with Appendix A. Example 3 Example 4 Figure 5 Water Demand Calculator for the Hot Water Branch (Example 4) Listing of Sections with “Hot Water” 219.0 Remote Outlet 608.7 Vacuum Relief Valves 609.1 Installation A105.3 Hard Water A108.1 Example Appendix 1 10.6.3 Appendix 1 10.6.4 Appendix 1 Table 2 L 503.3.7 Heat Traps L 503.4.3 Buildings with High-Capacity Service Water Heating Systems L 503.4.5 Capacity Appendix I contains the following references to hot-water. However, since this Appendix is IAPMO IS 31-2014, changes to the standard are not part of the UPC code process. Appendix I 10.6.3 Flow velocities through the water
distribution system, used for calculating flush tank and flush valve fixture units, depending on the tubing sizes (see Table 1), shall not exceed (a) 3.0 m/s (10 ft/s) for cold-water distribution systems; and (b) 2.4 m/s (8 ft/s) for hot-water distribution systems. Note: The flow velocities in Items (a) and (b) account for the increased velocities through the fittings.

Appendix I 10.6.4 Hot-Water recirculation systems shall (a) be balanced to maintain adequate system temperatures; and (b) have flow velocities that do not exceed 0.6 m/s (2 ft/s) (see Table 2); and (c) use only PEX tubing designated for hot, chlorinated water recirculation systems and rated for the maximum percentage of time during which the system is intended to be operated at elevated temperatures, in accordance with ASTM F876. Appendix I Table 2 TUBING SIZES, FLOWS, AND FRICTION LOSSES FOR HOT-WATER RECIRCULATION SYSTEMS (See Section 10.6.4)
701.2 Drainage Piping. Materials for drainage piping shall be in accordance with one of the referenced standards in Table 701.2 except that:

(1) No galvanized wrought-iron or galvanized steel pipe shall be used underground and shall be kept not less than 6 inches (152 mm) aboveground.

(2) ABS and PVC DWV piping installations shall be installed in accordance with applicable standards referenced in Table 701.2 and Chapter 14 “Firestop Protection.” Except for individual single-family dwelling units, materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke developed index of not more than 50, where tested in accordance with ASTM E84 or UL 723. Plastic piping installed in plenums shall be tested in accordance with all requirements of ASTM E84 or UL 723. Mounting methods, supports and sample sizes of materials for testing that are not specified in ASTM E84 or UL 723 shall be prohibited.

Note: ASTM E84 and UL 723 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
A growing issue in the plumbing industry is that the ASTM E84 test protocol is being modified to test combustible piping materials. At the direction of plastics manufacturers, test labs will modify testing methods, supports and test specimen dimensions to achieve results that are in compliance with the 25/50 benchmarks the code requires. These results are then used to secure a listing by third party certifiers to serve as proof to code officials of compliance to the flame spread and smoke developed index requirements found in the code. The question of whether a piping material is in compliance to the flame spread and smoke developed requirements of the code is often further blurred as third party certifiers provide listings indicating that materials meet the 25/50 requirements using modified test methods. Third party certifiers disclose this information in their full listing or report, but this is not always easily identified or even accessible to officials. An inspector seeing ASTM E84 on a pipe would likely assume that it meets the requirement of the code without fully knowing or understanding the restrictions that exist in the listing. In fact, listing agencies assume that the inspector will analyze the listing and make their own determination on compliance. This code change proposal provides notice to the official that simply adding the ASTM E84 or UL 723 marking to the wall of the pipe does not necessarily mean that the product was tested in full compliance according to the code. Charlotte Pipe has conducted ASTM E84 tests at two different test facilities and found that results below the 25/50 flame spread and smoke developed index are not achievable when performed to the full requirements of ASTM E84. Our testing has shown that CPVC and PVC piping will not pass the ASTM E84 without modification of the mounting method, supports or test specimen dimensions. If the practice of accepting modified test results is allowed to continue, then the requirements of the code will not be achieved. ASTM E84 is a comparison test, and the 25/50 flame spread and smoke developed index is not a requirement of the standard, but of the code itself. If the 25/50 requirement is too restrictive, then an effort should be made to change the code. If the ASTM E84 test method is flawed, change the standard. However, we can no longer allow the use of modified tests and third party listings to circumvent the requirements of the code which exist to preserve the health and safety of the public. This proposal also clarifies the existing language.
Item #: 104
UPC 2021 Section: 701.2

SUBMITTER: Michael Cudahy
Plastic Pipe and Fittings Association (PPFA)

RECOMMENDATION:
Revise text

701.0 General.

701.2 Drainage Piping. Materials for drainage piping shall be in accordance with one of the referenced standards in Table 701.2 except that:

1. No galvanized wrought-iron or galvanized steel pipe shall be used underground and shall be kept not less than 6 inches (152 mm) aboveground.
2. ABS and PVC DWV piping installations shall be installed in accordance with applicable standards referenced in Chapter 17 and Chapter 14 “Firestop Protection.” Except for individual single-family dwelling units, DWV combustible piping materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke-developed index of not more than 50, where tested in accordance with ASTM E84 or UL 723. These tests shall comply with all requirements of the standards to include the sample size, both for width and length. Plastic pipe shall not be tested filled with water.

SUBSTANTIATION:
(2) probably shouldn’t really be an exception. (2) is also confusing - Table 701.2 is a table for the pipe material. For installation, the standards are in Chapter 17. All piping materials, not just ABS and PVC, should be installed in accordance with applicable standards requirements, but new standard test requirements should not be imposed by the code. There are now multiple tables for standards in Chapter 17 and the materials and installation should meet the requirements found in Table 1701.1 and Table 1701.2. The last section is specific to combustible DWV and that should also be made clear. There are other plenum requirements for other products.
SUBMITTER: Robert D. Ryan
Exact Fit Inc.

RECOMMENDATION:
Revise text

**TABLE 701.2**
MATERIALS FOR DRAIN, WASTE, VENT PIPE AND FITTINGS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>UNDERGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS</th>
<th>ABOVEGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS</th>
<th>BUILDING SEWER PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS (Schedule 40)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>ASTM D2661, ASTM D2680*</td>
<td>ASTM D2661, ASTM D2680*, IAPMO IGC 342</td>
</tr>
<tr>
<td>PVC (Schedule 40)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>ASTM D1785, ASTM D2665, ASTM F794*</td>
<td>ASTM D2665, ASTM F794*, ASTM F1866, IAPMO IGC 342</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

**TABLE 1701.1**
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO IGC 342- 2018</td>
<td>ABS and PVC Snap-Lock DWV Fittings</td>
<td>Fittings</td>
<td>Table 701.2</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

**Note:** IAPMO IGC 342 meets the requirements for mandatory reference standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

**SUBSTANTIATION:**
The DWV couplings covered by IAPMO IGC 342, ABS and PVC Snap-Lock DWV Fittings address the difficulty faced with repairing and replacing a section of buried drain pipe. In a typical situation, the repair would be accomplished through creative methods to insert rigid couplings on both ends or installation of a flexible coupling compliant with ASTM C1173. Use of fittings covered under IAPMO IGC 342 will allow this repair to be completed with a pipe measured to exactly fit the section of pipe that was removed, without the creative solutions or reliance on a flexible coupling to complete the installation. This proposal is intended to include reference to IGC 342 in the code to allow another better option to addressing the repair and replacement of ABS and PVC drain pipe for use of Snap-Lock DWV Fittings in addition to those already covered by the existing references.
**Item #: 106**  
UPC 2021  Section: 701.2  

**SUBMITTER:** Brian Conner  
Charlotte Pipe and Foundry  

**RECOMMENDATION:**  
Add new text

### TABLE 701.2  
MATERIALS FOR DRAIN, WASTE, VENT PIPE AND FITTINGS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>UNDERGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS</th>
<th>ABOVEGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS</th>
<th>BUILDING SEWER PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS (Schedule 40)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>ASTM D2661, ASTM D2680*</td>
<td>ASME A112.4.4, ASTM D2661, ASTM D2680*</td>
</tr>
<tr>
<td>Co-Extruded ABS (Schedule 40)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>ASTM F628</td>
<td>ASME A112.4.4, ASTM D2661, ASTM D2680*</td>
</tr>
<tr>
<td>Co-Extruded Composite (Schedule 40)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>ASTM F1488</td>
<td>ASME A112.4.4, ASTM D2661, ASTM D2680*</td>
</tr>
<tr>
<td>Co-Extruded PVC (Schedule 40)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>ASTM F891, ASTM F1760</td>
<td>ASME A112.4.4, ASTM D2665, ASTM F794*, ASTM F1136*, ASTM F1866</td>
</tr>
<tr>
<td>PVC (Schedule 40)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>ASTM D1785, ASTM D2665, ASTM F794*</td>
<td>ASME A112.4.4, ASTM D2665, ASTM F794*, ASTM F1866</td>
</tr>
</tbody>
</table>

* For building sewer applications.

(portions of table not shown remain unchanged)

### TABLE 1701.1  
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME A112.4.4-2017</td>
<td>Plastic Push-Fit Drain, Waste, and Vent (DWV) Fittings</td>
<td>Fittings</td>
<td>Table 701.2</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: ASME A112.4.4 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
Adding this consensus standard to the "referenced standard(s) fittings section for "ABS (Schedule 40)", "Co-Extruded ABS (Schedule 40)", "Co-Extruded Composite (Schedule 40)", "Co-Extruded PVC (Schedule 40)", and PVC (Schedule 40)" for Push-fit DWV fittings will give code officials direction on push-fit fitting installations and installers direction on installing push-fit fittings.
Item #: 107  
UPC 2021  Section: 701.2, Table 1701.1

**SUBMITTER:** Bryan Miko  
Advanced Drainage Systems, Inc.

**RECOMMENDATION:**  
Revise text

**TABLE 701.2**  
MATERIALS FOR DRAIN, WASTE, VENT PIPE AND FITTINGS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>UNDERGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS</th>
<th>ABOVE GROUND DRAIN, WASTE, VENT PIPE AND FITTINGS</th>
<th>BUILDING SEWER PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polypropylene (PP)</td>
<td></td>
<td></td>
<td>X</td>
<td>ASTM F2764</td>
<td>ASTM F2764</td>
</tr>
</tbody>
</table>

*For building sewer applications.

(portion of table not shown remains unchanged)

**TABLE 1701.1**  
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM F2764/F2764M – 2017**</td>
<td>6 to 60 in.</td>
<td>Polypropylene (PP) Corrugated Double and Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications</td>
<td>Pipe</td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

**Note:** ASTM F2764/F2764M meets the requirements for a mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects

**SUBSTANTIATION:**  
Offering suggestive update to table to include gravity flow sanitary sewer polypropylene pipe per ASTM F2764.
Item #: 108  
UPC 2021 Section: Table 702.1

SUBMITTER: David Mann  
Rep: Self

RECOMMENDATION:  
Revise text

### TABLE 702.1  
DRAINAGE FIXTURE UNIT VALUES (DFU)

<table>
<thead>
<tr>
<th>PLUMBING APPLIANCES, APPURTEANCES, OR FIXTURES</th>
<th>MINIMUM SIZE TRAP AND TRAP ARM (Inches)</th>
<th>PRIVATE</th>
<th>PUBLIC</th>
<th>ASSEMBLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shower, single-head trap</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Multi-head, each additional</td>
<td>2.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

For SI units: 1 inch = 25 mm  
(portions of table not shown remain unchanged)

Notes:

1. Indirect waste receptors shall be sized based on the total drainage capacity of the fixtures that drain thereinto, in accordance with Table 702.2(2).
2. Provide a 2 inch (50 mm) minimum drain.
3. For refrigerators, coffee urns, water stations, and similar low demands.
4. For commercial sinks, dishwashers, and similar moderate or heavy demands.
5. Buildings having a clothes-washing area with clothes washers in a battery of three or more clothes washers shall be rated at 6 fixture units each for purposes of sizing common horizontal and vertical drainage piping.
6. Water closets shall be computed as 6 fixture units where determining septic tank sizes based on Appendix H of this code.
7. Trap sizes shall not be increased to the point where the fixture discharge is capable of being inadequate to maintain their self-scouring properties.
8. Assembly [Public Use (see Table 422.1)].
9. For a bathtub to shower retrofit, a 1 1/2 (40 mm) trap and trap arm shall be permitted with a maximum shower size of 36 inches (914 mm) in width and 60 inches (1524 mm) in length. See Section 408.6 and Section 408.8.

SUBSTANTIATION:  
The population often desires to replace their bathtubs with a shower pan, allowing greater adaptability and comfort. The current requirement creates a deterrent and adds extra time and cost which may not be feasible for many elderly people on fixed incomes.
Item #: 109
UPC 2021  Section: Table 702.1

SUBMITTER: Jay Peters
Codes and Standards International
Rep: Falcon Waterfree Technologies

RECOMMENDATION:
Revise text

**TABLE 702.1**
DRAINAGE FIXTURE UNIT VALUES (DFU)

<table>
<thead>
<tr>
<th>PLUMBING APPLIANCES, APPURTENANCES, OR FIXTURES</th>
<th>MINIMUM FIXTURE TRAP AND TRAP ARM (inches)</th>
<th>PRIVATE</th>
<th>PUBLIC</th>
<th>ASSEMBLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinal, Hybrid Urinal with Drain Cleansing Action</td>
<td>2</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

SUBSTANTIATION:
This term was updated from Hybrid Urinal to correspond with the new terminology added to the ASME A112.19.19-2016 for this type of fixture and is merely a correlation issue.
Item #: 110  
UPC 2021 Section: Table 703.2

SUBMITTER: Scott Denny  
Rep: Self

RECOMMENDATION:  
Revise text

<table>
<thead>
<tr>
<th>Table 703.2</th>
<th>MAXIMUM UNIT LOADING AND MAXIMUM LENGTH OF DRAINAGE AND VENT PIPING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SIZE OF PIPE</strong></td>
<td><strong>(inches)</strong></td>
</tr>
<tr>
<td><strong>Maximum Units</strong></td>
<td>Drainage Piping</td>
</tr>
<tr>
<td></td>
<td>Horizontal</td>
</tr>
<tr>
<td><strong>Maximum Length</strong></td>
<td>Drainage Piping</td>
</tr>
<tr>
<td></td>
<td>Horizontal (unlimited)</td>
</tr>
<tr>
<td><strong>Vent Piping</strong></td>
<td>Horizontal and Vertical</td>
</tr>
<tr>
<td></td>
<td>Maximum Lengths, (feet)</td>
</tr>
</tbody>
</table>

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm

Notes:
1. Excluding trap arm.  
2. Except for sinks, urinals, and dishwashers – exceeding 1 fixture unit.  
3. Except for six-unit traps or water closets.  
4. Only Not to exceed four water closets or six-unit traps allowed on a vertical pipe or stack, and not to exceed three water closets or six-unit traps on a horizontal branch or drain.  
5. Based on 1/4 inch per foot (20.8 mm/m) slope. For 1/8 of an inch per foot (10.4 mm/m) slope, multiply horizontal fixture units by a factor of 0.8.  
6. The diameter of an individual vent shall be not less than 1 1/4 inches (32 mm) nor less than one-half the diameter of the drain to which it is connected. Fixture unit load values for drainage and vent piping shall be computed from Table 702.1 and Table 702.2(2). Not to exceed one-third of the total permitted length of a vent shall be permitted to be installed in a horizontal position. Where vents are increased one pipe size for their entire length, the maximum length limitations specified in this table do not apply. This table is in accordance with the requirements of Section 901.3.  

SUBSTANTIATION:  
Note 4 of Table 703.2 originated in the 1973 UPC when GPF for water closets were unlimited and 5 to 7 GPF was common. The maximum is now 1.6. GPF, trending toward 1.28 GPF, 25% of the water volume used for water closets in 1973. Tests have proven the same volume of water carrying solid human waste flows 25 to 50% further in a 3 inch line than a 4” line. I believe everyone will agree that increased line carry is a desirable trait in a building drain. This change will be a step in that direction. *See Section 3.4 page 22 of attached report CMHC - Drainline Carry Project.
Item #: 111  
UPC 2021 Section: Table 703.2

SUBMITTER: Phillip H Ribbs  
PHR Consultants

RECOMMENDATION:  
Revise text

**TABLE 703.2**  
**MAXIMUM UNIT LOADING AND MAXIMUM LENGTH OF DRAINAGE AND VENT PIPING**

<table>
<thead>
<tr>
<th>SIZE OF PIPE (inches)</th>
<th>1/8</th>
<th>1/4</th>
<th>1/2</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage Piping</td>
<td>1</td>
<td>2</td>
<td>16(^2)</td>
<td>48(^4)</td>
<td>256</td>
<td>600</td>
<td>1380</td>
<td>3600</td>
<td>5600</td>
<td>8400</td>
<td></td>
</tr>
<tr>
<td>Vertical</td>
<td>1</td>
<td>8</td>
<td>35(^5)</td>
<td>216(^7)</td>
<td>428(^9)</td>
<td>720(^1)</td>
<td>2640(^2)</td>
<td>4680(^3)</td>
<td>8200(^4)</td>
<td></td>
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</tr>
<tr>
<td>Horizontal</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Maximum Length</td>
<td>45</td>
<td>65</td>
<td>85</td>
<td>212</td>
<td>300</td>
<td>390</td>
<td>510</td>
<td>750</td>
<td>–</td>
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</tr>
<tr>
<td>Drainage Piping</td>
<td></td>
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<td></td>
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<tr>
<td>Vertical, (feet)</td>
<td>45</td>
<td>60</td>
<td>120</td>
<td>212</td>
<td>300</td>
<td>390</td>
<td>510</td>
<td>750</td>
<td>–</td>
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<td></td>
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<tr>
<td>Horizontal (unlimited)</td>
<td></td>
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</tbody>
</table>

| Vent Piping           |     |     |     |   |   |   |   |   |   |    |    |
| Maximum Units         | 1   | 8\(^3\) | 24  | 84  | 256 | 600 | 1380 | 3600 | –   | –   |    |
| Maximum Lengths, (feet)| 45  | 60  | 120 | 212 | 300 | 390 | 510  | 750  | –   | –   |    |

Table For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm

Notes:

1. Excluding trap arm.
2. Except for sinks, urinals, and dishwashers – exceeding 1 fixture unit.
3. Except for six-unit traps or water closets.
4. *Not to exceed* four water closets or six-unit traps on a vertical pipe or stack, and not to exceed three water closets or six-unit traps on a horizontal branch or drain.
5. Based on 1/4 inch per foot (20.8 mm/m) slope. For 1/8 of an inch per foot (10.4 mm/m) slope, multiply horizontal fixture units by a factor of 0.8.
6. The diameter of an individual vent shall be not less than 1 1/4 inches (32 mm) nor less than one-half the diameter of the drain to which it is connected. Fixture unit load values for drainage and vent piping shall be computed from Table 702.1 and Table 702.2(2). Not to exceed one-third of the total permitted length of a vent shall be permitted to be installed in a horizontal position. Where vents are increased one pipe size for their entire length, the maximum length limitations specified in this table do not apply. This table is in accordance with the requirements of Section 901.3.

**SUBSTANTIATION:**

As currently written, note 4 of Table 903.2 can be interpreted as “only” the quantity of water closets or six-unit traps being allowed on the vertical pipe or stack. However, the intent of the note is not to exceed the quantity indicated. The modification clarifies that the end user is not allowed to exceed four water closets or six-unit traps on the vertical.
SUBMITTER: John Stuart Lansing, CPDT, LEED Green Associate
Interface Engineering

RECOMMENDATION:
Revise text

### TABLE 703.2

**MAXIMUM UNIT LOADING AND MAXIMUM LENGTH OF DRAINAGE AND VENT PIPING**

<table>
<thead>
<tr>
<th>SIZE OF PIPE (Inches)</th>
<th>1/8</th>
<th>1/4</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum Units</strong></td>
<td></td>
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<tr>
<td>Drainage Piping</td>
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<tr>
<td>Vertical</td>
<td>1</td>
<td>2</td>
<td>16</td>
<td>48</td>
<td>256</td>
<td>600</td>
<td>1380</td>
<td>3600</td>
<td>5600</td>
<td>8400</td>
<td></td>
</tr>
<tr>
<td>Horizontal</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>35</td>
<td>216</td>
<td>428</td>
<td>720</td>
<td>2640</td>
<td>4680</td>
<td>8200</td>
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<tr>
<td><strong>Maximum Length</strong></td>
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<tr>
<td>Drainage Piping</td>
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<td>Vertical, (feet)</td>
<td>45</td>
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<td>85</td>
<td>212</td>
<td>300</td>
<td>390</td>
<td>510</td>
<td>750</td>
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<tr>
<td>Horizontal (unlimited)</td>
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<tr>
<td><strong>Vent Piping</strong></td>
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<td>Maximum Units</td>
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<td></td>
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</tr>
<tr>
<td>Maximum Lengths, (feet)</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>24</td>
<td>84</td>
<td>256</td>
<td>600</td>
<td>1380</td>
<td>3600</td>
<td>–</td>
<td>–</td>
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<tr>
<td></td>
<td>45</td>
<td>60</td>
<td>120</td>
<td>212</td>
<td>300</td>
<td>390</td>
<td>510</td>
<td>750</td>
<td>–</td>
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<td></td>
</tr>
</tbody>
</table>

Table For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm

Notes:

1. Excluding trap arm.
2. Except for sinks, urinals, and dishwashers – excluding 1 fixture unit.
3. Except for six-unit traps or water closets.
4. Only four water closets or six-unit traps allowed on a vertical pipe or stack, and not to exceed three water closets or six-unit traps on a horizontal branch or drain.
5. Based on 1/4 inch per foot (20.8 mm/m) slope. For 1/8 of an inch per foot (10.4 mm/m) slope, multiply horizontal fixture units by a factor of 0.8.
6. The diameter of an individual vent shall be not less than 1/4 inches (32 mm) nor less than one-half the diameter of the drain to which it is connected. Fixture unit load values for drainage and vent piping shall be computed from Table 702.1 and Table 702.2(2). Not to exceed one-third of the total permitted length of a vent shall be permitted to be installed in a horizontal position. Where vents are increased one pipe size for their entire length, the maximum length limitations specified in this table do not apply. This table is in accordance with the requirements of Section 901.3.
7. Up to 8 public lavatories are permitted to be installed on a 1-1/2 inch (40 mm) horizontal sanitary branch sloped at 1/4 inch per foot (20.8 mm/m).

**SUBSTANTIATION:**

2 inch drains are inappropriately required for horizontal sanitary branches carrying the discharge of two or more lavatories. These conditions have a flow area of 7% and a flow velocity of 0.67 ft/s, which is well under the 2 ft/s cleansing velocity that serves as the basis for UPC pipe sizes and other model plumbing codes. Given that public lavatories are limited to a maximum of 0.5 gpm flow rates and generally do not have basin filling functionality, the flow rate of the faucet may be the only flow considered. A flow of 4.78 gpm will occupy 50% of the pipe area in a 1-1/2” horizontal drain and will flow at a velocity of 1.74 ft/s when sloped at 2%. A maximum of 9 lavatories will create a flow of 4.5 gpm and 48% of the flow area in a 1-1/2” horizontal drain. The impact of this exception will be substantially easier installation and coordination with insulated water supply piping when fitting in a 4 inch stud wall.
UPDATE: Phillip H Ribbs  
PHR Consultants

RECOMMENDATION:  
Revise text

704.3 Commercial Sinks. Pot sinks, scullery sinks, dishwashing sinks, silverware sinks, and other similar fixtures shall be connected directly to the drainage system. A floor drain shall be provided adjacent to the fixture, and the fixture shall be connected on the sewer side of the floor drain trap sink, provided that no other drainage line shall be connected between the floor drain waste connection and the fixture drain. The fixture and floor drain shall be trapped and vented in accordance with this code.

SUBSTANTIATION:  
This proposed modification will clarify that a floor drain fixture and its trap, must be located downstream on the fixture branch line. This will allow the floor drain to serve both as an emergency drain and as an indicator that the fixture branch line is backed up; this will allow the floor drain to relieve a back-up of the fixture branch line prior to reaching the commercial sink.
Item #: 114
UPC 2021 Section: 704.3

SUBMITTER: Gerry Quast
City of Anaheim Building Division

RECOMMENDATION:
Revise text

704.0 Fixture Connections (Drainage).

704.3 Commercial Sinks. Pot sinks, scullery sinks, dishwashing sinks, silverware sinks, and other similar fixtures, shall be connected directly to the drainage system. A floor drain shall be provided adjacent to the fixture. The floor drain waste connection shall be located upstream of any horizontal waste line connected to the directly-connected fixture, and the fixture shall be connected on the sewer side of the floor drain trap, provided that no other drainage line is shall be connected between the floor drain waste connection and the fixture drain. The fixture and floor drain shall be trapped and vented in accordance with this code.

SUBSTANTIATION:
The code language in UPC Section 704.3 does not clearly indicate the intent of the code and should be revised. It allows for two different interpretations for where a floor drain is to be connected adjacent to a directly-connected sink. I have always required the F/D to be connected upstream of the sink connection, while Figure 704.3 on page 229 of the 2012 UPC Illustrated Training Manual shows the F/D connected downstream of the sink connection. The code language is unclear in that it could be interpreted to allow both F/D locations. However, (as shown in the Figure 704.3), with the F/D downstream of the sink, a stoppage between the sink and the F/D would not cause the "visual indication of stoppage" that the Manual says is important. A solution to this situation would be to revise the code language to clearly require the F/D to be connected upstream of the sink connection. Although both F/D locations may provide "visual indication", a stoppage in the sink drainage piping is more likely than a stoppage in the F/D piping, and the F/D being connected upstream of the sink more closely follows the intent of the code. The UPC Section 704.3 code language should be revised and the Illustrated Training Manual Figure 704.3 (and the accompanying opinion language) should also be revised.
Mechanical joints for cast-iron pipe and fittings shall be of the elastomeric compression type or mechanical joint couplings. Compression type joints with an elastomeric gasket for cast-iron hub and spigot pipe shall comply with ASTM C564 and be tested in accordance with ASTM C1563. Hub and spigot shall be clean and free of dirt, mud, sand, and foreign materials. Cut pipe shall be free from sharp edges. Fold and insert gasket into the hub. Lubricate the joint following manufacturer’s instructions. Insert spigot into hub until the spigot end of the pipe bottom out in the hub. Use the same procedure for the installation of fittings.

A mechanical joint shielded coupling type for hubless cast-iron pipe and fittings shall have a metallic shield that complies with ASTM A1056, ASTM C1277, ASTM C1540, or CISPI 310. The elastomeric gasket shall comply with ASTM C564. Hubless cast-iron pipe and fittings shall be clean and free of dirt, mud, sand, and foreign materials. Cut pipe shall be free from sharp edges. Gasket shall be placed on the end of the pipe or fitting and the stainless steel shield and clamp assembly on the end of the other pipe or fitting. Pipe or fittings shall be seated against the center stop inside the elastomeric sleeve. Slide the stainless steel shield and clamp assembly into a position centered over the gasket and tighten. Bands shall be tightened using an approved calibrated torque wrench specifically set by the manufacturer of the couplings. Hubless joints shall be restrained in accordance with CISPI 310 to withstand a thrust force associated with 40 feet (12192 mm) of water head pressure (119.3 kPa). Restraint systems shall be third party certified to this requirement and shall be installed in accordance with the manufacturer’s installation instructions.

Note: CISPI 310 meets the requirements for a mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.
Item #: 116
UPC 2021 Section: 705.6.1

SUBMITTER: Angel Guzman
The American Society of Mechanical Engineers (ASME)

RECOMMENDATION:
Revise text

705.0 Joints and Connections.

705.6 PVC and PVC Co-Extruded Plastic Pipe and Joining Methods. (remaining text unchanged)

705.6.1 Mechanical Joints. Mechanical joints shall be designed to provide a permanent seal and shall be of the mechanical or push-on joint type. The push-on joint shall include an elastomeric gasket that complies with ASTM D3212 and shall provide a compressive force against the spigot and socket after assembly to provide a permanent seal. Nonremovable push fit fittings that employ quick assembly push fit connectors shall be in accordance with ASME A112.4.4.

### Table 701.2
Materials for Drain, Waste, Vent Pipe and Fittings

<table>
<thead>
<tr>
<th>Material</th>
<th>Underground</th>
<th>Aboveground</th>
<th>Building Sewer</th>
<th>Ref Stds Pipe</th>
<th>Ref Stds Fttgs</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC (Sch 40)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>ASTM D1785, ASTM D2665, ASTM F794*</td>
<td>ASTM D2665, ASTM F794*, ASTM F1866, ASME A112.4.4</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

### Table 1701.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
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</thead>
<tbody>
<tr>
<td>ASME A112.4.4–2017</td>
<td>Plastic Push Fit Drain, Waste and Vent (DWV)</td>
<td>Fittings</td>
<td>705.6.1</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: ASME A112.4.4 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
A new standard has been published for push fit fittings to be used in DWV applications. Fittings are to be used with ABS or PVC pipe only in non-pressure applications. Push fit fittings are currently allowed in the UPC for water supply and distribution pressure applications under Sections 605.1.3.3, 605.2.1 and Table 604.1. The language proposed is similar to Section 605.2.1 for CPVC mechanical joints.
SUBMITTER: Michael Cudahy  
Plastic Pipe and Fittings Association (PPFA)

RECOMMENDATION:  
Revise text

**705.6 PVC and PVC Co-Extruded Plastic Pipe and Joining Methods.** (remaining text unchanged)

705.6.2 Solvent Cement Joints. A two-step method of joining pipe and fittings shall be made in accordance with ASTM D2855. Solvent cement joints for PVC pipe and fittings shall be clean from dirt and moisture. Pipe shall be cut square, and pipe shall be deburred. Where surfaces to be joined are cleaned and free of dirt, moisture, oil, and other foreign material, apply primer purple in color that complies with ASTM F656. Primer shall be applied to the surface of the pipe and fitting is softened. Solvent cement that comply with ASTM D2564 shall be applied to all joint surfaces. Joints shall be made while both the inside socket surface and outside surface of pipe are wet with solvent cement. Hold joint in place and undisturbed for 1 minute after assembly.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM D2855-2015</td>
<td>Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets</td>
<td>Joints</td>
<td>705.6.2</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

**TABLE 1701.2**  
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM D2855-2015</td>
<td>Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets</td>
<td>Joints</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

**Note:** ASTM D2855 meets the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

**SUBSTANTIATION:**  
ASTM D2855 is Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets ASTM D2855 is already in the plumbing code.
Item #: 118

UPC 2021 Section: 706.3

SUBMITTER: Ronald George, CPD, President
Plumb-Tech Design & Consulting Services LLC
Rep: Self

RECOMMENDATION:
Add new text

706.0 Changes in Direction of Drainage Flow.

706.3 Horizontal to Horizontal. Horizontal drainage lines connecting with other horizontal drainage lines shall enter through 45 degree (0.79 rad) wye branches, combination wye and one-eighth bend branches, or other approved fittings of equivalent sweep.

706.3.1 Horizontal Branch Drains. Horizontal branch drains, the lowest level connecting to the building drain, shall be rolled up to enter the building drain above the centerline of the building drain to minimize loss of hydraulic depth-of-flow in the building drain and sewer. (see Figure 706.3.1(1) and Figure 706.3.1(2))

SUBSTANTIATION:
The text below is from the February 2018 issue of Plumbing Engineer Magazine. You can view the article with the associated graphics at: https://www.phcppros.com/articles/6752-
dry-drains Dry Drains – Water Conservation Effects on Drain-line Transport By: Ron George, CPD Every three years, there are code change cycles for all the model plumbing code organizations. For the last few decades there have been water and energy conservation code change proposals that are intended to reduce energy and water consumption levels for plumbing fixtures. During the more recent rounds of code change hearings, the water conservation proposals have seen some success restricting water flow rates beyond the requirements in the Energy Policy Act. I’m all for saving water, but I believe we need to save water by being smart and we need to keep health, safety and system performance in mind. Water conservation efforts are making drain-line transport issues and sewer back-ups become more common. This has led to a phenomenon known as “Dry Drains”. I had the honor of being asked to be one of the speakers at the “Dry Drains” Conference a few years ago. It was held in conjunction with the International Sanitation and Heating (ISH) conference and expo in Frankfurt, Germany. The ISH show is held in odd numbered years in Frankfurt, Germany. The speakers were from around the world and they all gave presentations about drainline transport issues they were facing in their respective countries. The speakers got a chance to spend a few days together and they realized that they were all dealing with similar issues related to water conservation efforts in their respective countries. The issues were drainline transport issues. We are reaching a point in water conservation efforts where there is not enough water left in the drain to transport solids. I have often said “there needs to be enough water left in the river to float the boats”. This is becoming more and more obvious in states like California and Texas that are exceeding the mandated energy and water conservation limits in the Energy Policy Act of 1992. The number of sewer cleaning calls has gone up significantly in these areas where water conservation efforts are more aggressive. This is good news if you own a drain cleaning business, but it is not good news if you are a homeowner or a building owner or tenant in a building experiencing problems. Energy and Water Savings Mandates are Contributing Dry-Drains There will always be fresh water because fresh water is constantly circulating in the hydrological cycle - evaporating, condensing into rain, falling to earth, and flowing into the streams, lakes and the ground as groundwater. The rainwater flows into the ocean where it mixes with salt water. We can catch the rainwater in tanks and hold the rainwater run-off in reservoirs for treatment and use as fresh/potable water. [see on-line article for graphic] Figure 1 – The Hydrological Cycle. Source:
https://water.usgs.gov/edu/watercycle.html We also have the technology to convert seawater into fresh water with reverse osmosis systems. The key for us is to learn how to
manage the fresh water resources and development so that development does not outpace the ability to provide fresh water in arid regions. In many cases, proper engineering and
planning can provide additional reservoir capacity to store more fresh water, which would require acquiring land for the reservoir, the dam, the treatment facilities, the pumping
stations and water mains. The United Nations conducted a study on the total amount of water in the world and it gave a breakdown of the freshwater resources. The study shows
that 97.5 percent of the Earth’s water is salt water and only 2.5 percent is fresh water. The study went on to show about 70 percent of the fresh water is trapped in ice and snow in
glaciers in mountainous regions and polar ice caps. About 29.7 percent or 30 percent of the fresh water is in groundwater, and the remaining 0.3 percent is available to us in the
form of fresh surface water in rivers, lakes, and streams. [see on-line article for graphic] Source: Igor Shiklomanov’s Chapter “World Freshwater Resources” (Numbers rounded).
https://water.usgs.gov/edu/earthwherewater.html Figure 2 – Total World Water and Breakdown of Freshwater Resources Water Uses in the United States According to a U.S.
Geological Survey conducted by the Environmental Protection Agency, eighty-seven (87) percent of the fresh water use in the United States is for non-residential water use. NonResidential users include agricultural, industrial, and commercial uses. Large water users include the industries that produce metals, wood and paper products, chemicals, gasoline
and oils. Just about every manufactured product uses water during some part of the production process. Other industrial water uses include water used for such purposes as
washing, diluting, cooling, or transporting a product. Some uses incorporate water into a product, or they may use water with disinfection chemicals for sanitation. Substantial
amounts of water are used to wash down equipment, rooms, and floors within manufacturing facilities and in food processing plants, meat packing plants and dairy processing
plants. Other industries that use substantial amounts of water produce such commodities as paper pulp for a variety of uses like diapers, facial tissue, newspapers, and other paper
products. Water is used in chemical plants, for condensing towers in refineries and petroleum plants, or for cooling water in primary metal processing plants. Irrigation water use
includes water used for growing crops, frost protection, chemical applications, weed control, and other agricultural purposes, as well as irrigation and washdown water used to
maintain areas such as parks and golf courses. Other uses include private water wells, livestock, aquaculture, fish hatcheries, and mining activities. Electric power accounts for a
significant use of water withdrawals. Most of the water is derived from surface water and used for once-through evaporative cooling at power plants. Residential Water use Figure 3
shows that only eight percent of all water use in the United States is residential, yet this is where much of the focus of the federal laws dealing with water conservation have been
focused. I would like to see more focus on conserving water in the other segments discussed above; there is an enormous potential for water savings in these industries. [see online article for graphic] Figure 3 – Facts about Water Use in the United States Source: U.S. Geological Survey, Environmental Protection Agency Residential water use is reported to
be 8 percent of all water use, then 92% of all other fresh water use is from non-residential uses. Water & energy conservation code changes have been focusing on saving water for
fixtures like: water closets, lavatories, sinks and showers. These efforts to further reduce water use is causing performance issues with respect to drain line transport of solids and
other issues. On the other end of the plumbing system the water conservation is affecting the water quality in the water supply system with reduced water usage causing aging
water issues. Aging water occurs when the lower flow rates allow water to linger in the distribution piping for longer periods of time. The water treatment chemicals continue to
dissipate at the same rate and they are dissipating down to ineffective levels to control bacteria growth in municipal and building water systems. The significant increase in
Legionella outbreaks recorded since the advent of the energy policy act seems to show a correlation in the increase in reported cases of Legionnaires disease along with the
mandated decrease in plumbing fixture flow rates. There are ongoing studies a Drexel University and Purdue University studying the effects of water conservation programs on
water quality. We should hear about the results of these studies in a few years. The 1992 Energy Policy Act In 1992, the federal Energy Policy Act, was passed, and has since
undergone various amendments. The broad focus of this law is to increase clean energy use and improve overall energy efficiency in the United States. Mandates for the reduction
of water usage by residential and commercial users were included in this law based upon the understanding that the production and distribution of water requires energy. The law
sets minimum efficiency standards for flow rates for water closets, urinals, faucets and showerheads, (except emergency fixture showerheads) that are distributed in commerce for
personal use or commercial use or consumption. The minimum efficiency standards for water closets, urinals faucets and showerheads set forth in the 1992 Energy Policy Act,
section 123, are covered in in Title 42 USC section 6295(j) and , 6295 (k). 42 USC section 6295(k)(1)(A) Except as provided in subparagraph (B), the maximum water use allowed in
gallons per flush for any of the following water closets manufactured after January 1, 1994, is the following: Gravity tank-type toilets 1.6 gpf. Flushometer tank toilets 1.6 gpf.
Electromechanical hydraulic toilets 1.6 gpf. Blowout toilets 3.5 gpf. 42 USC section 6295(k)(1)(B) The maximum water use allowed for any gravity tank-type white 2-piece toilet
which bears an adhesive label conspicuous upon installation consisting of the words “Commercial Use Only” manufactured after January 1, 1994, and before January 1, 1997, is 3.5
gallons per flush. 42 USC section 6295(k)(1)(C) The maximum water use allowed for flushometer valve toilets, other than blowout toilets, manufactured after January 1, 1997, is 1.6
gallons per flush. 42 USC section 6295(k)(2) The maximum water use allowed for any urinal manufactured after January 1, 1994, is 1.0 gallon per flush. There are similar maximum
flow requirements for faucets and showers in section (j). These flow rate reductions have led to an increased the number of drainline transport problems for older plumbing systems
when they were combined with poorly designed and poorly performing plumbing fixtures at the time. Manufacturers had to spend great sums of money to redesign water closets to
flush with better performance. We are approaching the point where manufacturers cannot make many more improvements to plumbing fixture performance at these very low flow
rates. There is a minimum amount of water required to maintain a hydraulic depth of flow in a drain and for drains to flow and perform properly. When low-flow plumbing fixtures are
installed on older plumbing systems that have existing larger drains installed at the minimum slope, the lower flows create a lower hydraulic depth of flow in the drain and solids will
do not transport down the drain as well. They tend to pile up and form a dam over time. The dam creates a pond in from of the dam where flow velocities are interrupted allowning
solids to settle out in the pond that is formed in the drain pipe. Over a period of time, the solids plug up the existing oversized drain lines. This necessitates a call for a drain cleaning
service technician. Many of us may have heard about problems in drains and sewers following the advent of the 1992 Energy Policy Act and the mandated water flow reductions.
Since then, the plumbing product manufacturers have invested a lot of money redesigning their fixtures to perform better at lower flows, however there is a limit to the possible
improvements with respect to performance. The Plumbing Industry Research Coalition (PERC) was formed and has been doing research to learn more about the drainline transport
issues using low-flow fixtures. Their funding has been limited, and more research is needed, to address issues with flushable wipes, flushable toilet seat covers, and feminine
products in the drain line. The research they have provided so far has been valuable with respect to understanding the limitations of plumbing fixtures and drain line transport at
lower flow rates. For information on the PERC research see the following website: http://www.plumbingefficiencyresearchcoalition.org/ (Phase 1, Phase 2 and Phase 2.1). Studies
by two engineers, Bill Gauley and John Koeller, show when various models of 1.6 and 1.28 Gallon per flush GPF water closet’s were tested, tests showed drainline transport of
solids is generally less in 1.28 GPF water closets when compared to 1.6 GPF water closets. The was a reduction in the drainline transport of about at 37 percent when reducing
flows from 1.6 to 1.28 GPF. The transport distance was reduced from 36 feet on average to about 23 feet on average. (See Figure 4). With even lower flows being proposed, it will
be difficult if not impossible for larger horizontal drainage systems to transport solids. Drain blockages will become more common at lower flow rates. In high-rise vertical buildings, it
should be relatively easy to transport the waste a short distance to a vertical stack if the stack is within about 15 feet of the fixtures. There should be enough additional uses of water
in the stack in a high-rise building to provide sufficient drainline transport at the lowest level in the horizontal building drain. In a remote restroom in a large horizontal building, with
no other branches providing drainage flow, there will be drainline transport problems and an increase in drainline blockages. The energy expended after cleaning up after a sewage
back-ups could easily exceed the cost associated with having an adequate drain flow in the original system design. When you consider the enery and expenses associated with: 1.
Cleaning the drain lines, 2. Removing moldy drywall and finishes 3. Repairing damage to the building 4. Healthcare costs associated with the spread of disease, bacteria and mold
The small amount of energy and water that may be saved will be offset by far with remediation costs. Another consideration that I have experienced is, when people realize the
drains block-up on a regular basis because of inadequate flow, people will be trained to flush twice or three times to ensure the waste goes down the drain. I have seen signs in
many restrooms asking users to flush multiple times if there are solids in the bowl. There is a minimum sustainable drainline flow rate and more research is needed to understand
these limitations before we arbitrarily pick lower flow rates in order to gain points for an energy and environmental, water conservation program. [see on-line article for graphic]
Figure 4 – Illustration Showing Drainline Transport Distance at various flow rates Source: Evaluation of Low-Flush-Volume Toilet Technologies to Carry Waste in Drainlines,
February 2005, by: Bill Gauley, P.Eng., and John Koeller, P.E. The ‘Dry Drains’ Phenomenon Dry drains is a phenomenon being brought about because of aggressive energy and
water conservation efforts. Energy and water conservation code changes continue to be proposed for further reductions of water consumption for plumbing fixtures beyond the
requirements in the Energy Policy Act of 1992. These water flow reduction proposals are what I have referred to in the past as the “water conservation limbo. How low can we go?”
Using the Manning Formula, and from various drainage research that is available, we have a basic understanding of the minimum flow required for each pipe size and pipe slope for
various drain loadings. Despite this available knowledge, people still propose code change submittals based on simple math of water savings based on a lower flow over a fixture
use period. There is no consideration of the impact on other parts of the plumbing system. Many code change proposals don’t consider the laws of physics. Many code changes
seem to be on the edge of violating or maybe violate the laws of physics. However, plumbing systems should perform properly with health and safety being more important than
energy and water conservation. The International code change process has a button to click that asks if the proposed code change will add cost to building construction. I would like
to see a button that asks: Will this code change potentially cause a decrease in system performance? I would also like to see a button for: Will this code change cause a health and
Safety Issue? Code changes should be provided with technical support and research that shows no adverse effect on system performance, and the health and safety issues. The
problem is complex and a simple request to save water comes with many other performance and health & safety ramifications that are not always contemplated by code change
proponents with the good intentions of saving water. Drain flows are getting to the point where the flows are insufficient to transport solids down the drain. If drain flows are reduced,
and the drain pipes are the same size, then the hydraulic depth of flow will be less. In older buildings, there will likely be more problems than in newer buildings that can be designed
with smaller drains with more slope. To compound the issue, when a greywater reuse system collects discharged water from fixtures for reuse to flush water closets or for subsurface irrigation purposes, it is taking water away from the sanitary drainage system. (See Figure 4). The wastewater flow needs to be maintained at a level to keep the hydraulic
depth of flow sufficient for proper water velocities and drain line transport. [see on-line article for graphic] Figure 5 – Illustration showing Less Water in Drains Due to Water
Conservation Loss of Hydraulic Depth in Building Drains from Flow into Horizontal Branch Drains There has been research done in Australia that was reported on at the Dry Drains
conference that addressed flows in horizontal building drains with horizontal branch connections. The study showed when building drain branches are connected horizontally to the
building drain, they allow waste to divert or back-up into each branch as the waste flows by each branch. This lowers the hydraulic depth of flow in the main. (See Figure’s 5, 6 & 7)
This illustrates the need to consider code requirements to roll up branches up on a 45-degree angle to prevent the waste from entering the branches ( and further reducing the
drainline transport capacity for drains that are already at or near minimum flow rates for proper drainline transport for ultra-low flow fixtures). The research also confirmed a drain
should not drop from directly overhead into a horizontal drain. Waste usually would be directed upstream from a vertical stack dropping into a horizontal drain. This allowed solids to
settle in the horizontal pipe upstream of the connection and reduced the hydraulic depth of flow because of the diversion of waste. The stack should use a 45 and a Y fitting rolled to
allow a rolled up 45-degree entry into the horizontal drain. Some of these are already required in our codes. We should also be more aware of using directional drainage pattern
fittings as water closet flow rates are further reduced. An interesting thing of note is the fact that the minimum slope in Australia is 1.67 percent and in the U.S., the minimum slope is
1.0104 percent (1/8 inch per foot) because they generally use smaller drain pipes. [see on-line article for graphic] Figure 6 – Less Water in Drains Due to flow into Horizontal Branch
Connections [see on-line article for graphic] Figure 7 – Less Water in Drains Due to flow into Multiple Horizontal Branch Connections [see on-line article for graphic] Figure 8 –Rolled
Up Branch Drain to Assist with Transport of Solids. [see on-line article for graphic] Figure 9 – Large Pipe with Low Flow Fixtures = Low hydraulic depth and Drainline Transport
Problems [see on-line article for graphic] Figure 10 – Small Pipe with Low Flow Fixtures = Good Hydraulic Depth and Drainline Transport (Smaller pipes may require increased

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As a member of a water utility, we were experiencing water quality problems at the ends of the water distribution network because of aging water. We were also dealing with blockages in the sewer mains because there was not enough flow in the sewers. We ended up flushing fire hydrants every couple of weeks and directing the flow into sewer manholes to address the water quality and drain flushing the sewers. How is this accounted for in the energy and water conservation calculations? I am hoping the water quality studies associated with water conservation programs at Drexel University and Purdue University look at the issue of water and sewer departments needing to flush water mains to maintain water quality at the ends of their water distribution systems. This seems counter-productive but is necessary for safe drinking water and to flush the poorly performing sewers. Ron George, CPD is president of Ron George Design & Consulting Services he has over 40 years’ experience designing plumbing systems. To contact Ron, write to him at Ron@Plumb-TechLLC.com.
Item #: 119  
UPC 2021  Section: 706.4

SUBMITTER: John Stuart Lansing, CPDT, LEED Green Associate  
Interface Engineering

RECOMMENDATION:  
Revise text

706.0 Changes in Direction of Drainage Flow.

706.4 Vertical to Horizontal. Vertical drainage lines connecting with horizontal drainage lines shall enter through 45 degree (0.79 rad) wye branches, combination wye and one eighth bend branches, or other approved fittings of equivalent sweep. Branches or offsets of 60 degrees (1.05 rad) shall be permitted to be used where installed in a true vertical position. Double sanitary tees shall be permitted to be used where the barrel of the fitting is not less than two pipe sizes larger than the largest inlet.  

Exception: Fixture drains from up to two lavatories.

SUBSTANTIATION:  
Common installations of lavatory connections that consist of a pair of 1-1/2 inch fixture drains connecting into a 2 inch vertical common drain through a double sanitary tee are technically not permitted here. This could be interpreted as permitted if referring to the Minimum Size Trap and Trap Arm in Table 702.1, but the phrasing of the text does not give this flexibility.
SUBMITTER: April Trafton  
Donald F. Dickerson Associates

RECOMMENDATION:  
Revise text

707.0 Cleanouts.  
707.1 General. Cleanouts shall comply with ASME A112.36.2, CISPI 301, CSA B79, IAPMO IGC 78, IAPMO IGC 224, or IAPMO PS 90.  

(renumber remaining sections)

7022.7073 Approved. Each cleanout fitting and each cleanout plug or cap shall be of an approved type in accordance with the reference standards in Section 707.1.  

(renumber remaining sections)

### TABLE 1701.1  
**REFERENCED STANDARDS**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME A112.36.2-1991 (R2017)</td>
<td>Cleanouts</td>
<td>DWV Components</td>
<td>707.1</td>
</tr>
<tr>
<td>CSA B79-2008 (R2013)</td>
<td>Commercial and Residential Drains and Cleanouts</td>
<td>Fixtures</td>
<td>418.1, 707.1</td>
</tr>
<tr>
<td>CISPI 301-2012</td>
<td>Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications</td>
<td>Piping, Ferrous</td>
<td>301.2.4, 707.1, Table 701.2</td>
</tr>
<tr>
<td>IAPMO IGC 78-2018</td>
<td>Drain, Waste and Vent (DWV) Internal Cleanout Fittings</td>
<td>DWV Components</td>
<td>707.1</td>
</tr>
<tr>
<td>IAPMO IGC 224-2018</td>
<td>ABS, PVC and Cast Iron DWV Test Fitting With Integral Cleanout</td>
<td>DWV Components</td>
<td>707.1</td>
</tr>
<tr>
<td>IAPMO PS 90-2014</td>
<td>Elastomeric Test Caps, Cleanout Caps, and Combination Test Caps/Shielded Couplings</td>
<td>DWV Components</td>
<td>707.1</td>
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</tbody>
</table>

(portion of table not shown remains unchanged)

### TABLE 1701.2  
**STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES**

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME A112.36.2-1991 (R2017)</td>
<td>Cleanouts</td>
<td>DWV Components</td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

Note: The ASME, CSA, CISPI, and IAPMO standards meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:  
The existing requirements cleanouts are unclear. This proposal clarifies these requirements for the end user through reference to the applicable standards for cleanouts. The summarized scope of the standards included in this proposal for the compliance of cleanout fittings are: (a) ASME A112.36.24M covers cleanouts including floor and wall types used in concealed piping and adjacent to commercial, industrial, institutional, and other buildings open to public use. (b) CISPI 301 covers pipe and fittings for hubless cast iron sanitary and storm drain, sanitary waste, and vent piping applications. (c) CSA B79 covers commercial and residential drains and cleanouts. (d) IGC 78 covers flush-finished cleanout plugs with countersunk rectangular slots. (e) IGC 224 covers ABS, PVC test fittings with integral cleanout fittings with compatible dimensions for use with Cast Iron, ABS and PVC drain waste and vent. (f) IAPMO PS 90 covers elastomeric test caps, cleanout caps, and combination test caps/shielded couplings.
707.0 Cleanouts. Cleanouts shall be designed to be watertight and gastight. Threaded plugs and caps shall be installed or reinstalled with anti-seizing compound applied to threads to assure plug removal for upper sewer lateral emergency access. Sewer backup overflow devices shall be required by the Authority Having Jurisdiction in lieu of a threaded clean out plug on the upper sewer lateral cleanout riser, and shall be approved by the Authority Having Jurisdiction in writing to building and home owners on a case by case basis for mitigation issues.

SUBSTANTIATION:
Problem is multiple: The threads on upper sewer lateral clean out risers are easily damaged by Drain Snake Cables when clearing blockages. The Water and Gas tight seal is lost from cables and cross threading sewer seepage results. I have observed costly property damage done from sewer backup into buildings/homes with threaded plugs and caps. Also: had to fight threaded clean out plugs seized up many times on the upper sewer lateral clean out riser is common, brass and plastic. Additional labor to remove plugs adds costs to customers. Often the brass plug has to be chiseled or drilled under head pressure to force collapsing the plug to access clean out riser opening. Have experienced cast iron c/o risers breaking off trying to remove threaded brass and galvanized plugs. Plastic c/o plugs were reused when possible. Included: Threaded clean out plugs are a real nuisance under pressure and, unreliable in emergency situations. Furthermore, many states adopt the UPC as their state plumbing code. However, the (AHJ) The Sanitation District, requires building and home owners to remove threaded clean out plugs at the upper sewer lateral clean out riser and replace with a Sewer Backup up Overflow Device. Sewage is a bio hazard. Sewer backup overflow products discharge sewage on yards that gets to gutters, then into storm drains, causing water pollution. Surface water contamination people walk through. Increased response time to sewer backup overflows is warranted to prevent community and environmental health damage where sewer backup overflow products are used. Substantiation: Sewer overflow products discharge sewage on yards that gets to gutters, then into storm drains, causing water pollution and surface water contamination people walk through. Increased response time to sewer backup overflows is warranted to prevent community and environmental health damage where sewer backup overflow products are used. Potable water is wasted cleaning overflows that can and should be reduced, especially for drought prone areas. The health of society and the environment are compromised to avoid litigation from sewer overflow damage claims. It is not in the best public interest that the AHJ willfully undermine Public Health and Safety regulations and the Uniform Plumbing Code. There is no ANSI listing or product standard for sewer backup overflow products. The AHJ mandates the use of unlisted, untested sewer overflow devices. Time magazine May 2003 and, the Uniform Plumbing Code (IAPMO) Official magazine October 2004 indicated a leak in a broken sewage drain pipe in a light well was a major cause for the SARS Outbreak. Eliminate or reduce fecal droplet exposure to the public was a major objective of the SARS symposium of February 2004. Contact Exposure to Sewer waste water backup overflows are ignored and, overlooked for Flu outbreaks and pandemics. The AHJ is oblivious to October through April is the rainy season and, sewer drain systems backup more frequently into homes and businesses. The cold and flu season are the same months during the rain season. This is the only time of year for Flu Pandemics. Resolution: 1. Apply anti seize compound to threaded clean out plugs to assure opening in an emergency access situation. 2. PPE personal protective equipment training certification for Plumber Service Technician / Drain openers. 3. Threaded clean out caps or plugs should display biohazard insignia stickers to alert people to use caution around sewer waste water as a safety countermeasure. 2. Develop test criteria for Product Standard of, Sewer Backup Overflow Devices and High Water Alarms (attached photos Sewer Alert Relief Device proto type) basic features; Visual alert, gas and water tight. has temporary containment area for effluent. 3. Legislation: Clean Water Act Violations by the AHJ to Congress. 4. The CDC, EPA, OSHA and the Uniform Plumbing Codes need to be on the same page for public and environmental health. The Incubation period, time gap is the main issue of contact exposure to a communicable disease outbreak before signs and symptoms appear.
Item #: 122

UPC 2021  Section: 707.4(3)

SUBMITTER: Arnold Rodio
Pace Setter Plumbing, Corp.

RECOMMENDATION:
Revise text

707.4 Cleanouts.

707.4 Location. Each horizontal drainage pipe shall be provided with a cleanout at its upper terminal, and each run of piping, that is more than 100 feet (30 480 mm) in total developed length, shall be provided with a cleanout for each 100 feet (30 480 mm), or fraction thereof, in length of such piping. An additional cleanout shall be provided in a drainage line for each aggregate horizontal change in direction exceeding 135 degrees (2.36 rad). A cleanout shall be installed above the fixture connection fitting, serving each urinal, regardless of the location of the urinal in the building.

Exceptions:
(1) Cleanouts shall be permitted to be omitted on a horizontal drain line less than 5 feet (1524 mm) in length unless such line is serving sinks or urinals.
(2) Cleanouts shall be permitted to be omitted on a horizontal drainage pipe installed on a slope of 72 degrees (1.26 rad) or less from the vertical angle (one-fifth bend).
(3) Excepting the building drain, its horizontal branches, kitchen sinks, and urinals, a cleanout shall not be required on a pipe or piping that is above the floor level of the lowest floor of the building.
(4) An approved type of two-way cleanout fitting, installed inside the building wall near the connection between the building drain and the building sewer or installed outside of a building at the lower end of a building drain and extended to grade, shall be permitted to be substituted for an upper terminal cleanout.

SUBSTANTIATION:
Water closets, showers, tubs, drains and others fixtures typically do not present as big an issue with servicing the drain as kitchen sinks. Kitchen sink generate build-ups of grease and food materials that are unique to the use of the kitchen sink. Cleaning out upper story kitchen sinks is often a very messy and unsanitary process as the result of the lack of a cleanout. Having all kitchen sinks required to have a cleanout regardless of floor would go a long ways to alleviating this issue. The cost is minimal.
SUBMITTER: Sidney Cavanaugh  
Cavanaugh Consulting  
Rep: LMK Technologies

RECOMMENDATION:  
Revise text

707.0 Cleanouts.

707.5 Cleaning. Each cleanout shall be installed so that it opens to allow cleaning in the direction of flow of the soil or waste or at right angles thereto and, except in the case of wye branch and end-of-line cleanouts, shall be installed vertically above the flow line of the pipe. A small bore vacuum excavation saddle tee used as outside sewer service cleanout installed in accordance with ASTM F3097 shall be permitted.

719.0 Cleanouts.

719.4 Cleaning. Each cleanout shall be installed so that it opens to allow cleaning in the direction of flow of the soil or waste or at right angles thereto and, except in the case of wye branch and end-of-line cleanouts, shall be installed vertically above the flow line of the pipe. A small bore vacuum excavation saddle tee used as outside sewer service cleanout installed in accordance with ASTM F3097 shall be permitted.

### TABLE 1701.1 REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM F3097-2015</td>
<td>Installation of an Outside Sewer Service Cleanout through a Minimally Invasive Small Bore Vacuum Excavation</td>
<td>Miscellaneous</td>
<td>707.5, 719.4</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

**Note:** ASTM F3097 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

**SUBSTANTIATION:**
This change will recognize a less costly and invasive means of installing a cleanout which may be used for maintenance and rehabilitation of building sewers and sewer service laterals. In addition the change will add ASTM F3097 to Chapter 17.
SUBMITTER: Tim Collings  
Self

RECOMMENDATION:  
Revise text

710.0 Drainage of Fixtures Located Below the Next Upstream Manhole or Below the Main Sewer Level.

710.13 Macerating Toilet Systems and Pumped Waste Systems. Fixtures shall be permitted to discharge to a macerating toilet system, or pumped waste system and shall be permitted as an alternate to a sewage pump system where approved by the Authority Having Jurisdiction. Such systems shall comply with ASME A112.3.4/CSA B45.9 and shall be installed in accordance with the manufacturer's installation instructions. Macerating systems, used for bedpan liners, shall comply with IAPMO IGC 290 and shall be installed in accordance with the manufacturer's installation instructions.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO IGC 290-2012</td>
<td>Bedpan Liner Macerators</td>
<td>Fixtures</td>
<td>710.13</td>
</tr>
</tbody>
</table>

(Note: IAPMO IGC 290 meets the requirements for a mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:  
These macerator types are a permanent fixture connected to the plumbing supply and waste envelope. They are commonly used in hospitals and residences to simplify the disposal of bedpan contents. These systems are not currently regulated and should be included in the code to ensure the health and safety of the public through code enforcement. IAPMO IGC 290 covers bedpan liner macerators and this proposal intends to clarify to the end users that products compliant with IAPMO IGC 290 are approved devices.)
Item #: 125
UPC 2021 Section: 715.3

SUBMITTER: Sidney Cavanaugh
Cavanaugh Consulting
Rep: LMK Technologies

RECOMMENDATION:
Revise text

715.0 Building Sewer Materials.

715.3 Existing Sewers. Replacement of existing building sewer and building storm sewers using trenchless methodology and materials shall be installed in accordance with ASTM F1216. Cast-iron soil pipes and fittings shall not be repaired or replaced by using this method aboveground or belowground. Replacement using cured-in-place pipe liners shall not be used on collapsed piping or when the existing piping is compromised.

SUBSTANTIATION:
Cast-iron soil pipe and fittings, while approved for use on building sewers, are rarely if ever used for that application but would certainly be a candidate for rehabilitation if needed outside the building. The section 715.3 is only prescribing requirements for rehabilitation of existing building sewers and ASTM F1216 is only intended to apply to piping outside of the building thus the mention of cast-iron pipe and fittings aboveground or belowground is not appropriate in section 715.3.
SUBMITTER: Sidney Cavanaugh
Cavanaugh Consulting
Rep: LMK

RECOMMENDATION:
Revise text

715.0 Building Sewer Materials.

715.3 Existing **Building Sewers and Sewer Service Lateral Rehabilitation.** Replacement of rehabilitation of existing building sewers, building sewers (storm) and building storm sewers. **Building service laterals** using trenchless methodology and materials shall be installed in accordance with ASTM F2599 or ASTM F1216. Any rehabilitation of building sewer and sewer service lateral pipe and its connection to the main sewer pipe shall be in accordance with ASTM F2561. All rehabilitation of building sewer piping and sewer service laterals shall include use of hydrophilic O-rings and or gaskets that comply with ASTM F3240 to assure water tightness and elimination of ground water penetration. Inspection shall include CCTV to assure compliance of interior to the requirements of the standards and the proper positioning of the gaskets.

**Exception:** Cast-iron soil pipes and fittings shall not be repaired or replaced by using standards referenced in Section 715.3 both aboveground or belowground. Replacement using cured-in-place pipe liners shall not be used on collapsed piping or when the existing piping is compromised.

### TABLE 1701.1

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
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<tbody>
<tr>
<td>ASTM F2561-2017</td>
<td>Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-In-Place Liner</td>
<td>Piping</td>
<td>715.3</td>
</tr>
<tr>
<td>ASTM F2599-2016</td>
<td>The Sectional Repair of Damaged Pipe By Means of An Inverted Cured-In-Place Liner</td>
<td>Piping</td>
<td>715.3</td>
</tr>
<tr>
<td>ASTM F3240-2017</td>
<td>Installation of Seamless Molded Hydrophilic Gaskets (SMHG) for Long-Term Watertightness of Cured-In-Place Rehabilitation of Main and Lateral Pipelines</td>
<td>Piping</td>
<td>715.3</td>
</tr>
</tbody>
</table>

Note: ASTM F2561, ASTM F2599, and ASTM F3240 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

**SUBSTANTIATION:**
The wording was changed to more appropriately reflect the current industry use of “rehabilitation” rather than trench less which is included in title of all appropriate standards. The technology has progressed and many other standards are in use today which are needed to assure performance and water tightness. In addition minimal inspection requirements are needed and should be required. Finally, restrictions should be in separate section.
Item #: 127
UPC 2021 Section: 804.1

SUBMITTER: Phillip H Ribbs
PHR Consultants

RECOMMENDATION:
Revise text

804.0 Indirect Waste Receptors.

804.1 Standpipe Receptors. Plumbing fixtures or other receptors receiving the discharge of indirect waste pipes shall be approved for the use proposed and shall be of such shape and capacity as to prevent splashing or flooding and shall be located where they are readily accessible for inspection and cleaning. No standpipe receptor for a clothes washer shall extend more than 30 inches (762 mm), or not less than 18 inches (457 mm) above its trap weir. No trap for a clothes washer standpipe receptor shall be installed below the floor, but shall be roughed in not less than 6 inches (152 mm) and not more than 18 inches (457 mm) above the floor. No indirect waste receptor shall be installed in a toilet room, closet, cupboard, or storeroom, or in a portion of a building not in general use by the occupants thereof; except standpipes for clothes washers shall be permitted to be installed in toilet and bathroom areas where the clothes washer is installed in the same room.

SUBSTANTIATION:
The proposed modification will assist the end user in regards to the appropriate height of a stand pipe receptor by clarifying that the measurement starts at the trap "weir."
Item #: 128

UPC 2021  Section: 811.1.2

**SUBMITTER:** Reinhard Hanselka
Menlo Park Fire Protection District

**RECOMMENDATION:**
Revise text

811.0 Chemical Wastes.
811.1 Pretreatment. (remaining text unchanged)

811.1.2 Chemical waste having an NFPA health, flammability or reactivity rating of 3 or 4 shall have a receptor as required in the Mechanical Code.

**SUBSTANTIATION:**
Currently there is no guidance for containment of Hazardous waste. This change would provide requirements for containment of Health Hazard 3 or 4 materials per Section 1406.2

Containment and safety are the drivers.
Item #: 129

UPC 2021  Section: 814.2

SUBMITTER: Randy Young
Sacramento JATC

RECOMMENDATION:
Revise text

814.0 Condensate Waste and Control.

814.2 Condensate Control. Where any equipment or appliance is installed in a space where damage is capable of resulting from condensate overflow, other than damage to replaceable lay-in ceiling tiles, a drain line shall be provided and shall be drained in accordance with Section 814.1. An additional protection method for condensate overflow shall be provided in accordance with one of the following:

(remaining text unchanged)

SUBSTANTIATION:
Where equipment or appliances are installed in any area and condensate has a potential of causing any damage, proper precautions should be taken to prevent such damage. Ceiling tiles are like sponges, they will accept and retain moisture which could lead to mold and mildew growth. Damage to items located below the ceiling such as files, computers, desks or whatever else the building owner decides to place under an area unknown to him/her if the ceiling is going to hiding a leaky hazard.
Item #: 130
UPC 2021  Section: 814.5

SUBMITTER: Philip H Ribbs
PHR Consultants

RECOMMENDATION:
Revise text

814.0 Condensate Waste and Control.

814.5 Point of Discharge. Air-conditioning condensate waste pipes shall connect indirectly, except where permitted in Section 814.6, to the drainage system through an air gap or air break to trapped and vented receptors, roof drains, dry wells, leach pits, or the tailpiece of plumbing fixtures. A condensate drain shall be trapped in accordance with the appliance manufacturer’s instructions or as approved.

Exception: Where permitted in Section 814.6.

814.6 Condensate Waste From Air-Conditioning Coils. Where the condensate waste from air-conditioning coils discharges by direct connection to a lavatory tailpiece or to an approved accessible inlet on a bathtub overflow, the connection shall be located in the area controlled by the same person controlling the air-conditioned space.

SUBSTANTIATION:
As written, the exception may be misinterpreted as pertaining to the described fixtures. However, the fixtures are not part of the exception. The proposed modification removes any ambiguity by adding the exception to the bottom. Furthermore, roof drains are being added as it is an appropriate location for air-conditioning condensate waste pipes to connect indirectly.
Item #: 131
UPC 2021 Section: 903.1 (2)

SUBMITTER: Brian Helms
Charlotte Pipe and Foundry

RECOMMENDATION:
Revise text

903.0 Materials.

903.1 Applicable Standards. Vent pipe and fittings shall comply with the applicable standards referenced in Table 701.2, except that:

(1) No galvanized steel or 304 stainless steel pipe shall be installed underground and shall be not less than 6 inches (152 mm) aboveground.

(2) ABS and PVC DWV piping installations shall be in accordance with Chapter 14 “Firestop Protection.” Except for individual single-family dwelling units, materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke-developed index of not more than 50 where tested in accordance with ASTM E84 or UL 723. These tests shall comply with all requirements of the standards to include the sample size, both for width and length. Plastic pipe shall not be tested filled with water.

Plastic piping installed in plenums shall be tested in accordance with all requirements of ASTM E84 or UL 723. Mounting methods, supports and sample sizes of materials for testing that are not specified in ASTM E84 or UL 723 shall be prohibited.

SUBSTANTIATION:
A growing issue in the plumbing industry is that the ASTM E 84 test protocol is being modified to test combustible piping materials. At the direction of plastics manufacturers, test labs will modify mounting methods, supports and test specimen dimensions to achieve results that are in compliance with the 25/50 benchmarks the code requires. These results are then used to secure a listing by third party certifiers to serve as proof to code officials of compliance to the flame spread and smoke developed index requirements found in the code. The question of whether a piping material is in compliance to the flame spread and smoke developed requirements of the code is often further blurred as third party certifiers provide listings indicating that materials meet the 25/50 requirements using modified test methods. Third party certifiers disclose this information in their full listing or report, but this is not always easily identified or even accessible to officials. An inspector seeing ASTM E 84 on a pipe would likely assume that it meets the requirement of the code without fully knowing or understanding the restrictions that exist in the listing. In fact, listing agencies assume that the inspector will analyze the listing and make their own determination on compliance. This code change proposal provides notice to the official that simply adding the ASTM E 84 or UL 723 marking to the wall of the pipe does not necessarily mean that the product was tested in full compliance with the standard in the manner that the code intends. Charlotte Pipe has conducted ASTM E 84 tests at two different test facilities and found that results below the 25/50 flame spread and smoke developed index are not achievable when performed to the full requirements of ASTM E 84. Our testing has shown that CPVC and PVC piping will not pass the ASTM E 84 without modification of the mounting method, supports or test specimen dimensions. If the practice of accepting modified test results is allowed to continue, then the requirements of the code will not be achieved. ASTM E 84 is a comparison test, and the 25/50 flame spread and smoke developed index is not a requirement of the standard, but of the code itself. If the 25/50 requirement is too restrictive, then an effort should be made to change the code. If the ASTM E 84 test method is flawed, change the standard. However, we can no longer allow the use of modified tests and third party listings to circumvent the requirements of the code which exist to preserve the health and safety of the public. This proposal also clarifies the current language.
Item #: 132
UPC 2021  Section: 904.0, 904.2

SUBMITTER: Phillip H Ribbs
PHR Consultants

RECOMMENDATION:
Revise text

904.0 Size of Vents.

904.2 Length. Not more than one-third of the total permitted length, in accordance with Table 703.2, of a minimum-sized vent shall be installed in a horizontal position. Exception: Where a minimum-sized vent is increased one pipe size for its entire length, the maximum length limitation shall not apply.

SUBSTANTIATION:
The modifications adds clarity to the section by removing the exemption and making the last sentence it's own section. The provisions in Section 904.2 (Length) pertain to a "minimum-sized" vent. Furthermore, Note 6 of Table 703.2 contains these same provisions, with the last sentence as part of the provisions, not as an exception.
Item #: 133
UPC 2021  Section: 907.1

SUBMITTER: John Stuart Lansing, CPDT, LEED Green Associate
Interface Engineering

RECOMMENDATION:
Revise text

907.0 Vent Stacks and Relief Vents.
907.1 Drainage Stack. Each drainage stack that extends 10 or more stories shall be served by a parallel vent stack, which shall extend undiminished in size from its upper terminal and connect to the drainage stack at or immediately below the lowest fixture drain. Each such vent stack shall also be connected to the drainage stack at each fifth floor, counting down from the uppermost fixture drain, using a yoke vent, the size of which shall be not less in diameter than either the drainage or the vent stack, whichever is smaller.

Exception: For sanitary stacks that serve only emergency fixtures, parallel vent stacks may be omitted, provided that a stack vent of equal diameter is located above the highest fixture connection.

SUBSTANTIATION:
The intent of a parallel stack vent with relief vents is to equalize pressure differentials that occur between the top and bottom of a sanitary stack, due to multiple fixtures discharging. Given that these sanitary stacks have a design load of a single fixture being used, flow interruption in the stack from a discharging branch of another fixture will likely never occur. The stack loading values listed by the UPC are based on 1/4th flow through the stack, which provides 3/4th of the pipe for uninterrupted airflow, leaving a parallel vent stack redundant. This being the case, the pressure differentials imposed by a discharging fixture from the top of the stack down to the base of the stack will not exceed 1-inch water column pressure differential, provided that the stack vent is large enough. NBS Monograph 31 authored by Wyly & Eaton in 1961, prove that maximum airflow possible in a stack will never exceed 1.5 that of the drainage flow in the stack. The need for compact solutions for emergency fixture drain stacks has risen to particular importance with the new requirements for elevator trench drains being installed in elevator lobbies.
Item #: 134
UPC 2021  Section: 911.2

SUBMITTER: John Stuart Lansing, CPDT, LEED Green Associate
Interface Engineering

RECOMMENDATION:
Revise text

911.0 Circuit Venting.

911.2 Dry Vent Size and Connection. The dry vent connection to the circuit vent shall be not less than 2 inches (50 mm) in diameter, and the connection shall be located between the two most upstream fixture drains. The dry vent shall connect vertically into the horizontal drain acting as the circuit vent branch on the vertical. The dry vent circuit vent pipe shall not receive the discharge of soil or waste.

SUBSTANTIATION:
The proposed code change clarifies the use of the term "vent" and "circuit vent" when referring to the dry vent. The circuit vent is the horizontal wet portion of the sanitary branch being used as the vent, so it is incorrect to refer to the dry vent connection as the "circuit vent".
911.0 Circuit Venting.

911.1 Circuit Vent Permitted. A maximum of eight floor-outlet water closets, showers, bathtubs, or floor drains connected to a horizontal branch shall be permitted to be circuit vented. Each trap arm shall connect horizontally to the horizontal branch being circuit vented in accordance with Table 902.2. The horizontal branch shall be classified as a drain and a vent from the most downstream trap arm connection to the most upstream trap arm connection to the horizontal branch.

Exception: Rear-outlet water closets shall be permitted to be circuit vented provided that no floor-outlet fixtures are connected to the same horizontal branch.

911.1.1 Multiple Circuit-Vented Branches. Circuit-vented horizontal branch drains are permitted to be connected together. Each group of a maximum of eight fixtures shall be considered a separate circuit vent and shall be in accordance with the provisions of this section.

911.2 Circuit Vent Size and Connection. The circuit vent size shall be in accordance with Table 703.2 according to the number of fixture vented fixtures connected to the horizontal branch drain. The horizontal branch drain shall be not less than 2 inches (50 mm) in diameter and shall be connected to the stack between the two most upstream fixture drains. The vent shall connect to the horizontal branch on the vertical between the two most upstream trap arms. The circuit vent pipe shall not receive the discharge of a soil or waste line.

911.2.1 Multiple Circuit Vents. When multiple circuit vents are interconnected according to Section 911.4.1, each individual circuit vent shall be sized according to 911.2. The vent pipe connecting each circuit vent shall be sized in accordance with Table 703.2.

911.3 Slope and Size of Horizontal Branch. The slope of the vent section of the horizontal branch drain shall be not more than 1 inch per foot (83.3 mm/m). The entire length of the vented section of the horizontal branch drain shall be sized for the total drainage discharge to the branch.

911.3.1 Size of Multiple Circuit Vent. Multiple circuit-vented branches shall be permitted to connect on the same floor level. Each separate circuit-vented horizontal branch shall be sized independently in accordance with Section 911.4. The downstream circuit-vented horizontal branch shall be sized for the total drainage discharge into the branch, including the upstream branches and the fixtures within the branch.

911.4.1.1 Multiple Circuit-Vented Branches. Circuit-vented horizontal branches are permitted to be connected together. Each group of a maximum of eight fixture units shall be considered a separate circuit vent and shall be in accordance with Section 911.4.1.1 and Section 911.4.1.2.

911.4.1.2 Size of Continuous Horizontal Branches. Two or more circuit-vented systems continuous on the same horizontal branch shall be uniformly sized for the total discharge into the branch.

911.5 Additional Fixtures. Fixtures, other than the circuit-vented fixtures, are permitted to discharge to the horizontal branch drain. Such fixtures shall be located on the same floor as the circuit-vented fixtures and shall be either individually or common vented.

205.0 -C- Circuit Vent – The vent that connects to a horizontal drainage branch and vents two traps to a maximum of eight traps connected into a battery of fixtures.

SUBSTANTIATION:
1. Because of the public concern that the current code language is confusing and unclear as to the meaning, application, and enforcement of circuit venting, increasing the possibility of incorrect and unintended installations. The proposed changes rectify this confusion by adding significant clarity to the provisions of the code, correcting improper terminology, removing uncertain phrases, and by arranging the provisions more suitable to the components of the system. The revision begins with adding a definition for circuit venting and identifying the number and specific kinds of fixtures allowed for a circuit vent that is not present in the current edition. This will curtail unintended installations. Circuit venting is applied only to specific floor mounted fixtures in battery. The term fixture drain is improperly used and is corrected with the proper term of trap arm. A reference to Table 902.2 was needed to limit trap arm length. An exception was added to allow back-outlet water closets commonly used in commercial applications, which are not floor-outlet fixtures. The rest of the provisions are arranged by components. First, the circuit vent pipe provisions. Second, the relief vent pipe provisions. Third, the horizontal branch provisions. Fourth, additional fixtures connected to the circuit vented horizontal branch. The revision adds circuit vent sizing by referencing Table 703.2. Currently, there is no guidance for circuit vent sizing other than a minimum size of two inches. For example, eight public water closets on a circuit vented horizontal branch is a total of 32 fixture units. Referring to Table 703.2, the vent is required to be three inches rather than two. Without this Table reference, there was no guidance to suggest an increase of the circuit vent size. Furthermore, the provisions allow other than circuit vented fixtures to connect to the circuit vent without indicating how they impact the size of the circuit vent. Therefore, clarity was added to identify only the circuit vented fixtures are used with Table 703.2 to size the circuit vent. Multiple circuit vented branches are also allowed to connect together without any guidance on how to size the horizontal vent connecting all the individual circuit vents. Hence, a new subsection, 911.2.1 was added to address this omission. The relief vent can also serve as a fixture drain with a total of four fixture units. This needed restriction since fixture uses such as clothes washers, public wash fountains, and commercial sinks were not intended to discharge into the relief vent. Therefore, the revision restricts the discharges to one and two fixture unit fixtures. The horizontal branch provisions needed the most revision. Section 911.3.1 is mistitled since the provisions do not apply to the circuit vent, but to the horizontal branch. Furthermore, the language is confusing and suggests more a parallel application than a continuous application for multiple circuit vented horizontal branches connecting together. Therefore, the revision makes a distinction in application of multiple circuit vented branches – parallel and continuous. The sizing is different for each application. For the parallel application, the circuit vented horizontal branches are sized independently. For the
continuous application, the circuit vented horizontal branches are uniformly sized for the combined discharge into the branch. 2. The figures illustrate the intent of the proposed code language. Figure 1 displays the basic requirements of where the circuit vent needs to connect to the horizontal branch, the maximum number of fixtures allowed, and the uniform sizing of the horizontal branch. Figure 2 displays trap arm distance requirements. Figure 3 illustrates multiple circuit vented branches. On one horizontal branch, the first group of eight fixtures include six water closets and two floor drains. Assuming emergency floor drains with 0 fixture units, the upstream circuit vent is two inches serving the first group of 24 fixture units. The downstream circuit vent is two inches, serving the second group of four water closets and one floor drain having 16 fixture units. Where the two circuit vents connect, Table 703.2 requires the vent size to increase to three inches serving 40 fixture units. Figure 4 displays the requirement of a relief vent needed when there is a battery of toilets discharging into a stack receiving waste from above. Summary: The current code language has the potential for unintended installations and consequences. There is unclear guidance for both the installation and inspection of a proper circuit vented system. Misapplication could result in a health and safety hazard. For example, without sizing guidance an improper circuit vent size could result in compromising trap seals for fixtures connected to the horizontal branch. Another misapplication would be combining floor outlet fixtures with above floor fixtures using the same circuit vent. The current code language allows any combination of fixtures without discrimination to have the same circuit vent. This could result in a system that is improperly vented and sized.
Item #: 136
UPC 2021 Section: 912.2

SUBMITTER: Michael DiMonte Sr.
ANTI AIR LOCK

RECOMMENDATION:
Revise text

912.0 Engineered Vent System.

912.2 Minimum Requirements. An engineered vent system shall provide protection of the trap seal in accordance with Section 901.3. The engineered vent system shall be tested in accordance with Section 712.1 and tested with water in accordance with Section 712.2 or tested with air in accordance with Section 712.3.

712.0 Testing.
712.1 Media. The piping of the plumbing, drainage, and venting systems shall be tested with water or air except that plastic pipe shall not be tested with air. The Authority Having Jurisdiction shall be permitted to require the removal of cleanouts, etc., to ascertain whether the pressure has reached all parts of the system. After the plumbing fixtures have been set and their traps filled with water, they shall be submitted to a final test.

712.2 Water Test. The water test shall be applied to the drainage and vent systems either in its entirety or in sections. Where the test is applied to the entire system, openings in the piping shall be tightly closed, except the highest opening, and the system filled with water to the point of overflow. Where the system is tested in sections, each opening shall be tightly plugged, except the highest opening of the section under test, and each section shall be filled with water, but no section shall be tested with less than a 10 foot head of water (30 kPa). In testing successive sections, not less than the upper 10 feet (3048 mm) of the next preceding section shall be tested, so that no joint or pipe in the building (except the uppermost 10 feet (3048 mm) of the system) shall have been submitted to a test of less than a 10 foot head of water (30 kPa). The water shall be kept in the system, or in the portion under test, for not less than 15 minutes before inspection starts. The system shall then be tight at all points.

712.3 Air Test. The air test shall be made by attaching an air compressor testing apparatus to a suitable opening and, after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gauge pressure of 5 pounds-force per square inch (psi) (34 kPa) or sufficient to balance a column of mercury 10 inches (34 kPa) in height. The pressure shall be held without the introduction of additional air for a period of not less than 15 minutes.

SUBSTANTIATION:
In accordance with Section 712.0 and Section 712.1, the piping of the plumbing, drainage and venting systems shall be tested with water or air.
**Proposals**

**Item #: 137**

**UPC 2021**  Section: 912.3

**SUBMITTER:** Michael DiMonte Sr.

**ANTI AIR LOCK**

**RECOMMENDATION:**

Add new text

**912.0 Engineered Vent System.**

**912.3 Minimum Maintenance.** The premise owner or responsible person shall have the engineered vent system tested at the time of installation, repair, or relocation and not less than on an annual schedule thereafter, or as required by the Authority Having Jurisdiction. The periodic testing shall be performed in accordance with Section 712.1 and tested with water in accordance with Section 712.2 or tested with air in accordance with Section 712.3.

**712.0 Testing.**

**712.1 Media.** The piping of the plumbing, drainage, and venting systems shall be tested with water or air except that plastic pipe shall not be tested with air. The Authority Having Jurisdiction shall be permitted to require the removal of cleanouts, etc., to ascertain whether the pressure has reached all parts of the system. After the plumbing fixtures have been set and their traps filled with water, they shall be submitted to a final test.

**712.2 Water Test.** The water test shall be applied to the drainage and vent systems either in its entirety or in sections. Where the test is applied to the entire system, openings in the piping shall be tightly closed, except the highest opening, and the system filled with water to the point of overflow. Where the system is tested in sections, each opening shall be tightly plugged, except the highest opening of the section under test, and each section shall be filled with water, but no section shall be tested with less than a 10 foot head of water (30 kPa). In testing successive sections, not less than the upper 10 feet (3048 mm) of the next preceding section shall be tested, so that no joint or pipe in the building (except the uppermost 10 feet (3048 mm) of the system) shall have been submitted to a test of less than a 10 foot head of water (30 kPa). The water shall be kept in the system, or in the portion under test, for not less than 15 minutes before inspection starts. The system shall then be tight at all points.

**712.3 Air Test.** The air test shall be made by attaching an air compressor testing apparatus to a suitable opening and, after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gauge pressure of 5 pounds-force per square inch (psi) (34 kPa) or sufficient to balance a column of mercury 10 inches (34 kPa) in height. The pressure shall be held without the introduction of additional air for a period of not less than 15 minutes.

**SUBSTANTIATION:**

In accordance with 712.0 and 712.1 the piping of the plumbing, drainage and venting systems shall be tested with water or air. The maintenance requirements for engineered vent systems shall improve public health and safety by continuing to ensure engineered vent systems remain safe.
Item #: 138
UPC 2021  Section: 912.4

SUBMITTER: Michael DiMonte Sr.
ANTI AIR LOCK

RECOMMENDATION:
Add new text

912.0 Engineered Vent System.

912.4 Maintenance Documentation. A brief and legible handwritten record of any and all specific work and testing done to an engineered vent system (e.g., the date, time, and result(s)/observation(s) of the operational functionality after application of tests) shall be affixed and visible (within a clear plastic envelope) onto each engineered vent system for any future reference or inspection. Records shall be maintained and updated not less than on an annual schedule.

SUBSTANTIATION:
In accordance with Section 712.0 and Section 712.1, the piping of the plumbing, drainage and venting systems shall be tested with water or air. The maintenance documentation requirements for engineered vent systems shall improve public health and safety by continuing to ensure engineered vent systems documentation is available for reference and can be relied upon in real time.
Item #: 139

UPC 2021  Section: 1001.2, 222.0

SUBMITTER: Samantha Liu
Self

RECOMMENDATION:
Revise text

1001.0 General.

1001.2 Where Required. Each plumbing fixture shall be separately trapped by an approved type of liquid seal rap. This section shall not apply to fixtures with integral traps. Not more than one trap shall be permitted on a trap arm. Food waste disposers installed with a set of restaurant, commercial, or industrial sinks shall be connected to a separate trap. Each domestic clothes washer and each laundry tub shall be connected to a separate and independent trap, except that a trap serving a laundry tub shall also be permitted to receive the waste from a clothes washer set adjacent to it. The vertical distance between a fixture outlet and the trap weir shall be as short as practicable, but in no case shall the tailpiece from a fixture exceed 24 inches (610 mm) in length. One trap shall be permitted to serve a set of not more than three single compartment sinks or laundry tubs of the same depth or three lavatories immediately adjacent to each other and in the same room where the waste outlets are not more than 30 inches (762 mm) apart, and the trap is centrally located where three compartments are installed.

222.0    – T –

Tailpiece. The pipe or tubing that connects the outlet of a plumbing fixture to a trap.

SUBSTANTIATION:
The proposed modification will add clarity to Section 1001.2 with regards to a tail piece. The language is clear in regards to the tailpiece not being allowed to exceed 24 inches. Furthermore, a tailpiece is already defined in the code and provided for your information.
Item #: 140
UPC 2021 Section: Table 1002.2

SUBMITTER: John Stuart Lansing, CPDT, LEED Green Associate
Interface Engineering

RECOMMENDATION:
Revise text

1002.0 Traps Protected by Vent Pipes.

1002.2 Fixture Traps. Each fixture trap shall have a protecting vent so located that the developed length of the trap arm from the trap weir to the inner edge of the vent shall be within the distance given in Table 1002.2, but in no case less than twice the diameter of the trap arm.

**Table 1002.2**

**Horizontal Lengths of Trap Arms**

<table>
<thead>
<tr>
<th>Trap Arm Pipe Diameter (inches)</th>
<th>Distance Trap to Vent Minimum (inches)</th>
<th>Length Maximum (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ¼</td>
<td>2 ½</td>
<td>30-50</td>
</tr>
<tr>
<td>1 ½</td>
<td>3</td>
<td>45-75</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>60-100</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>75-150</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>120-200</td>
</tr>
<tr>
<td>Exceeding 4</td>
<td>2 x Diameter</td>
<td>120 x Diameter x ratio of slope</td>
</tr>
</tbody>
</table>

For SI units: 1 inch = 25.4 mm

Notes:

1 Maintain ¼ inch per foot slope (20.8 mm/m). For slopes other than ¼ inches per foot (20.8 mm/m), divide the pipe diameter by the slope to determine the maximum allowable length.

2 The developed length between the trap of a water closet or similar fixture (measured from the top of the closet flange to the inner edge of the vent) and its vent shall not exceed 6 feet (1829 mm).

**Substantiation:**
These new values reflect increases in the maximum permissible fixture drain lengths based on the trap weir being located below the highest inlet to the vent, with respect to the slope (see Table 1002.2 in attachment). This has been confirmed through the testing of Dr. Roy B. Hunter in his 1924 report Elimination Waste Series BH2 (see Figure 1). John L French later proved Hunter’s table to be extremely conservative in his 1951 report BMS 126 Self-Siphonage of Fixture Traps (Figure 2). The table proposed by Dr. Hunter has also been implemented in the International Plumbing Code in Section 909.2 Venting of Fixture Drains. The values in Table 1002.2 reflect the limited understanding of self-siphonage in the early 20th century. French states in the 1951 report “In fact, as so often happens, some of these variables had been found by cut-and-dry methods before their rational basis had been shown. This was due to the fact that heavy pressure was placed upon us to get practical results at the earliest possible date to be used in preparing certain sections of the Uniform Plumbing Code. Because of this pressure, it was only when the results were being written up finally that time could be taken to make an adequate analysis of the problem.” The Uniform Plumbing Code French was referencing was the 1949 edition and the trap to vent distances remain mostly unchanged in the current 2018 UPC Table 1002.2 (see Figure 3). Updating the table will reduce the number of instances where venting below the flood level rim of the fixture (flat venting) is necessary and provide greater flexibility to plumbing fixture locations with respect to architectural enclosures for concealing vent piping.
Item #: 141
UPC 2021  Section: 1014.1

SUBMITTER: Phillip H Ribbs  
PHR Consultants

RECOMMENDATION:  
Revise text

1014.0 Grease Interceptors.

1014.1 General. Where it is determined by the Authority Having Jurisdiction that waste pretreatment is required, an approved type of grease interceptor(s) comply shall comply with ASME A112.14.3, ASME A112.14.4, CSA B481, PDI G-101, or PDI G-102, and sized in accordance with Section 1014.2.1 or Section 1014.3.6, shall be installed in accordance with the manufacturer’s installation instructions to receive the drainage from fixtures or equipment that produce grease-laden waste, located in areas of establishments where food is prepared. Grease-laden waste fixtures shall include but not be limited to sinks and drains, such as floor drains, floor sinks, and other fixtures or equipment in serving establishments such as restaurants, cafes, lunch counters, cafeterias, bars and clubs, hotels, hospitals, sanitariums, factory or school kitchens, or other establishments where grease is introduced into the drainage or sewage system in quantities that can effect line stoppage or hinder sewage treatment or private sewage disposal systems. A combination of hydromechanical, gravity grease interceptors and engineered systems shall be allowed to meet this code and other applicable requirements of the Authority Having Jurisdiction where space or existing physical constraints of existing buildings necessitate such installations. A grease interceptor shall not be required for individual dwelling units or private living quarters. Water closets, urinals, and other plumbing fixtures conveying human waste shall not drain into or through the grease interceptor.

SUBSTANTIATION:  
The proposed modification clarifies that floor drains, and floor sinks are part of the fixtures. Furthermore, the proposed text gives specific examples of establishments where food is prepared. This modification will assist the end user enforce the language.
Item #: 142

UPC 2021 Section: 1014.2 Exception

SUBMITTER: Brad Senecaud  
City of Hillsboro, OR

RECOMMENDATION:  
Revise text

1014.0 Grease Interceptors.

1014.2 Hydromechanical Grease Interceptors. Plumbing fixtures or equipment connected to a Type A and B hydromechanical grease interceptor shall discharge through an approved type of vented flow control installed in a readily accessible and visible location. Flow control devices shall be designed and installed so that the total flow through such device or devices shall at no time be greater than the rated flow of the connected grease interceptor. No flow control device having adjustable or removable parts shall be approved. The vented flow control device shall be located such that no system vent shall be between the flow control and the grease interceptor inlet. The vent or air inlet of the flow control device shall connect with the sanitary drainage vent system, as elsewhere required by this code, or shall terminate through the roof of the building, and shall not terminate to the free atmosphere inside the building.

Exception: Listed grease interceptors with integral flow controls or restricting devices shall be installed in an accessible location in accordance with the manufacturer’s installation instructions. The integral flow controls or restricting devices shall be accessible from finished grade.

SUBSTANTIATION:  
Toothpicks, pieces of paper, swizzle sticks, etc. can block the orifice of the flow controls/removable devices. The blockage can be cleared by removing the flow control/removable device, allowing the blockage to clear, and reinstalling it. Some manufacturers installation instructions are allowing up to 72” of riser rings, some of which the interior diameters are less than 24” inches. This limits the physical size of the plumber who needs to be lowered into the confined space with special equipment and breathing apparatus to perform the necessary repair. The result is an unintended, considerable expense to the owner, for each blockage occurrence. A ‘snake’ entered from an upstream cleanout will not remove the blockage without damaging the internal parts. Some manufacturers are addressing the issue with models that will comply with this code change, but have many products in production and inventory that do not. The interceptors requiring reachable integral parts can still be used with a 12” riser limit, but that could be addressed by the manufacturer. Entering confined spaces for plumbing repairs is not a new thing, but the spaces are usually designed for human entrance. A hydromechanical grease interceptor is not. I feel these installations do not meet the intent of the code for accessing items requiring routine maintenance, and are not safe for the plumbers doing the repair.
Item #: 143
UPC 2021 Section: 1101.4

SUBMITTER: Brian Helms
Charlotte Pipe and Foundry

RECOMMENDATION:
Revise text

1101.4 Material Uses. Pipe, tube, and fittings conveying rainwater shall be of such materials and design as to perform their intended function to the satisfaction of the Authority Having Jurisdiction. Conductors within a vent or shaft shall be of cast-iron, galvanized steel, wrought iron, copper, copper alloy, lead, Schedule 40 ABS DWV, Schedule 40 PVC DWV, stainless steel 304 or 316L [stainless steel 304 pipe and fittings shall not be installed underground and shall be kept not less than 6 inches (152 mm) aboveground], or other approved materials, and changes in direction shall be in accordance with the requirements of Section 706.0. ABS and PVC DWV piping installations shall be installed in accordance with applicable standards referenced in Table 1701.1 and Chapter 14 “Firestop Protection.” Except for individual single-family dwelling units, materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke-developed index of not more than 50, where tested in accordance with ASTM E84 or UL 723. These tests shall comply with all requirements of the standards to include the sample size, both for width and length. Plastic pipe shall not be tested filled with water. Plastic piping installed in plenums shall be tested in accordance with all requirements of ASTM E84 or UL 723. Mounting methods, supports and sample sizes of materials for tests that are not specified in ASTM E84 or UL 723 shall be prohibited.

Note: ASTM E84 and UL 723 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
A growing issue in the plumbing industry is that the ASTM E 84 test protocol is being modified to test combustible piping materials. At the direction of plastics manufacturers, test labs will modify mounting methods, supports and test specimen dimensions to achieve results that are in compliance with the 25/50 benchmarks the code requires. These results are then used to secure a listing by third party certifiers to serve as proof to code officials of compliance to the flame spread and smoke developed index requirements found in the code. The question of whether a piping material is in compliance to the flame spread and smoke developed requirements of the code is often further blurred as third party certifiers provide listings indicating that materials meet the 25/50 requirements using modified test methods. Third party certifiers disclose this information in their full listing or report, but this is not always easily identified or even accessible to officials. An inspector seeing ASTM E 84 on a pipe would likely assume that it meets the requirement of the code without fully knowing or understanding the restrictions that exist in the listing. In fact, listing agencies assume that the inspector will analyze the listing and make their own determination on compliance. This code change proposal provides notice to the official that simply adding the ASTM E 84 or UL 723 marking to the wall of the pipe does not necessarily mean that the product was tested in full compliance with the standard in the manner that the code intends. Charlotte Pipe has conducted ASTM E 84 tests at two different test facilities and found that results below the 25/50 flame spread and smoke developed index are not achievable when performed to the full requirements of ASTM E 84. Our testing has shown that CPVC and PVC piping will not pass the ASTM E 84 without modification of the mounting method, supports or test specimen dimensions. If the practice of accepting modified test results is allowed to continue, then the requirements of the code will not be achieved. ASTM E 84 is a comparison test, and the 25/50 flame spread and smoke developed index is not a requirement of the standard, but of the code itself. If the 25/50 requirement is too restrictive, then an effort should be made to change the code. If the ASTM E 84 test method is flawed, change the standard. However, we can no longer allow the use of modified tests and third party listings to circumvent the requirements of the code which exist to preserve the health and safety of the public. This proposal also clarifies the current language.
Item #: 144
UPC 2021  Section: 1101.4

SUBMITTER: Michael Cudahy
Plastic Pipe and Fittings Association (PPFA)

RECOMMENDATION:
Revise text

1101.0 General.

1101.4 Material Uses. Pipe, tube, and fittings conveying rainwater shall be of such materials and design as to perform their intended function to the satisfaction of the Authority Having Jurisdiction. Conductors within a vent or shaft shall be of cast-iron, galvanized steel, wrought iron, copper, copper alloy, lead, Schedule 40 ABS DWV, Schedule 40 PVC DWV, stainless steel 304 or 316L [stainless steel 304 pipe and fittings shall not be installed underground and shall be kept not less than 6 inches (152 mm) aboveground], or other approved materials, and changes in direction shall be in accordance with the requirements of Section 706.0. ABS and PVC DWV piping installations shall be installed in accordance with applicable standards referenced in Table 1701.1 Chapter 17 and Chapter 14 "Firestop Protection."

Except for individual single-family dwelling units, DWV combustible pipe materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke-developed index of not more than 50, where tested in accordance with ASTM E84 or UL 723. These tests shall comply with all requirements of the standards to include the sample size, both for width and length. Plastic pipe shall not be tested filled with water.

SUBSTANTIATION:
Language in 1101.4 is better than that found in section 701.2, but for installation, instead of just listing Table 1701.1, better to just list all of Chapter 17. All piping materials, not just ABS and PVC, should be installed in accordance with applicable standards requirements, and fire stopping requirements, but new standard test requirements should not be imposed by the code.
Item #: 145

UPC 2021 Section: 1101.4.5, Table 1701.1, Table 1701.2

SUBMITTER: Bryan Miko
Advanced Drainage Systems, Inc.

RECOMMENDATION:
Revise text

1101.4 Material Uses. (remaining text unchanged)

1101.4.5 Building Storm Sewers. Building storm sewer shall comply with the applicable standards referenced in Table 701.2 for building sewer pipe or Table 1101.4.5 for building storm sewer pipe where located more than 2 feet (610 mm) from the building.

Table 1101.4.5
Materials for Building Storm Sewer Pipe

<table>
<thead>
<tr>
<th>Materials</th>
<th>Referenced Standard(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyethylene</td>
<td>ASTM F2306/F2306M</td>
</tr>
<tr>
<td>Polypropylene</td>
<td>ASTM F2881</td>
</tr>
<tr>
<td>Reinforced Concrete Pipe</td>
<td>ASTM C76</td>
</tr>
</tbody>
</table>

Table 1701.1
Referenced Standards

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM C76-2015a</td>
<td>Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe</td>
<td>Storm Sewer</td>
<td>Table 1101.4.5</td>
</tr>
<tr>
<td>ASTM F2306/F2306M-2014</td>
<td>12 to 60 in. (300 to 1500 mm) Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications</td>
<td>Piping, Plastic</td>
<td>Table 1101.4.5</td>
</tr>
<tr>
<td>ASTM F2881-2011</td>
<td>12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications</td>
<td>Storm Sewer</td>
<td>Table 1101.4.5</td>
</tr>
</tbody>
</table>

Note: ASTM C76, ASTM F2306/F2306M, and ASMM F2881 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
State plumbing boards and their inspectors adopting the UPC are restricting the use of the most common large diameter, gravity flow storm sewer materials in the marketplace. When Table 701.2 for building sewer is applied all the way to the property line for larger developments and institutions, this greatly increases the cost for conveying storm water collected all over the site to the public sewer. Currently, many professional engineers are having to request alternate approval for all of these materials on every project they design because of the application of 701.2 to the property line. I am proposing an additional table under 1101.4.5 as building storm sewer pipe in order to alleviate that concern and restriction. I am open to verbiage changes, especially regarding the language with the distance from the building.
Item #: 146  
UPC 2021 Section: 1101.11.1

SUBMITTER: Christopher Jensen  
UL LLC

RECOMMENDATION:  
Add new text

1101.0 General.

1101.11 Paved Areas. {remaining text unchanged}

1101.11.1 Oil/Water Separators. Where oil/water separators are used to remove oil suspended in water from rainwater runoff or wash-down of parking lots and other paved areas, the oil/water separators shall be listed and labeled to UL 2215 and installed in accordance with the listing and manufacturer’s installation instructions.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 2215-2000</td>
<td>Outline of Investigation for Oil/Water Separators</td>
<td>Separator</td>
<td>1101.11.1</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: UL 2215 was not developed via an open process having a published development procedure in accordance with Section 3-3.7.1.2 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:  
Oil and gas entering into a public storm drain system can create a hazardous condition. When oil/water separators are installed to remove oil suspended in water resulting from rain or wash-down of parking lots or other paved surfaces, the code should address the safe installation of these products. These oil/water separators can be gravity or pump fed and have capacities of 60 to 50,000 gallons. Requiring these products to be listed to UL 2215 will provide assistance the AHJ to verify that the products meet basic safety standards. UL currently has 20 manufacturers with listed oil/water separators.
Item #: 147
UPC 2021  Section: 1102.3

SUBMITTER:  Julius Ballanco, P.E.
           JB Engineering and Code Consulting, P.C.
           Rep: Froet Industries

RECOMMENDATION:
Add new text

1102.0 Roof Drains.

1102.3 Combined Primary and Secondary Roof Drains. Roof drains having a combined primary and secondary roof drain shall have separate and independent strainers for the primary inlet and for the secondary inlet.

(Renumber remaining sections)

SUBSTANTIATION:
A similar change was submitted during the last cycle. The concern expressed was that this requirement is proprietary. Combined roof drains are not proprietary. Most manufacturers offer some style of combined primary and secondary roof drain. Any manufacturer can readily provide separate strainer. Such a design is not proprietary. The Building Code requires the roof loading to be based on the maximum amount of water ponding on the roof with the primary roof drain blocked. Additionally, the loading has to consider the rise in water above the secondary inlet to provide flow at the rainfall rate. The blockage identified in the Building Code and ASCE 7 included blockage of the strainer. If a single strainer serves the primary and secondary roof drain, a blockage of the strainer will block both the primary and secondary roof drain. This section is needed to clarify that two strainers are required for combined primary and secondary drains, one on the primary inlet and one on the secondary inlet.
1106.4 Engineered Roof Drainage Sizing. The flow rate through the roof drain shall be determined by testing to ASPE/IAPMO Z1034.

1106.4.1 System Design. The roof drainage system shall be sized as a system in accordance with Section 1106.4.2 or Section 1106.4.3. The piping sizing shall be designed to accommodate the rainfall rates specified in Table D101.1.

1106.4.2 Roof Drainage Table Method. The rainwater drainage flow rate from the roof surface shall be determined based on the rainfall rate of a 60 minute storm with a 100 year return period and the area of the roof being drained in accordance with Table 1106.4.2.

1106.4.2.1 Roof Drain. The discharge flow rate for the roof drain shall be the manufacturer’s published discharge flow rate based for a head height of 2 inches to 4 inches (51 mm to 102 mm) at the strainer. Roof drainage piping shall be sized in accordance with Table 1106.4.4 through Table 1106.4.6.

1106.4.2.2 Secondary Roof Drainage. The opening for the secondary roof drainage shall be not less than 2 inches (51 mm) and not more than 4 inches (102 mm) above the bottom opening of the primary roof drain. The secondary roof drainage system shall comply with Section 1101.12.2.

1106.4.3 Engineered Roof Drain Flow Rate. The flow rate used for sizing the roof drainage piping shall be based on the maximum anticipated ponding at the roof drain based on a rainfall rate of a 60 minute storm with a 100 year return period and a 5 minute storm with a 10 year return period. The roof drain shall be sized for the anticipated flow rate. The roof drainage piping shall be sized in accordance with Section 1106.4.4 through Section 1106.4.6 for the anticipated flow rate.

1106.4.3.1 Secondary Roof Drain. The discharge through the secondary roof drain shall not be considered where establishing the maximum height of ponding at the primary roof drain. The opening for the secondary roof drainage shall be not less than 2 inches (51 mm) above the bottom opening of the primary roof drain. The secondary roof drainage system shall comply with Section 1101.12.2.

### TABLE 1106.4.2

<table>
<thead>
<tr>
<th>Roof Drainage Area (square feet)</th>
<th>Drainage Flow Rate (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 (in/hr)</td>
</tr>
<tr>
<td>500</td>
<td>5</td>
</tr>
<tr>
<td>1000</td>
<td>10</td>
</tr>
<tr>
<td>1500</td>
<td>16</td>
</tr>
<tr>
<td>2000</td>
<td>21</td>
</tr>
<tr>
<td>2500</td>
<td>26</td>
</tr>
<tr>
<td>3000</td>
<td>31</td>
</tr>
<tr>
<td>3500</td>
<td>36</td>
</tr>
<tr>
<td>4000</td>
<td>42</td>
</tr>
</tbody>
</table>
**1106.4.4 Sizing Roof Drainage Piping.** Vertical and horizontal roof drainage piping shall be sized to receive the discharge from the roof drain(s) and in accordance with Table 1106.4.4.

**TABLE 1106.4.4 ROOF DRAINAGE PIPE SIZING**

<table>
<thead>
<tr>
<th>Pipe Size (inches)</th>
<th>Maximum Permitted Flow Rate (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vertical Drain</td>
</tr>
<tr>
<td></td>
<td>1/16 (in/ft)</td>
</tr>
<tr>
<td>2</td>
<td>34</td>
</tr>
<tr>
<td>3</td>
<td>87</td>
</tr>
<tr>
<td>4</td>
<td>180</td>
</tr>
<tr>
<td>5</td>
<td>311</td>
</tr>
<tr>
<td>6</td>
<td>538</td>
</tr>
<tr>
<td>8</td>
<td>1117</td>
</tr>
<tr>
<td>10</td>
<td>2050</td>
</tr>
<tr>
<td>12</td>
<td>3272</td>
</tr>
<tr>
<td>15</td>
<td>5543</td>
</tr>
</tbody>
</table>

For SI units: 1 inch = 25.4 mm, 1 inch per foot = 83.3 mm/m, 1 gallon per minute = 0.06 L/s, 1 gallon = 3.785 L

**1106.4.5 Sizing Conductors and Leaders.** Conductors and leaders shall be in accordance with Table 1106.4.5.

**TABLE 1106.4.5 CONDUCTOR AND LEADER SIZING**

<table>
<thead>
<tr>
<th>Size of Conductor or Leader (inches)</th>
<th>Maximum Permitted Flow Rate (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>2 x 2</td>
<td>30</td>
</tr>
<tr>
<td>1½ x 2½</td>
<td>30</td>
</tr>
<tr>
<td>2¼</td>
<td>54</td>
</tr>
</tbody>
</table>
### Table 1106.4.6

<table>
<thead>
<tr>
<th>Size of Conductor or Leader (inches)</th>
<th>Maximum Permitted Flow Rate (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 ½ × 2 ½</td>
<td>54</td>
</tr>
<tr>
<td>3</td>
<td>92</td>
</tr>
<tr>
<td>4</td>
<td>92</td>
</tr>
<tr>
<td>2 ½ × 3</td>
<td>92</td>
</tr>
<tr>
<td>4</td>
<td>192</td>
</tr>
<tr>
<td>3 × 4 ¼</td>
<td>192</td>
</tr>
<tr>
<td>3 ½ × 4</td>
<td>192</td>
</tr>
<tr>
<td>5</td>
<td>360</td>
</tr>
<tr>
<td>4 × 5</td>
<td>360</td>
</tr>
<tr>
<td>4 ½ × 4 ½</td>
<td>360</td>
</tr>
<tr>
<td>6</td>
<td>563</td>
</tr>
<tr>
<td>5 × 6</td>
<td>563</td>
</tr>
<tr>
<td>5 ½ × 5 ½</td>
<td>563</td>
</tr>
<tr>
<td>8</td>
<td>1208</td>
</tr>
<tr>
<td>6 × 8</td>
<td>1208</td>
</tr>
</tbody>
</table>

For SI units: 1 inch = 25.4 mm, 1 gallon per minute = 0.06 L/s, 1 gallon = 3.785 L

1106.4.6 Sizing Gutters. Gutters shall be sized based on the flow rate from the roof surface and in accordance with Table 1106.4.6.

### Table 1106.4.6

<table>
<thead>
<tr>
<th>Diameter of Gutter (inches)</th>
<th>Slope (in/ft)</th>
<th>Capacity (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ½ × 2 ½</td>
<td>1/4</td>
<td>26</td>
</tr>
<tr>
<td>1 ½ × 3 ½</td>
<td>1/2</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>1/8</td>
<td>39</td>
</tr>
<tr>
<td>2 ¼ × 3</td>
<td>1/4</td>
<td>55</td>
</tr>
<tr>
<td>2 ½ × 3</td>
<td>1/2</td>
<td>87</td>
</tr>
<tr>
<td>5</td>
<td>1/8</td>
<td>74</td>
</tr>
<tr>
<td>4 × 2 ½</td>
<td>1/4</td>
<td>106</td>
</tr>
<tr>
<td>3 × 3 ½</td>
<td>1/2</td>
<td>156</td>
</tr>
<tr>
<td>6</td>
<td>1/8</td>
<td>110</td>
</tr>
<tr>
<td>3 × 5</td>
<td>1/4</td>
<td>157</td>
</tr>
<tr>
<td>3 × 5</td>
<td>1/2</td>
<td>225</td>
</tr>
<tr>
<td>8</td>
<td>1/16</td>
<td>172</td>
</tr>
<tr>
<td>6</td>
<td>1/8</td>
<td>247</td>
</tr>
<tr>
<td>4 ½ × 6</td>
<td>1/4</td>
<td>348</td>
</tr>
<tr>
<td>4 ½ × 6</td>
<td>1/2</td>
<td>404</td>
</tr>
<tr>
<td>10</td>
<td>1/16</td>
<td>331</td>
</tr>
<tr>
<td>10</td>
<td>1/8</td>
<td>472</td>
</tr>
<tr>
<td>5 × 8</td>
<td>1/4</td>
<td>651</td>
</tr>
<tr>
<td>4 × 10</td>
<td>1/2</td>
<td>1055</td>
</tr>
</tbody>
</table>

For SI units: 1 inch = 25.4 mm, 1 inch per foot = 83.3 mm/m, 1 gallon per minute = 0.06 L/s, 1 gallon = 3.785 L
<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASPE/IAPMO Z1034-2015</td>
<td>Test Method for Evaluating Roof Drain Performance</td>
<td>Testing</td>
<td>1106.4</td>
</tr>
</tbody>
</table>

Note: ASPE/IAPMO Z1034 meets the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
This sizing method is being added to the engineered sizing section. This sizing method is being used by the plumbing engineers since the publication of the paper by the ASPE Research Foundation. ASPE Research Foundation and IAPMO cosponsored research on the performance of roof drains in storm drainage system. The code change is consistent with the recommendations in the ASPE RF report. The research report states the problem and the justification for this change. The research report can be downloaded at no cost at www.aspe.org. The only difference between this change and the recommendation in the ASPE RF report is the first methodology for sizing a storm drainage system in proposed Section 1106.4.1. These requirements were developed by the Storm Drainage Task Group. While the Task Group did not vote to bring these forward, it was thought that in the best interest of code development, the proposed text would be included. This first method is a cook book method for designing a storm drainage system.
Item #: 149

UPC 2021 Section: 1202.3

SUBMITTER: David Dias
Sheet Metal Workers Local 104

RECOMMENDATION:
Revise text

1202.0 Coverage of Piping System.

1202.3 Applications. This code shall not apply to the following items (reference standards for some of which appear in Chapter 17):

(remaining text unchanged)

SUBSTANTIATION:
In the 2018 edition of the UPC, Table 1701.1 has been split into two separate tables. Therefore, the existing reference to those tables must be revised to provide the proper standard for applications. Section 1202.3 must be revised by removing the reverence to Chapter 17 as the end user will not know the proper standard for such applications. Furthermore, it is informational language and not enforceable.
1210.0 Gas Piping Installation.

1210.1.3.2 Underground Piping. Underground piping shall comply with one or more of the following unless approved technical justification is provided to demonstrate that protection is unnecessary:

1. The piping shall be made of a corrosion-resistant material that is suitable for the environment in which it will be installed.
2. Pipe shall have a factory-applied, electrically insulating coating. Fittings and joints between sections of coated pipe shall be coated in accordance with the coating manufacturer’s instructions.
3. The piping shall have a cathodic protection system installed, and the system shall be maintained in accordance with Section 1210.1.3.3 or Section 1210.1.3.6. [NFPA 54:7.1.3.2]
4. The piping shall be installed within an encasement system listed for underground use or a non-metallic, watertight conduit.

SUBSTANTIATION:
The IAPMO published an interim guide criteria for polyethylene sleeved CSST (IGC-201) in 2004 which was renewed in 2014. The IGC-201 is currently (2018) being converted to a full IAPMO Standard. The use of listed encasement systems (such as polyethylene sleeved CSST) has been included in the National Fuel Gas Code (NFPA 54) Section 7.1.6 since the 2012 edition, and was first included in the 2015 edition of the Uniform Plumbing Code. This type of product has been used underground without failure or damage for approximately 15 years. Use of pre-assembled encasement systems streamlines the installation of gas piping underground, and can be installed underground without joints where required. This will protect the underground piping from corrosion, and improve safety (no joints/potential leak sites) when installing such systems. The use of buried conduit is already permitted by Section 1210.1.6 piping underground beneath buildings, but needs to be added here as well for consistency.
SUBMITTER: Robert Torbin  
Omega Flex Inc.

RECOMMENDATION:  
Revise text

1210.0 Gas Piping Installation.  

1210.1.6 Piping Underground Beneath Buildings. Where gas piping is installed underground beneath buildings, the piping shall be either of the following:

(1) Encased in an approved conduit designed to withstand the imposed loads and installed in accordance with Section 1210.1.6.1 or Section 1210.1.6.2.  
(2) A piping or encasement system listed for installation beneath buildings. [NFPA 54:7.1.6]  
(3) Polyethylene sleeved-corrugated stainless steel tubing in accordance with IAPMO IGC 201.

### TABLE 1701.1

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO IGC 201-2018</td>
<td>Polyethylene Sleeved-Corrugated Stainless Steel Tubing for Use in Fuel Gas Piping Systems</td>
<td>Fuel Gas Piping</td>
<td>1210.1.6</td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

Note: IAPMO IGC 201 meets the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
PE sleeved CSST have been tested and installed for over 10 years and continue to be installed today. IGC 201 covers Polyethylene Sleeved-Corrugated Stainless Steel tubing (PE-CSST) for use in fuel gas piping systems in underground and underground beneath building applications. Reference to the proper standard for this product will ensure public health and safety by clearly identifying products that are approved for this application assisting to the installers, inspectors and other end users of the code.
**SUBMITTER:** Mark Fasel  
Viega LLC

**RECOMMENDATION:**
Revise text

**1210.3 Concealed Piping in Buildings.** (remaining text unchanged)

**1210.3.1 Connections.** Where gas piping is to be concealed, connections shall be of the following type:

1. Pipe fittings such as elbows, tees, couplings, and right/left nipple/couplings.
2. Joining tubing by brazing (see Section 1208.6.11.2).
3. Fittings listed for use in concealed spaces or that have been demonstrated to sustain, without leakage, forces due to temperature expansion or contraction, vibration, or fatigue based on their geographic location, application, or operation, to ANSI LC 1/CSA 6.26, or ANSI LC 4/CSA 6.32.
4. Where necessary to insert fittings in the gas pipe that has been installed in a concealed location, the pipe shall be reconnected by welding, flanges, or the use of a right/left nipple/coupling.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSA LC 1-2016</td>
<td>Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (same as CSA 6.26)</td>
<td>Fuel Gas</td>
<td>1208.6.4.4, 1210.3.1</td>
</tr>
<tr>
<td>CSA LC 4a-2013</td>
<td>Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems (same as CSA 6.32a)</td>
<td>Fuel Gas</td>
<td>1208.6.11.1, 1208.6.11.2, 1210.3.1</td>
</tr>
</tbody>
</table>

(pertions of table not shown remain unchanged)

**Note:** ANSI LC 1/CSA 6.26 and ANSI LC 4/CSA 6.32 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

**SUBSTANTIATION:**
The current language has caused confusion of the fittings that are listed and approved for installation in concealed locations. The only fittings that are listed are included along with the standards they should be listed to. This language comes directly from NFPA 54 and provides a much clearer understanding for the building official what types of fitting shall be listed and to what standards they shall be listed to. The proposed language will remove confusion in the industry.
Item #: 153
UPC 2021   Section: 1212.6

SUBMITTER: David Dias
Sheet Metal Workers Local 104

RECOMMENDATION:
Revise text

1212.0 Appliance and Equipment Connections to Building Piping.

1212.6 Appliance Shutoff Valves and Connections. Each appliance connected to a piping system shall have an accessible, approved manual shutoff valve with a nondisplaceable valve member or a listed gas convenience outlet. Appliance shutoff valves and convenience outlets shall serve a single appliance only. The shutoff valve shall be located within 6 feet (1829 mm) of the appliance it serves. Where a connector is used, the valve shall be installed upstream of the connector. A union or flanged connection shall be provided downstream from the valve to permit removal of appliance controls. Shutoff valves serving decorative appliances shall be permitted to be installed in fireplaces if listed for such use. [NFPA 54:9.6.5, 9.6.5.1(A)(B)]

Exceptions:
(1) Shutoff valves serving decorative appliances in a fireplace shall not be permitted to be accessibly located inside or under an appliance within the fireplace firebox except where such appliance is removed without removal of the shutoff valve is listed for such use.
(2) Shutoff valves shall be permitted to be accessibly located inside wall heaters and wall furnaces listed for recessed installation where necessary maintenance is performed without removal of the shutoff valve.

SUBSTANTIATION:
The appliance shutoff valve requirements are being revised to clarify that the exception applies to shutoff valves installed within the fireplace firebox unless listed for such use. Furthermore, this will be consistent with current industry standards.
Item #: 154
UPC 2021 Section: 1212.6

SUBMITTER: Paul Cabot
American Gas Association

RECOMMENDATION:
Revise text

1212.0 Appliance and Equipment Connections to Building Piping.

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Exceptions:
(1) Shutoff valves shall be permitted to be accessibly located inside or under an appliance where such appliance is removed without removal of the shutoff valve.
(2) Shutoff valves shall be permitted to be accessibly located inside wall heaters and wall furnaces listed for recessed installation where necessary maintenance is performed without removal of the shutoff valve.
(3) Where installed at a manifold, the appliance shutoff valve shall be located within 50 feet (15240 mm) of the appliance served and shall be readily accessible and permanently identified. The piping from the manifold to within 6 feet (1829 mm) of the appliance shall be designed, sized, installed, and tested in accordance with this Chapter. [NFPA 54:9.6.5.3]

SUBSTANTIATION:
The UPC does not contain the option that allows shutoff valves to be located at a manifold up to 50 ft away from the appliance it serves. The proposed text is taken from the 2018 National Fuel Gas Code. This option is a long standing option in the NFGC and does not prohibit the installation of a shutoff valve near the appliance if the installer wishes to do so for convenience of testing or service.
SUBMITTER: Paul Cabot  
American Gas Association

RECOMMENDATION:
Revise text

1213.0 Pressure Testing, Inspection, and Purging.

1213.3 Test Pressure. The necessary apparatus for conducting pressure tests shall be furnished by the permit holder. Test gauges used in conducting pressure tests shall be in accordance with Section 318.0. This inspection shall include an air, CO$_2$, or nitrogen pressure test in the presence of the Authority Having Jurisdiction, at which time the gas piping shall stand a pressure of in accordance with Section 1213.3.1 or Section 1213.3.2.

1213.3.1 Pressure Limits. The test pressure to be used shall be no less than 1½ times the proposed maximum working pressure, but not less than 3 psi (20 kPa), irrespective of design pressure. Where the test pressure exceeds 125 psi (862 kPa), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe. [NFPA 54: 8.1.4.2]

1213.3.2 Elevated Pressure Test. Where the Authority Having Jurisdiction requires an elevated pressure test, the pressure shall not less than 10 psi (69 kPa) gauge pressure. Test pressures shall be held for a length of time satisfactory to the Authority Having Jurisdiction but in no case less than 15 minutes with no perceptible drop in pressure. For welded piping, and for piping carrying gas at pressures in excess of 14 inches water column pressure (3.5 kPa), the test pressure shall be not less than 60 psi (414 kPa) and shall be continued for a length of time satisfactory to the Authority Having Jurisdiction, but in no case for less than 30 minutes. For CSST carrying gas pressures in excess of 14 inches water column (3.5 kPa) pressure, the test pressure shall be not less than 30 psi (207 kPa) for 30 minutes. These tests shall be made using air, CO$_2$, or nitrogen pressure and shall be made in the presence of the Authority Having Jurisdiction. Necessary apparatus for conducting tests shall be furnished by the permit holder. Test gauges used in conducting tests shall be in accordance with Section 318.0.

SUBSTANTIATION:  
The proposal would permit the use of the pressure test criteria contain in the 2018 National Fuel Gas Code while continuing to allow the current UPC pressure test criteria when it is determined by the AHJ that an elevated pressure test is need for a particular piping installation. The NFGC test criteria has been successfully used for over 40 years and is widely used in the U.S.
Figure 1215.1.1

Example Illustrating Use of Table 1208.4.1 and Table 1215.2(1)

Problem: Determine the required pipe size of each section and outlet of the piping system shown in Figure 1215.1.1. Gas to be used has a specific gravity of 0.60 and 1100 British thermal units (Btu) per cubic foot (0.0114 kW•h/L), delivered at 8 inch water column (1.9 kPa) pressure.

(portion of figure not shown remains unchanged)

Solution:

(1) through (3) (remaining text unchanged)

(4) Using the column marked 60 feet (18 288 mm) in Table 1215.2(1) [no column for actual length of 55 feet (16 764 mm)]:

Outlet B supplying 3 cubic feet per hour (0.08 m^3/h), requires \( \frac{1}{2} \) of an inch (15 mm) pipe.
Outlet C, supplying 59 cubic feet per hour (1.67 m^3/h), requires \( \frac{1}{2} \) of an inch (15 mm) pipe.

(5) (remaining text unchanged)

SUBSTANTIATION:
Section 1215.1.1 (Longest Length Method) makes reference the example above for the "longest length method." The proposed modification will remove language that makes a comment for the "branch length method." This proposed change will remove confusion when referencing, and illustrating a sample for the "longest length method."
SUBMITTER: IAPMO Staff - Update Extracts  
NFPA 54 Extract Update  

RECOMMENDATION: \(\text{Revise text}\)

1202.3 Coverage of Piping System.  

1202.3.1 Applications. This code shall not apply to the following items:  

1. Portable LP-Gas appliances and equipment of all types that are not connected to a fixed fuel piping system.  
2. Installation of appliances such as brooders, dehydrators, dryers, and irrigation equipment used for agricultural purposes.  
3. Industrial gas applications using such gases as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen, and nitrogen.  
4. Petroleum refineries, pipeline compressor or pumping stations, loading terminals, compounding plants, refinery tank farms, and natural gas processing plants.  
5. Large integrated chemical plants or portions of such plants where flammable or combustible liquids or gases are produced by chemical reactions or used in chemical reactions.  
6. LP-Gas installations at utility gas plants.  
7. Liquefied natural gas (LNG) installations.  
8. Fuel gas piping in electric utility power plants.  
9. Proprietary items of equipment, apparatus, or instruments such as gas-generating sets, compressors, and calorimeters.  
10. LP-Gas equipment for vaporization, gas mixing, and gas manufacturing.  
11. LP-Gas piping for buildings under construction or renovations that is not to become part of the permanent building piping system—that is, temporary fixed piping for building heat.  
12. Installation of LP-Gas systems for railroad switch heating.  
13. Gas piping, meters, gas-pressure regulators, and other appurtenances used by the serving gas supplier in distribution of gas, other than undiluted LP-Gas.  
14. Building design and construction, except as specified herein.  
15. Fuel gas systems on recreational vehicles manufactured in accordance with NFPA 1192.  
17. Construction of appliances. [NFPA 54:1.1.1.2]  
18. Sizing Methods. Gas piping shall be sized in accordance with one of the following:  

1. Pipe sizing tables or sizing equations in this chapter.  
2. Other approved engineering methods acceptable to the Authority Having Jurisdiction.  
3. Sizing tables included in a listed piping system manufacturer’s installation instructions. [NFPA 54:5.4.3]  

1208.5 Maximum Design Operating Pressure In Buildings. The maximum design operating pressure for any piping systems located inside buildings shall not exceed 5 psi (34 kPa) unless one or more of the following conditions are met:  

1. The piping system is joints are welded or brazed.  
2. The piping joints are flanged and all pipe-to-flange connections are made by welding or brazing.  
3. The piping is located in a ventilated chase or otherwise enclosed for protection against accidental gas accumulation.  
4. The piping is located inside buildings or separate areas of buildings used exclusively for one of the following:  
   a. Industrial processing or heating  
   b. Research  
   c. Warehousing  
   d. Boiler or mechanical rooms  
5. The piping is a temporary installation for buildings under construction.  
6. The piping serves appliances or equipment used for agricultural purposes.  
7. The piping system is an LP-Gas piping system with an operating pressure greater than 20 psi (138 kPa) and complies with NFPA 58. [NFPA 54:5.5.1.4]  

1208.6.1 Used Materials. Pipe, fittings, valves, or other materials shall not be used again unless they are free of foreign materials and have been ascertained to be approved adequate for the service intended. [NFPA 54:5.6.1.2]
1208.6.3 Steel, Stainless Steel, and Wrought-Iron Pipe. Steel, stainless steel, and wrought-iron pipe shall be at least of standard weight (Schedule 40) and shall comply with the dimensional standards of ASME B36.10M and one of the following standards:

(1) ASME B36.10M ASTM A53
(2) ASTM A53M ASTM A106
(3) ASTM A106M ASTM A312 [NFPA 54:5.6.2.2]

1208.6.4 Metallic Tubing. Seamless copper, aluminum alloy, or steel tubing shall not be used with gases corrosive to such tubing material. [NFPA 54:5.6.3.1]

1208.6.4.1 Stainless Steel. Stainless steel tubing shall comply with one of the following:

(1) ASTM A268
(2) ASTM A269 [NFPA 54:5.6.3.3]

(renumber remaining sections)

1208.6.5 Plastic Pipe, Tubing, and Fittings. Polyethylene plastic pipe, tubing, and fittings used to supply fuel gas shall conform to ASTM D2513. Pipe to be used shall be marked “gas” and “ASTM D2513.” [NFPA 54:5.6.4.1.1] Polyamide, pipe, tubing, and fittings shall be identified in and conform to ASTM F2945. Pipe to be used shall be marked “gas” and “ASTM F2945.” [NFPA 54:5.6.4.1.2] Polyvinyl chloride (PVC) and chlorinated polyvinyl chloride (CPVC) plastic pipe, tubing, and fittings shall not be used to supply fuel gas. [NFPA 54:5.6.4.1.3]

1208.6.11 Tubing. Tubing Schedule 40 and heavier pipe joints shall be made threaded, flanged, brazed, welded, or assembled with approved gas tubing press-connect fittings, listed to ANSI LC 4/CSA 6.32. [NFPA 54:5.6.4.1.1]

(1) Pipe lighter than Schedule 40 shall be brazed with a material having a melting point in excess of 1000°F (538°C), or made by press-connect fittings that comply with CSA LC-4.

(2) Pipe lighter than Schedule 40 shall be brazed with a material having a melting point in excess of 1000°F (538°C), or shall be assembled with approved tubing fittings, flanges, brazing, or welding.

(3) Where nonferrous pipe is brazed, the brazing materials shall have a melting point in excess of 1000°F (538°C), or made by press-connect fittings that comply with CSA LC-4.

(4) Brazing alloys shall not contain more than 0.05 percent phosphorus. [NFPA 54:5.6.7.1]

1208.6.11.3 Copper Tubing Joints. Copper tubing joints shall be assembled with approved gas tubing fittings, shall be brazed with a material having a melting point in excess of 1000°F (538°C), or shall be assembled with press-connect fittings listed to ANSI LC 4/CSA 6.32. Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems. Brazing alloys shall not contain more than 0.05 percent phosphorus. [NFPA 54:5.6.7.2]

1208.6.11.4 Stainless Steel Tubing Joints. Stainless steel joints shall be welded, assembled with approved tubing fittings, brazed with a material having a melting point in excess of 1000°F (538°C), or assembled with press-connect fittings listed to ANSI LC 4/CSA 6.32, Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems. Brazing alloys and fluxes shall be recommended by the manufacturer for use on stainless steel alloys. [NFPA 54:5.6.7.3]

(renumber remaining sections)

1208.6.11.3 Flared Joints. Flared joints shall be used only in systems constructed from nonferrous pipe and tubing where experience or tests have demonstrated that the joint is approved suitable for the conditions and where provisions are made in the design to prevent separation of the joints. [NFPA 54:5.6.8.7.4]

1208.8 Gas Pressure Regulators. A line pressure regulator or gas appliance pressure regulator, as applicable, shall be installed where the gas supply pressure exceeds that at the line pressure regulator or gas appliance pressure regulator, as applicable, and where the branch supply line or appliances are designed to operate at varying beyond design pressure limits the maximum allowable inlet pressure of the appliance served. [NFPA 54:5.8.1]

1208.8.1 Listing. Line pressure regulators shall be listed in accordance with CSA Z21.80 where the outlet pressure is set to 2 psi (14 kPa) or less. [NFPA 54:5.8.2]

1208.10 Overpressure Protection Devices. Overpressure protection devices shall be one of the following:

(1) Pressure relief valve.
(2) Monitor regulator.
(3) Series regulator installed upstream from the line pressure regulator to the maximum values specified by Section 1208.9 or less.
(4) Automatic shutoff device installed in series with the line pressure regulator and set to shut off when the pressure on the downstream piping system reaches the maximum values specified by Section 1208.9 or less. This device shall be designed so that it will remain closed until manually reset. [NFPA 54:5.9.3.1]

1208.10.1 Separate Devices. The devices in Section 1208.10 shall be installed either as an integral part of the service or line pressure regulator or as separate units. Where separate overpressure protection devices are installed, they shall comply with Section 1208.10.2 through Section 1208.10.7. [NFPA 54:5.9.3.2]

1208.10.2 Construction and Installation. All overpressure protection devices shall meet the following requirements:

(1) Be constructed of materials so that the operation of the device is not impaired by corrosion of external parts by the atmosphere or of internal parts by the gas.
(2) Be designed and installed so that they can be operated to determine whether the valve is free. The devices shall also be designed and installed so that they can be tested to determine the pressure at which they operate and be examined for leakage when in the closed position. [NFPA 54:5.9.4]

1208.10.3 External Control Piping. External control piping shall be designed and installed so that damage to the control piping of one device does not render both the regulator and the overpressure protective device inoperative. [NFPA 54:5.9.5]

1208.10.4 Setting. Each pressure limiting or pressure relieving device shall be set so that the gas pressure supplied to the connected appliance(s) does not exceed the limits specified in Section 1208.9 and Section 1208.9.1. [NFPA 54:5.9.6]

1208.10.6 Discharge of Vents. Discharge of vents shall be connected so that it can be locked in the open position before leaving the premises.

1208.10.7 Unauthorized Operation. Where unauthorized operation of any shutoff valve could render a pressure relieving valve or pressure limiting device inoperative, one of the following shall be accomplished:

(1) The valve shall be locked in the open position. Instruct authorized personnel in the importance of leaving the shutoff valve open and of being present while the shutoff valve is closed so that it can be locked in the open position before leaving the premises.
(2) Duplicate relief valves shall be installed, each having adequate capacity to protect the system, and arrange the isolating valves or three-way valve so that only one relief valve can be rendered inoperative at a time. [NFPA 54:5.9.7]
1208.6.6 Discharge of Vents. The discharge of vents shall be in accordance with the following requirements:

1. The discharge stacks, vents, or outlet parts of all pressure-relieving and pressure-limiting devices shall be located so that gas is safely discharged to the outdoors.

2. Discharge stacks or vents shall be designed to prevent the entry of water, insects, or other foreign material that could cause a blockage.

1210.0 Gas Piping Installation.

1210.1 Piping Underground. Underground gas piping shall be installed with sufficient clearance from any other underground structure to avoid contact therewith, to allow maintenance, and to protect against damage from proximity to other structures. In addition, underground plastic piping shall be installed with sufficient clearance or shall be insulated from any sources of heat so as to prevent the heat from impairing the serviceability of the pipe. [NFPA 54:7.1.1]

1210.2 CSST Piping Systems. CSST piping systems shall be installed in accordance with this code and the manufacturer's installation instructions. [NFPA 54:7.1.8]

1210.3 Installation of Piping. (remained text unchanged)

1210.4 Hangers, Supports, and Anchors. Piping shall be supported with metal pipe hooks, metal pipe straps, metal bands, metal brackets, metal hangers, or building structural components, approved suitable for the size of piping of adequate strength and quality, and located at intervals to prevent or damp out excessive vibration. Piping shall be anchored to prevent undue strains on connected appliances and equipment and shall not be supported by other piping. Pipe hangers and supports shall conform to the requirements of MSS SP-58. [NFPA 54:7.2.5

1210.5 Metallic Pipe. Metallic pipe bends shall comply with the following:

1. Bends shall be made only with bending equipment and procedures intended for that purpose.

2. All bends shall be smooth and free from buckling, cracks, or other evidence of mechanical damage.

3. The longitudinal weld of the pipe shall be near the neutral axis of the bend.

4. The pipe shall not be bent through an arc of more than 90 degrees (1.57 rad).

5. The inside radius of a bend shall be not less than 6 times the outside diameter of the pipe. [NFPA 54:7.5.1]

1210.6 Drips and Sediment Traps. For other than dry gas conditions, a drip shall be provided at any point in the line of pipe where condensate could collect. Where required by the Authority Having Jurisdiction or the serving gas supplier, a drip shall also be provided at the outlet of the meter. This drip shall be installed so as to constitute a trap wherein an accumulation of condensate shuts off the flow of gas before it runs back into the meter. [NFPA 54:7.6.1]

1210.8.6.8 Protective Coating. Where in contact with material or atmosphere creating a corrosive action, metallic piping and fittings coated with a corrosion-resistant material shall be used. External or internal coatings at design used on piping or components shall not be considered as adding strength. [NFPA 54:7.2.4]

1210.9.1 Valves Controlling Multiple Systems. Main gas shutoff valves controlling several gas piping systems shall be readily accessible for operation and installed so as to be protected from physical damage. They shall be marked with a metal tag or other permanent means attached by the installing agency so that the gas piping systems supplied through them can be readily identified. [NFPA 54:7.2.1.2]

1210.10 Prohibited Devices. No device shall be placed inside the interior of gas piping or fittings where such devices reduce the cross-sectional area or otherwise obstruct the free flow of gas, except where allowance in the piping system design has been made for such a device and where approved by the Authority Having Jurisdiction. [NFPA 54:7.4.9]

1211.0 Electrical Bonding and Grounding.

1211.1 Pipe and Tubing other than CSST. Each aboveground portion of a gas piping system other than CSST that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path. Gas piping, other than CSST, shall be considered to be bonded when it is connected to appliances that are connected to the appliance grounding conductor of the circuit supplying the appliance. [NFPA 54:7.12.1]

1211.2 Bonding of CSST Gas Piping. CSST gas piping systems, and gas piping systems containing one or more segments of CSST, shall be electrically continuous and bonded to the electrical service grounding electrode system or, where provided, lightning protection grounding electrode system. [NFPA 54:7.12.2.1]

1211.2.2 Bonding Jumper Length. The length of the jumper between the connection to the gas piping system and the grounding electrode system shall not exceed 75 feet (22.875 mm). Any additional grounding electrodes installed to meet this requirement shall be bonded to the electrical service grounding electrode system or, where provided, lightning protection grounding electrode system. [NFPA 54:7.12.2.3]

1211.3 Arc-Resistant Jacketed CSST. CSST listed with an arc resistant jacket or coating system in accordance with CSA LC 1 shall be electrically continuous and bonded to an effective ground-fault current path. Where any CSST component of a piping system does not have an arc-resistant jacket or coating system, the bonding requirements of Section 1211.2 shall apply. Arc-resistant jacketed CSST shall be considered to be bonded when it is connected to appliances that are connected to the appliance grounding conductor of the circuit supplying the appliance. [NFPA 54:7.12.1]
1211.6.1 Safety Control. Any essential safety control depending on electric current as the operating medium shall be of a type that will shut off (fail safe) the flow of gas in the event of current failure. [NFPA 54:7.164.2]

1212.0 Appliance and Equipment Connections to Building Piping.
1212.1 Connecting Appliances and Equipment. Appliances and equipment shall be connected to the building piping in compliance with Section 1212.5 through Section 1212.8 by one of the following:

(1) - (4) (remaining text unchanged)

(5) CSST where installed in accordance with the manufacturer’s installation instructions. CSST shall connect only to appliances that are fixed in place.

(6) Listed nonmetallic gas hose connectors in accordance with Section 1212.3.

(7) Unlisted gas hose connectors for use in laboratories and educational facilities in accordance with Section 1212.4. [NFPA 54:9.6.1]

1212.9 Sediment Trap. Where a sediment trap is not incorporated as a part of the appliance, a sediment trap shall be installed downstream of the appliance shutoff valve as close to the inlet of the appliance as practical, before the flex connector, where used at the time of appliance installation. The sediment trap shall be either a tee fitting with a capped nipple in the bottom outlet, as illustrated in Figure 1212.9, or another device recognized as an effective sediment trap. Illuminating appliances, gas ranges, clothes dryers, decorative appliances for installation in vented fireplaces, gas fireplaces, and outdoor cooking appliances shall not be required to be so equipped. [NFPA 54:9.6.8]

1213.0 Pressure Testing, Inspection, and Purging.
1213.1.3 New Branches. Where new branches are installed to new appliance(s), only the newly installed branch(es) shall be required to be pressure tested. Connections between the new piping and the existing piping shall be tested with a noncorrosive leak-detecting fluid or approved leak-detecting methods. [NFPA 54:8.1.1.4]

1213.1.6 Test Medium. The test medium shall be air, nitrogen, carbon dioxide, or an inert gas. OXYGEN SHALL NEVER BE USED. Oxygen shall not be used as a test medium. [NFPA 54:8.1.2]

1213.5.3 Placing Appliances and Equipment in Operation. Appliances and equipment shall not be placed in operation until after the piping system has been checked for leakage and purged in accordance with Section 1213.6 and connections to the appliance are checked for leakage and purged in accordance with Section 1213.6. [NFPA 54:8.2.4]

1213.6.2.1 Purging Procedure. The piping system shall be purged in accordance with one or more of the following:

(1) The piping shall be purged with fuel gas and shall discharge to the outdoors.

(2) The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through an appliance burner not located in a combustion chamber. Such burner shall be provided with a continuous source of ignition.

(3) The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through a burner that has a continuous source of ignition, and that is designed for such purpose.

(4) The piping shall be purged with fuel gas that is discharged to the indoors or outdoors, and the point of discharge shall be monitored with a listed combustible gas detector in accordance with Section 1213.6.2.2. Purging shall be stopped when fuel gas is detected.

(5) The piping shall be purged by the gas supplier in accordance with written procedures. [NFPA 54:8.3.2.1]

1215.0 Required Gas Piping Size.

1215.2 Tables for Sizing Gas Piping Systems. Table 1215.2(1) through Table 1215.2(36) shall be used to size gas piping in conjunction with one of the methods described in Section 1215.1.1 through Section 1215.1.3. [NFPA 54:6.2]

1215.2.1 Natural Gas Piping Systems. Sizing of piping systems shall be in accordance with Section 1215.2.1 for natural gas piping system and Section 1215.2.2 for propane piping systems.

1215.2.2 Propane Piping Systems. Table 1215.2(1) through Table 1215.2(36) shall be used in conjunction with one of the methods described in Section 1215.1.1 through Section 1215.1.3 for piping materials other than non-corrugated stainless steel tubing. [NFPA 54:6.2.2]

Table 1215.2(15) CORRUGATED STAINLESS STEEL TUBING (CSST) [NFPA 54: TABLE 6.2.1(p)]

<table>
<thead>
<tr>
<th>TUBE SIZE (EHD)</th>
<th>GAS: NATURAL</th>
<th>INLET PRESSURE: LESS THAN 2 psi</th>
<th>PRESSURE DROP: 3.0 in. w.c.</th>
<th>SPECIFIC GRAVITY: 0.60</th>
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INTENDED USE: INITIAL SUPPLY PRESSURE OF 8.0 INCH WATER COLUMN OR GREATER

FLOW DESIGNATION: 13 15 18 19 23 25 30 31 37 46 48 60 62

LENGTH (feet) | CAPACITY IN CUBIC FEET OF GAS PER HOUR
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<td>300</td>
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**TABLE 1215.2(16)**
CORRUGATED STAINLESS STEEL TUBING (CSST) (NFPA 54: TABLE 6.2.7 TABLE 6.3.1(a))

<table>
<thead>
<tr>
<th>Gas: Natural</th>
<th>Inlet Pressure: LESS THAN 2 psi</th>
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<tr>
<td>Pressure Drop: 6.0 in. w.c.</td>
<td></td>
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<tr>
<td>Specific Gravity: 0.60</td>
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**Intended Uses: Initial Supply Pressure of 11.0 Inch Water Column or Greater**

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<tr>
<th>Tube Size (EHD)</th>
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<tbody>
<tr>
<td>Capacity in Cubic Feet of Gas per Hour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>21</td>
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<td>46</td>
<td>82</td>
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<td>319</td>
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</table>
| 300             | 13  | 19  | 37  | 42  | 75  | 87  | 144 | 168 |234  | 342 |559  |665  |1180 |1320

187
**TABLE 1701.1 REFERENCED STANDARDS**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTION</th>
</tr>
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<tbody>
<tr>
<td>ASME B36.10M-2015</td>
<td>Welded and Seamless Wrought Steel Pipe</td>
<td>Fuel Gas, Piping</td>
<td>1208.6.3.1(2)</td>
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<tr>
<td>ASTM A53/A53M-2012</td>
<td>ASTM A53/A53M-2012 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless</td>
<td>Piping</td>
<td>Table 604.1, Table 701.2, 1208.6.3.1(2)</td>
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<td>ASTM A106/A106M-2015</td>
<td>Seamless Carbon Steel Pipe for High-Temperature Service</td>
<td>Piping</td>
<td>1208.6.3.1(4)</td>
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<td>ASTM A268/A268M-2010(R2016)</td>
<td>Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service</td>
<td>-</td>
<td>1208.6.4.1</td>
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<td>ASTM A269/A269M-2015a</td>
<td>Seamless and Welded Austenitic Stainless Steel Tubing for General Service</td>
<td>Piping</td>
<td>1208.6.4.1, 1308.5(2)(a), Table 604.1</td>
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<td>ASTM A312/A312M-2016a</td>
<td>Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes</td>
<td>Piping</td>
<td>Table 604.1, 1208.6.3.1(3), 1308.5(2)(b)</td>
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<td>ASTM F2945-2015</td>
<td>Polyamide 11 Gas Pressure Pipe, Tubing, and Fittings</td>
<td>-</td>
<td>1208.6.5</td>
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<tr>
<td>CSA LC 1-2016</td>
<td>Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (same as CSA 6.26)</td>
<td>Fuel Gas</td>
<td>1208.6.4.4, 1211.3</td>
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<tr>
<td>CSA LC 4a-2013</td>
<td>Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems (same as CSA 6.32a)</td>
<td>Fuel Gas</td>
<td>1208.6.11.1, 1208.6.11.2, 1208.6.11.3, 1208.6.11.4</td>
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</table>

(portion of table not shown remains unchanged)

**Note:** The ASME, ASTM, and CSA standards meets the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

**SUBSTANTIATION:**
In accordance with IAPMO Governing Consensus Project, Section Chapter 12 is being revised to the latest edition of NFPA 54-2018.
Item #: 158
UPC 2021 Section: 1303.3

SUBMITTER: Tim Keane
Legionella Risk Management, Inc.
Rep: Self

RECOMMENDATION:
Add new text

1303.0 Health Care Facilities.
1303.3 Locations for Ice Storage. Ice makers or ice storage containers shall be located in nursing stations or similarly supervised areas to minimize potential contamination. The heat load from the ice machines shall not cause room temperature to rise above 77°F (25°C) or incoming cold water temperature, whichever is higher.

SUBSTANTIATION:
Frequently these small nutrition rooms housing a refrigerator and an ice machine do not take into account the heat rejection of this equipment in sizing the air flow for the room. This can result in higher temperatures in these rooms increasing the cold water supply temperature to the ice machine and increasing risk for Legionella growth.
SUBJECT: 1303.9 Temperature for Hand washing

RECOMMENDATION: Add new text

Statement of Problem and Substantiation/Resolution

Health and safety for hand washing needs to include 1) scald prevention, 2) hand washing efficacy and 3) minimizing the risk of pathogen growth in the building’s water distribution system. We do not want the temperature of the water at hand washing sinks to be too hot. We want the temperature of the water to be acceptable (not too cold) so that people will scrub their hands long enough to get them clean. We want to reduce the likelihood that pathogens will grow in the water distribution system. And, we would like to accomplish all of these health and safety functions in the most cost effective and sustainable manner possible. Legionella in building water systems has become a major concern for public health with the incidence of Legionnaires’ disease growing by 500% from 0.4 cases per 100,000 people in 2000 to 2.0 cases per 100,000 people in 2015.1 It used be thought that warm water was necessary for effective hand cleaning to control the spread of germs (bacteria). Science has since proven that the temperature of the water used for hand washing does not impact the efficacy of removing bacteria at all. 2,3,4 While each of these three papers are very clear the CDC sums it up best with “The temperature of the water does not appear to affect microbe removal; however, warmer water may cause more skin irritation and is more environmentally costly.”4 The most important variables for removing bacteria from one’s hands are scrubbing and the use of soap. Neither of these criteria is within the purview of a building code. Health care facilities have infection control professionals and protocols for hand washing that do not depend on the temperature of the water to be effective. Section 407.3 in the 2018 UPC establishes a maximum temperature of 120°F for the delivery of hot water from public-use lavatories. All other sinks do not have any limitation on the maximum temperature. No section in the UPC establishes a minimum temperature to deliver water for hand washing. The Facilities Guidelines Institute has published three documents for use by the health care industry that address the temperature for hand washing – 2018 Guidelines for Design and Construction of Hospitals and the 2018 Guidelines for Design and Construction of Outpatient Facilities and the 2018 Guidelines for Design and Construction of Residential Health, Care, and Support Facilities. These documents state that one way to limit the potential growth of Legionella in a heated potable water system is to distribute the water at a temperature lower than 80°F. We are proposing 77°F because it is a more conservative value. While the Uniform Plumbing Code does not prohibit the delivery of water at sinks and lavatories at relatively cool temperatures, this proposal makes it clear that it is permissible to do so. References: 1) US Centers for Disease Control (CDC) Atlanta, GA Chart titled, “Legionnaires’ Disease is on the Rise 2000-2015” National Notifiable Diseases Surveillance System https://www.cdc.gov/legionella/downloads/fs-legionella-clinicians.pdf 2) Quantifying the Effects of Water Temperature, Soap Volume, Lather Time, and Antimicrobial Soap as Variables in the Removal of Escherichia coli ATCC 11229 from Hands Journal of Food Protection June 2017 Dane A. Jensen,1 David R. Macinga,2 David J. Shumaker,2 Roberto Bellino,2 James W. Arbogast,2 and Donald W. Schaffner1 http://jfoodprotection.com/doi/full/10.4315/0362-028X.JFP-16-370/code=opr-site Above was in an article titled Cool Water as Effective as Hot for Removing Germs During Handwashing Infection Control Today May 30 2017 3) The environmental cost of misinformation: why the recommendation to use elevated temperatures for handwashing is problematic International Journal of Consumer Studies Volume 37, Issue 4 July 2013 Amanda R. Carrico, Micajah Spoden, Kenneth A. Wallston, Michael P. Vandenbergh http://onlineibrary.wiley.com/doi/10.1111/jics.12012/abstract 4) Show Me the Science - How to Wash Your Hands CDC Website https://www.cdc.gov/handwashing/show-me-the-science-handwashing.html
1303.9 Work Performed in Occupied Healthcare Facilities. In existing, occupied healthcare facilities, all plumbing systems installation, remodel, maintenance, or service work shall be performed by personnel certified in accordance with ASSE 12000.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 12000-2014</td>
<td>Professional Qualifications Standard for the Health and Safety of Construction and Maintenance Personnel</td>
<td>Miscellaneous</td>
<td>1303.9</td>
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</table>

(portion of table not shown remain unchanged)

Note: ASSE 12000 meets the requirements for a mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
Healthcare-associated infections (HAI) are the most common complications which occur during hospital care. According to a Center for Disease Control (CDC) study, approximately 1 in 25 hospitalized patients has at least one healthcare-associated infection. There are 99,000 deaths per year from HAIs which is the 4th leading cause of death in the U.S. According to the CDC, approximately 270 people die every day from HAIs. Many common HAIs can be prevented. Progress has been made in preventing specific HAIs through federally sponsored programs from the Agency for Healthcare Research and Quality (AHRQ), CDC, and the Centers for Medicare and Medicaid Services (CMS). The CDC has developed guidelines for the prevention of certain HAIs in healthcare facilities. In the full guidelines, Part I, Background Information: Environmental Infection Control in Health-Care Facilities, provides a comprehensive review of the relevant scientific literature. Attention is given to engineering and infection-control concerns during construction, demolition, renovation, and repair of health-care facilities. Use of an infection-control risk assessment is strongly supported before the start of these or any other activities expected to generate dust or water aerosols. Extra thought and care should be taken when working around individuals with weakened immune systems. One must consider the effects of moving a ceiling tile, cutting into a wall, disconnecting a pipe or even carrying your tools to the job site. To address the critical nature of pathogens and other infectious diseases that play dangerous roles throughout the construction industry, ASSE International has developed the voluntary consensus ASSE/IAPMO/ANSI Series 12000. It sets minimum criteria for the training and certification of craftspeople and maintenance personnel, on how to safely work in an environment with potentially deadly diseases. Certified individuals will be proficient in identifying and managing potential situations where there may be exposure to pathogens and infectious diseases. The ASSE Series 12000 is the only industry developed, ANSI approved standard and certification program. To become ASSE Series 12000 certified an individual must first possess an OSHA 10 or OSHA 30 certification, complete 12 hour minimum training in ASSE Standards 12010 (Biological Pathogens), 12030 (Waterborne Pathogens) and 12040 (Contamination/Infection Prevention) and pass written exams consisting of a minimum of 25 questions each on 12010, 12030 and 12040 with a minimum passing score of 80% for each exam. The certification is for three years.
Item #: 161
UPC 2021 Section: 1303.9

SUBMITTER: Tim Keane
Legionella Risk Management, Inc.
Rep: Self

RECOMMENDATION:
Add new text

1303.0 Health Care Facilities.
1303.9 Patient Bathrooms. Patient bathrooms shall be in accordance with the following:

(1) Fixture count for water demand calculations. In patient rest rooms the sink and shower shall be considered as one fixture for pipe size / water demand calculations.

(2) Sink and shower layout fixtures shall be located to minimize the number of branches and branch line lengths.

(3) Patient showers patient showers shall have a either a shower head or a shower hose but not both unless required by patient criteria.

(4) Configuration for flushing shower branch line to the shower mixing valve.

The shower shall be located as close as practical to the sink. The sink and shower shall share common hot and cold branch lines such that the sink is downstream of the fixture branch to the shower. The fixture branch to the shower shall be as short as practical. The take-off from the shower branch line to the sink shall be located within 2 feet (610 mm) of the shower mixing valve.

SUBSTANTIATION:
In healthcare facilities, showers pose a high risk for Legionella growth because they are typically never used. Very few patient care units such as maternity, routinely use showers and in most patient care units showers are almost never used once a day or even once a week and sometimes never used at all. Presently to control Legionella and other waterborne pathogens, showers in healthcare facilities are flushed daily by environmental services (housekeeping) in hospitals. Showers only need to be flushed two to three times a week by environmental services when they are not used. However environmental services is not like maintenance, they don't have PM schedules that can vary. These are the lowest paid employees with the highest turnover rates. No assignments can include varying schedules. They have a check off sheet of what must be done in each room and an item is either done every day or not done at all. This daily shower flushing is on average 2 minutes per shower and the shower flow is 2 gpm. Below are calculated water consumptions based on these flushes. Having a quality control program to reduce illness based solely on manual controls by employees with lowest retention rates is a program more likely to fail. Improvements in plumbing design as recommended in this submittal can minimize if not eliminate this need for shower flushing and will dramatically improve the patient room process control reliability for shower a) if single fixture shower - 4 gallon per shower per day wasted - 4 minutes per shower per day of housekeeping time. That’s 1,465 gallons per year and 24 hours of housekeeping time b) If dual fixture shower (shower head, shower hose w/ head and diverter valve) - 8 gallon per shower per day wasted - 6 minutes per shower per day housekeeping time. That’s 2,920 gallons per year and 36.5 hours of housekeeping time per room. For an average sized 200 bed hospital that’s 584,000 gallons of water wasted per year for shower flushing and 7,300 hours of housekeeping time.
Item #: 162
UPC 2021 Section: 1361.1.1

SUBMITTER: Christopher Jensen
UL LLC

RECOMMENDATION:
Add new text

1316.0 Station Outlets and Inlets.
1316.1 General. Each station outlet/inlet for medical gases or vacuums shall be gas-specific, whether the outlet/inlet is threaded or is a noninterchangeable quick coupler. [NFPA 99:5.1.5.1]
1316.1.1 Listing Required. Station inlets and outlets shall be listed and labeled in accordance with UL 1331, and shall be installed in accordance with the terms of their listings and the manufacturer’s installation instructions.

<table>
<thead>
<tr>
<th>TABLE 1701.1</th>
<th>REFERENCED STANDARDS</th>
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<tr>
<td>UL 1331-2005</td>
<td>Station Inlets and Outlets (with revisions through May 12, 2017)</td>
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(portions of table not shown remain unchanged)

Note: UL 1331 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

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<tr>
<th>TABLE 1701.2</th>
<th>STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES</th>
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<td>UL 1331-2005</td>
<td>Station Inlets and Outlets (with revisions through August 25, 2014)</td>
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(portions of table not shown remain unchanged)

SUBSTANTIATION:
Components of the medical gas system are critical. UL 1331 is the standard used for listing station inlets and outlets. Also, need to move UL 1331 from Table 1702.1 to 1701.1.
Item #: 163
UPC 2021 Section: Chapter 13, Table 1701.1

SUBMITTER: IAPMO Staff - Update Extracts
NFPA 99 Extract Update

RECOMMENDATION: Revise text

Part I – General Requirements.

1301.0 General Requirements.

4.304.4(1301.4) Where Required. Construction and equipment requirements shall be applied only to new construction and new equipment, except as modified in individual sections of this chapter. [NFPA 99:1.3.2]

4.304.5(1301.5) Existing Systems. Only the altered, renovated, or modernized portion of an existing system or individual component shall be required to meet the installation and equipment requirements stated in this code. If the alteration, renovation, or modernization adversely impacts the existing performance requirements of a system or component, additional upgrading shall be required. An existing system that is not in strict compliance with the provisions of this code shall be permitted to be continued in use, unless the Authority Having Jurisdiction has determined that such use constitutes a distinct hazard to life. [NFPA 99:1.3.2.1 – 1.3.2.3]

1302.0 Design Requirements.

1302.1 Building System Risk Categories. Activities, systems, or equipment shall be designed to meet Category 1 through Category 4 requirements as detailed in this chapter. [NFPA 99:4.1]

1302.1.1 Process and Operations. The healthcare facility's governing body shall establish the processes and operations that are planned for the healthcare facility. [NFPA 99:4.2.1]

1302.1.1.1 Risk Categories. The governing body shall conduct risk assessments and shall determine risk categories based on the character of the processes and operations conducted in the healthcare facility. [NFPA 99:4.2.1.1]

1302.1.2 Risk Assessment. Risk Categories shall be determined by the governing body by following and documenting a defined risk assessment procedure. [NFPA 99:4.2.2.1]

1302.1.2.1 Documents to AHJ. Where required by the Authority Having Jurisdiction (AHJ), the risk assessment shall be provided to the AHJ for review based on the character of the processes and operations conducted in the healthcare facility. [NFPA 99:4.2.2.2.1]

1302.1.3 Documented Risk Assessment. A documented risk assessment shall not be required where for Category 1 is selected. [NFPA 99:4.2.2.1.2.3]

1302.2 Patient Care Spaces. The healthcare facility's governing body or its designee shall establish the following areas in accordance with the type of patient care anticipated (see definition of patient care spaces in Chapter 2):

(1) Category 1 spaces
(2) Category 2 spaces
(3) Category 3 spaces
(4) Category 4 spaces [NFPA 99:1.3.4.1]

1302.3 Anesthesia. It shall be the responsibility of the healthcare facility's governing body of the healthcare organization to designate anesthetizing locations. [NFPA 99:1.3.4.2]

1302.4 Wet Procedure Locations. It shall be the responsibility of the healthcare facility's governing body of the healthcare organization to designate wet procedure locations. [NFPA 99:1.3.4.3]

Part II – Medical Category 1 Piped Gas and Vacuum Systems.

1332.0 Central Supply Systems.

1332.1.1307.1 Terms. Where the terms medical gas or medical support gas occur, the provisions shall apply to all piped systems for oxygen, nitrous oxide, medical air, carbon dioxide, helium, nitrogen, instrument air, and mixtures thereof. Wherever the name of a specific gas service occurs, the provision shall apply only to that gas. [NFPA 99:5.1.1.3]

1337.2 Nature of Hazards of Gas and Vacuum Systems. Potential fire and explosion hazards associated with positive pressure gas central piping systems and medical–surgical vacuum systems shall be considered in the design, installation, testing, operation, and maintenance of these systems. [NFPA 99:5.1.2]

1332.1.307.3 Permitted Locations for Medical Gases. Central supply systems and medical gas outlets for oxygen, medical air, nitrous oxide, carbon dioxide, and all other patient medical gases shall be piped only to medical gas outlets complying with Section 1316.0, into areas where the gases will be used under the direction of licensed medical professionals for purposes congruent with the following:

(1) Direct respiration by patients.
(2) Clinical applications of the gas to a patient, such as the use of an insufflator to inject carbon dioxide into patient body cavities during laparoscopic surgery and carbon dioxide used to purge heart-lung machine blood flow ways.
(3) Medical device applications directly related to respiration.
(4) Power for medical devices used directly on patients.
3312.2 1309.4 Materials. Materials used in central supply systems shall meet the following requirements:
(1) In those portions of systems intended to handle oxygen at gauge pressures greater than 350 pounds-force per square inch (psi) (2413 kPa), interconnecting hose shall contain no polymeric materials.
(2) In those portions of systems intended to handle oxygen or nitrous oxide material, construction shall be compatible with oxygen under the temperatures and pressures to which the components can be exposed in the containment and use of oxygen, nitrous oxide, mixtures of these gases, or mixtures containing more than 23.5 percent oxygen.
(3) If potentially exposed to cryogenic temperatures, materials shall be designed for low temperature service.
(4) If intended for outdoor installation, materials shall be installed per the manufacturer’s requirements. [NFPA 99:5.1.3.5.4]

3315.2 1308.2 Pressure Relief Valves. All pressure relief valves shall meet the following requirements:
(1) They shall be of brass, bronze, or stainless steel construction.
(2) They shall be designed for the specific gas service.
(3) They shall have a relief pressure setting not higher than the maximum allowable working pressure (MAWP) of the component with the lowest working pressure rating in the portion of the system being protected.
(4) They shall be vented to the outside of the building, except that relief valves for compressed air systems having less than 3000 cubic feet (84 950 L) at STP shall be permitted to be diffused locally by means that will not restrict the flow.
(5) They shall have a vent discharge line that is not smaller than the size of the relief valve outlet.
(6) Where two or more relief valves discharge into a common vent line, its internal cross-sectional area shall be not less than the aggregate cross-sectional area of all relief valve vent discharge lines served.
(7) They shall not discharge into locations creating potential hazards.
(8) They shall have the discharge terminal turned down and screened to prevent the entry of rain, snow, or vermin.
(9) They shall not discharge into locations creating potential hazards.
(10) They shall not discharge into locations creating potential hazards.

3315.3 1309.1 Oxygen Concentrator Supply Units.

3315.4 1309.0 Oxygen Concentrator Supply Units. Oxygen concentrator supply units for use with medical gas pipelines shall produce oxygen meeting the requirements of Oxygen 93 USP or Oxygen USP. [NFPA 99:5.1.3.5.11.1]

3315.5 1309.2 Particulate Size. Output shall have less than or equal to 6.85 × 10⁻⁴ kg/m³ of permanent particulates sized 1 micron or larger at normal atmospheric pressure. [NFPA 99:5.1.3.5.11.2]

3315.6 1309.3 Suitability. Materials of construction on the air side of the oxygen concentrator unit shall be suitable for the service as determined by the manufacturer. [NFPA 99:5.1.3.5.11.3]

3315.7 1309.4 Compatible Materials. Materials of construction on the oxygen side of the oxygen concentrator shall comply with Section 1307.2. [NFPA 99:5.1.3.5.11.4]

3315.8 1309.5 Oxygen Concentrator Components. The components that make up the oxygen concentrator unit shall be as follows:
(1) The manufacturer of the concentrator unit shall be permitted to use such components and arrangement of such components as needed to produce oxygen complying with Section 1309.1 in the quantity as required by the facility, except where otherwise specifically defined in this code.
(2) Air receivers and oxygen accumulators, when used, shall comply with Section VIII, “Unfired Pressure Vessels,” of the ASME Boiler and Pressure Vessels Code and be provided with overpressure relief valves. [NFPA 99:5.1.3.5.11.5]

3315.9 1309.6 Supply Air Quality. The supply air to the concentrators shall be of a quality to ensure the oxygen concentrator unit can produce oxygen complying with Section 1309.1 and shall not be subject to normally anticipated contamination (e.g., vehicular or other exhausts, gas leakage, discharge from vents, flooding, and so forth). [NFPA 99:5.1.3.5.11.6]

3315.10 1309.7 Electrical Components. The oxygen concentrator supply unit and any associated electrical equipment shall be provided a minimum with the following electrical components:
(1) Either a disconnect switch for each major electrical component or a single disconnect that deactivates all electrical components in the concentrator unit.
(2) Motor starting devices with overload protection for any component with an electrical motor over 2 hp. [NFPA 99:5.1.3.5.11.7]

3315.11 1309.8 Vent Valve. A vent valve shall be provided as follows:
(1) Located on the source side of the concentrator outlet isolation valve to permit the operation of the oxygen concentrator unit for validation, calibration, and testing while the unit is isolated from the pipeline system.
(2) Sized to allow for at least 25 percent of the oxygen concentrator unit flow.
(3) Located on a vented section of the oxygen concentrator unit as determined by the manufacturer. [NFPA 99:5.1.3.5.11.8]

3315.12 1309.9 Valved Sample Port. A DN8 (NPS 1/4) valved sample port shall be provided near the oxygen concentration monitor sensor connection for sampling of the gas from the oxygen concentrator unit. [NFPA 99:5.1.3.5.11.9]

3315.13 1309.10 Venting of Relief Valves. Indoor supply systems shall have all relief valves vented per Section 1308.2(1) through Section 1308.2(11). [NFPA 99:5.1.3.3.3.2]

3315.14 1309.11 Check Valve. A check valve shall be provided at the outlet of the oxygen concentrator supply unit to prevent backflow into the oxygen concentrator supply unit and to allow service to the unit. [NFPA 99:5.1.3.5.11.10]

3315.15 1309.12 Outlet Valve. An outlet valve shall be provided to isolate all components of the oxygen concentrator from the pipeline with the following characteristics:
(1) The valve shall have both manual and automatic actuation with visual indication of open or closed.
(2) The valve shall close automatically whenever the oxygen concentrator unit is not producing oxygen of a concentration equal to that in Section 1309.1.
(3) The isolating valve, when automatically closed due to low concentration, shall require manual reset to ensure the oxygen concentrator supply unit is examined prior to return to service.
(4) The isolating valve shall close automatically whenever the oxygen concentrator unit is not producing oxygen of a concentration equal to that in Section 1309.1.
(5) The isolating valve shall close automatically whenever the oxygen concentrator unit is not producing oxygen of a concentration equal to that in Section 1309.1.

3315.16 1309.13 Oxygen Concentration Monitor. The oxygen concentrator supply unit shall be provided with an oxygen concentration monitor with the following characteristics:
(1) The monitor shall be capable of monitoring 90 percent oxygen concentration with 1 percent accuracy.
(2) The monitor shall continuously display the oxygen concentration and shall activate local alarm and master alarm per NFPA 99 when a concentration lower than 91 percent is observed.
(3) The monitor shall continuously display the oxygen concentration.
1310.0 Category 1 Medical Air Central Supply Systems.

1310.1 Quality of Medical Air. Medical air shall be required to have the following characteristics:
(1) It shall be supplied from cylinders, bulk containers, or medical air compressor sources, or it shall be reconstituted from oxygen USP and oil-free, dry nitrogen NF.
(2) It shall meet the requirements of medical air USP.
(3) It shall have no detectable liquid hydrocarbons.
(4) It shall have less than 25 ppm gaseous hydrocarbons.
(5) It shall have equal to or less than 1mg/m³ (6.85 x 10⁻⁷ lb/yd³) of permanent particulates sized 1 micron or larger in the air at normal atmospheric pressure. [NFPA 99:5.1.3.6.1]

1310.2 Category 1 Medical Air Compressor. Medical air compressors shall be sufficient to serve the peak calculated demand with the largest single compressor out of service. In no case shall there be fewer than two compressors. [NFPA 99:5.1.3.6.3.9(B)]

1310.2.2 Required Components. Medical air compressor systems shall consist of the following:
(1) Components shall be arranged to allow service and a continuous supply of medical air in the event of a single fault failure. Component arrangement shall be permitted to vary as required by the technology(ies) employed, provided that an equal level of operating redundancy and medical air quality is maintained. [NFPA 99:5.1.3.6.3.9(A)-(C)]
(2) Automatic means to prevent backflow from all on-cycle compressors through all off-cycle compressors.
(3) Manual shutoff valve to isolate each compressor from the centrally piped system and from other compressors for maintenance or repair without loss of pressure in the system.
(4) Intake filter-muffler(s) of the dry type.
(5) Pressure relief valve(s) set at 50 percent above line pressure.
(6) Piping and components between the compressor and the source shutoff valve that do not contribute to contaminant levels.
(7) Except as defined in Section 1313.2.2(5), materials and devices used between the medical air intake and the medical air source valve that are of any design or construction appropriate for the service as determined by the manufacturer. [NFPA 99:5.1.3.6.3.2 (2-7)]

1310.3 Medical Air Receivers. Receivers for medical air shall meet the following requirements:
(1) They shall be made of corrosion-resistant materials or otherwise be made corrosion resistant.
(2) They shall comply with Section VIII, “Unfired Pressure Vessels,” of the ASME Boiler and Pressure Vessel Code.
(3) They shall be equipped with a pressure relief valve, automatic drain, manual drain, sight glass, and pressure indicator.
(4) They shall be of a capacity sufficient to prevent the compressor from short-cycling. [NFPA 99:5.1.3.6.3.6]

1310.4 Valves. A medical air receiver(s) shall be provided with proper valves to allow the flow of compressed air to enter and exit out of separate receiver ports during normal operation and allow the receiver to be bypassed during service without shutting down the supply of medical air. [NFPA 99:5.1.3.6.3.9(D)]

1311.0 Compressor Intake.

1311.1 Air Sources. Air sources for medical air compressors shall comply with Section 1311.5.1 or Section 1311.5.2 through Section 1311.8.

1311.2 Medical Air Compressor Source. The medical air compressors shall draw their air from a source of clean air. [NFPA 99:5.1.3.6.3.11(A)]

(1) If an air source equal to or better than outside air (e.g., air already filtered for use in operating room ventilating systems) is available, it shall be permitted to be used for the medical air compressors with the following provisions:
(2) Ventilating systems having fans with motors or drive belts located in the airstream shall not be used as a source of medical air intake. [NFPA 99:5.1.3.6.3.11(E)]

1311.3 Air Intakes. Compressor intake piping shall be permitted to be made of materials and use a joining technique as permitted under Section 1308.3.12 and Section 1321.2. [NFPA 99:5.1.3.6.3.11(F)]

1311.4 Location. Medical air intakes shall be located as follows:
(1) The medical air intake shall be located a minimum of 25 feet (7620 mm) from ventilating system exhausts, fuel storage vents, combustion vents, plumbing vents, and vacuum discharges, or areas that can collect vehicular exhausts or other noxious fumes.
(2) The medical air intake shall be located a minimum of 20 feet (6096 mm) above ground level.
(3) The medical air intake shall be located a minimum of 10 feet (3048 mm) from any door, window, or other opening in the building. [NFPA 99:5.1.3.6.3.11(B-D)]

1311.5 Separate Compressors. Air intakes for separate compressors shall be permitted to be joined together to one common intake where the following conditions are met:
(1) The common intake is sized to minimize back pressure in accordance with the manufacturer’s recommendations.
(2) Each compressor can be isolated by manual or check valve, blind flange, or tube cap to prevent open inlet piping when the compressor(s) is removed for service from the other compressor(s). [NFPA 99:5.1.3.6.3.11(G)]

1311.6 Screening. The end of the intake shall be turned down and screened or otherwise be protected against the entry of vermin, debris, or precipitation by screening fabricated or composed of a noncorroding material. [NFPA 99:5.1.3.6.3.11(H)]

1311.7 Medical Surgical Vacuum Central Supply Systems.

1311.2 Medical-Surgical Vacuum Sources. Medical-surgical vacuum central supply systems sources shall consist of the following:
(1) Two or more vacuum pumps sufficient to serve the peak calculated demand with the largest single vacuum pump out of service.
(2) Automatic means to prevent backflow from any on-cycle vacuum pump through any off-cycle vacuum pumps.
(3) Shutoff valve or other isolation means to isolate each vacuum pump from the centrally piped system, and other vacuum pumps for maintenance or repair without loss of vacuum in the system.
(4) Vacuum receiver.
(5) Piping between the vacuum pump(s), discharge(s), receiver(s), and vacuum source shutoff valve in accordance with Section 1302.5.1329.1, except brass, galvanized, or black steel pipe, which is permitted to be used as recommended by the manufacturer.
(6) Except as defined in Section 1311.2(1), materials and devices used between the medical vacuum exhaust and the medical vacuum source that are permitted to be of any design or construction appropriate for the service, as determined by the manufacturer.

1311.3 Vacuum Receivers. Receivers for vacuum shall meet the following requirements:
(1) They shall be made of materials deemed suitable by the manufacturer.
(2) They shall comply with Section VIII, “Unfired Pressure Vessels,” of the ASME Boiler and Pressure Vessel Code.
(3) They shall be capable of withstanding a gauge pressure of 60 psi (414 kPa) and 30 inch (762 mm) gauge HgV.
(4) They shall be equipped with a manual drain.
(5) They shall be of a capacity based on the technology of the pumps. [NFPA 99:5.1.3.7.3]
1311.4 Vacuum Filtration. Central supply systems for vacuum shall be provided with inlet filtration with the following characteristics:

1. Filtration shall be at least duplex to allow one filter to be exchanged without impairing vacuum system.
2. Filtration shall be located on the patient side of the vacuum producer.
3. Filters shall be efficient to 0.03 µ and 99.97 percent HEPA or better, per DOE-STD-3020.
4. Filtration shall be sized for 100 percent of the peak calculated demand while one filter or filter bundle is isolated.
5. It shall be permitted to group multiple filters into bundles to achieve the required capacities.
6. The system shall be provided with isolation valves on the source side of each filter or filter bundle and isolation valves on the patient side of each filter or filter bundle, permitting the filters to be isolated without shutting off flow to the central supply system.
7. A means shall be available to allow the user to observe any accumulations of liquids.
8. A vacuum relief petcock shall be provided to allow vacuum to be relieved in the filter canister during filter replacement.
9. Filter elements and canisters shall be permitted to be constructed of materials deemed suitable by the manufacturer.
10. In normal operation, one filter or filter bundle shall be isolated from the system to be available for service should a blockage in the operating filter occur or rotation of the filters be desired after filter element exchange. [NFPA 99: 5.1.3.7.4]

1313.0 Medical-Surgical Vacuum Exhaust

1314.5.1313.1 Vacuum Source Exhausts. The medical-surgical vacuum pumps shall exhaust in a manner and location that minimizes the hazards of noise and contamination to the facility and its environment. [NFPA 99: 5.1.3.7.7.1]

1314.4.5.1314.2 Location. The exhaust shall be located as follows:
1. Outdoors.
2. At least 25 feet (7620 mm) from any door, window, air intake, or other openings in buildings or places of public assembly.
3. At a level different from air intakes.
4. Where prevailing winds, adjacent buildings, topography, or other influences will not divert the exhaust into occupied areas or prevent dispersion of the exhaust. [NFPA 99: 5.1.3.7.6.2, 5.1.3.7.7.2]

1314.4.5.1314.3 Screening. The end of the exhaust shall be turned down and screened or otherwise be protected against the entry of vermin, debris, or precipitation by screening fabricated or composed of a noncorroding material. [NFPA 99: 5.1.3.7.7.3]

1314.4.5.1314.4 Dips and Loops. The exhaust shall be free of dips and loops that might trap condensate or oil or provided with a drip leg and valved drain at the bottom of the low point. [NFPA 99: 5.1.3.7.7.4]

1314.4.5.1314.5 Multiple Pumps. Vacuum exhausts from multiple pumps shall be permitted to be joined together to one common exhaust where the following conditions are met:
1. The common exhaust is sized to minimize back pressure in accordance with the pump manufacturer's recommendations.
2. Each pump can be isolated by manual or check valve, blind flange, or tube cap to prevent open exhaust piping when the pump(s) is removed for service from consequent flow of exhaust air into the room. [NFPA 99: 5.1.3.7.6.5, 5.1.3.7.7.5]

1314.0 Electrical Power and Control

1314.3 Vacuum Pumps. Additional pumps shall automatically activate when the pump(s) in operation is incapable of adequately maintaining the required vacuum.

Automatic or manual alternation of pumps shall allow division of operating time. If automatic alternation of pumps is not provided, the facility staff shall arrange a schedule for manual alternation. [NFPA 99: 5.1.3.7.5.4]

1314.1 Vacuum Pumps. Medical vacuum source systems shall be controlled to ensure continuous supply of suction at pressures consistent with Table 1305.1 under all conditions of system use as follows:
1. Automatic activation of pump(s) as necessary to supply the demand.
2. Managing the operation to equalize wear on all pumps. Where this equalization is achieved manually, the facility staff shall arrange a schedule for manual alternation. [NFPA 99: 5.1.3.7.8(A)]

1314.2 Electrical Installation and Wiring. Electrical installation and wiring shall conform to the requirements of NFPA 70. [NFPA 99: 5.1.3.7.8(E)]

4344.0 1315.0 Valves.

1315.1 Gas and Vacuum Shutoff Valves. Shutoff valves shall be provided to isolate sections or portions of the piped distribution system for maintenance, repair, or planned future expansion need and to facilitate periodic testing. [NFPA 99: 5.1.4.1.1]

4344.0.1315.2 Security. All valves, except valves in zone valve box assemblies, shall be secured by any of the following means:
1. Located in secured areas.
2. Locked or latched in their operating position.
3. Located above ceilings, but remaining accessible and not obstructed. [NFPA 99: 5.1.4.1.2]

4344.0.1315.3 Labeled. All valves shall be labeled as to gas supplied and the area(s) controlled, in accordance with Section 4331.10. [NFPA 99: 5.1.4.1.3]

1315.4 Accessibility. Zone valves shall be installed in valve boxes with removable covers large enough to allow manual operation of valves.

Zone valves for use in certain areas, such as psychiatric or pediatric areas, shall be permitted to be secured with the approval of the Authority Having Jurisdiction to prevent inappropriate access. [NFPA 99: 5.1.4.1.4]

1315.4.1 Flammable Gases. Valves for nonflammable medical gases shall not be installed with valves for flammable gases in the same zone valve box assembly with flammable gases. [NFPA 99: 5.1.4.1.5]

1315.5 Valve Types. 1315.4 General. New or replacement valves shall be permitted to be of any type as long as they meet the following conditions:

(1) They have a minimum pressure drop at intended maximum flow of 0.2 psig (1.4 kPa) in pressure service and 0.15 Hg (3.8 mm) in vacuum service, minimum Cv factor in accordance with Table 1315.5.
(2) They use a quarter turn to off.
(3) They are constructed of materials suitable for the service.
(4) They are provided with copper tube extensions by the manufacturer for brazing or with corrugated medical tubing (CMT) fittings.
(5) They indicate to the operator if the valve is open or closed.
(6) They permit in-line serviceability.
(7) They are cleaned for oxygen service by the manufacturer if used for any positive-pressure service. [NFPA 99: 5.1.4.1.6]

TABLE 1315.5

POSITIVE PRESSURE GASES

[]
### NFPA 60: Table for Valve Size and Minimum Cv

<table>
<thead>
<tr>
<th>Valve Size (inch)</th>
<th>Minimum Cv (full open)</th>
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</tbody>
</table>

#### 1315.6 Source Valves

A shutoff valve shall be placed at the immediate connection of each source central supply system to the piped distribution system to allow the entire source central supply system, including all accessory devices (e.g., air dryers, final line regulators), to be isolated from the facility. [NFPA 99:5.1.4.2.1]

**1315.6.1 Location.** The source valve shall be located in the immediate vicinity of the source equipment, central supply system. [NFPA 99:5.1.4.2.2]

**1315.7 Main Line Valve.** A shutoff valve shall be provided in the main supply line inside of the buildings being served, except where one or more of the following conditions exist:

1. The source and source valve are located inside the building served.
2. The source system is physically mounted to the wall of the building served, and the pipeline enters the building in the immediate vicinity of the source valve. [NFPA 99:5.1.4.3.1]

**1315.7.1 Location.** The main line valve shall be located on the facility side of the source valve and outside of the source room, the enclosure, or where the main line first enters the building. [NFPA 99:5.1.4.3.2]

**1315.8 Riser Valves.** Each riser supplied from the main line shall be provided with a shutoff valve in the riser adjacent to the main line. [NFPA 99:5.1.4.4]

**1315.9 Service Valves.** Service valves shall be installed to allow servicing or modification of lateral branch piping from a main or riser without shutting down the entire main, riser, or facility. [NFPA 99:5.1.4.5.1]

**1315.10 Zone Valves.** All station outlets/inlets shall be supplied through a zone valve, which shall be placed as follows:

1. The zone valve shall be placed such that a wall intervenes between the valve and the outlets/inlets that it controls.
2. The zone valve shall serve only outlets/inlets located on that same story. It is readily operable from a standing position.
3. The zone valve shall not be located in a room with the station outlets/inlets that it controls. It is installed where it is visible and accessible at all times.
4. It is not installed where it can be hidden from plain view, such as behind normally open or normally closed doors.
5. It is not installed in a room with the station outlets/inlets that it controls.
6. It is not installed in rooms, areas, or closets that can be closed or locked. [NFPA 99:5.1.4.6.1]

**1315.10.1 Readily Operable.** Zone valves shall be readily operable from a standing position in the corridor on the same floor they serve. [NFPA 99:5.1.4.6.2]

**1315.10.2 Arrangement.** Zone valves shall be so arranged that shutting off the supply of medical gas or vacuum to one zone will not affect the supply of medical gas or vacuum to another zone or the rest of the system. [NFPA 99:5.1.4.6.3]

**1315.10.3 Indicators.** A pressure/vacuum indicator shall be provided on the station outlet/inlet side of each zone valve. [NFPA 99:5.1.4.6.4]

**1315.11 In-Line Shutoff Valves.** Optional in-line valves shall be permitted to be installed to isolate or shut off piping for servicing of individual rooms or areas. [NFPA 99:5.1.4.7]

**1315.12 Valves for Future Connections.** Future connection valves shall be labeled as to gas content. [NFPA 99:5.1.4.8.1]

**1315.12.1 Downstream Piping.** Downstream piping shall be closed with a brazed cap with tubing allowance for cutting and rebrazing. [NFPA 99:5.1.4.8.2]

**1316.0 Station Outlets and Inlets.**

**1316.1 General.** Each station outlet/inlet for medical gases or vacuums shall be gas-specific, whether the outlet/inlet is threaded or is a noninterchangeable quick coupler. [NFPA 99:5.1.5.1]

**1316.2 Required Valves.** Each station outlet shall consist of a primary and a secondary valve (or assembly).

Each station inlet shall consist of a primary valve (or assembly) and shall be permitted to include a secondary valve (or assembly). [NFPA 99:5.1.5.2, 5.1.5.3]

**1316.3 Secondary Valve.** The secondary valve (or assembly) shall close automatically to stop the flow of gas (or vacuum, if provided) when the primary valve (or assembly) is removed. [NFPA 99:5.1.5.4]

**1317.0 Pressure and Vacuum Indicator Locations.**

**1317.2 Pressure and Vacuum Indicator Locations.** Pressure/vacuum indicators shall be readable from a standing position. Pressure/vacuum indicators shall be provided at the following locations, as a minimum:

1. Adjacent to the alarm-initiating device for source main line pressure and vacuum alarms in the master alarm system.
If medical gas tube in accordance with ASTM B819, Standard Specification for Seamless Copper Tube for Medical Gas Systems, is used for medical gas systems, the following provisions shall apply:

1. Visual inspection of each component for integrity and proper installation is required.
2. A label indicating the gas type and pressure rating is required.
3. All components shall be clearly marked with the manufacturer's name and the material type.
4. The system shall be tested for leaks under pressure.
5. All connections shall be made with appropriate fittings.
6. The system shall be isolated from other systems to prevent cross-contamination.
7. The system shall be monitored for proper operation.
8. The system shall be inspected by a qualified professional on a regular basis.
9. The system shall be designed to comply with all applicable codes and standards.
10. The system shall be documented for future reference and maintenance.

Documentation:

11. The documentation shall include all relevant codes and standards.
12. The documentation shall include all relevant specifications and performance data.
13. The documentation shall include all relevant inspection and testing reports.
14. The documentation shall include all relevant maintenance and repair records.
15. The documentation shall be accessible to all authorized personnel.

For additional information, refer to NFPA 99: Medical Gas and Vacuum Systems.
(2) Welding, as described in Section 1309.16–1323.1.

(3) Memory metal fittings, as described in Section 1309.16–1323.3.

(4) Axially swaged, elastic preload fittings, as described in Section 1309.16–1323.4.

(5) Threaded, as described in Section 1309.16–1323.5. [NFPA 99:5.10.3.1]

1321.2.1 Corrugated Medical Tubing. Positive pressure patient gas systems, medical support gas systems, and vacuum systems constructed of corrugated medical tubing (CMT) shall have turns, offsets, and other changes in direction made by bending the tubing up to the minimum bend radius or by fitting in accordance with Section 1321.2.

[NFPA 99:5.10.3.2]

1321.2.2 Medical Vacuum Systems. Vacuum systems fabricated from copper tubing shall be permitted to have branch connections made using mechanically formed, drilled, and extruded tee-branch connections that are formed in accordance with the tool manufacturer’s instructions. Such branch connections shall be joined by brazing, as described in Section 1309.1–1321.2. [NFPA 99:5.10.3.3]

1322.0 Brazed Joints.

1322.1 Brazed Joints and Fittings. Fittings shall be wrought-copper capillary fittings complying with ASME B16.22, or brazed fittings complying with ASME B16.50. Cast copper alloy fittings shall not be permitted.

Brazed joints shall be made using a brazing alloy that exhibits a melting temperature in excess of 1000°F (538°C) to retain the integrity of the piping system in the event of fire exposure. [NFPA 99:5.10.4.1–5.10.4.1.3]

1322.4.1–1322.4.2 Tube Joints. Brazed tube joints shall be the socket type. [NFPA 99:5.10.4.1.4]

1322.12.3 Filler Metals. Filler metals shall bond with and be metallurgically compatible with the base metals being joined.

Filler metals shall comply with AWS A5.8. [NFPA 99:5.10.4.1.5, 5.10.4.1.6]

1322.4.3–1322.4.5 Copper-to-Copper Joints. Copper-to-copper joints shall be brazed using a copper–phosphorus or copper-phosphorus-silver brazing filler metal (BCuP series) without flux. [NFPA 99:5.10.4.1.7]

1322.4.6–1322.5. Accessible. Joints to be brazed in place shall be accessible for necessary preparation, assembly, heating, filler application, cooling, cleaning, and inspection. [NFPA 99:5.10.4.1.8]

1322.5.1–1322.5.2 Tube Ends. Tube ends shall be cut square using a sharp tubing cutter to avoid deforming the tube. [NFPA 99:5.10.4.2.1]

1322.5.3 Cutting Wheels. The cutting wheels on tubing cutters shall be free from grease, oil, or other lubricant not suitable for oxygen service. [NFPA 99:5.10.4.2.2]

1322.5.4–1322.5.6 Cut Ends. The cut ends of the tube shall be permitted to be rolled smooth or deburred with a sharp, clean deburring tool, taking care to prevent chips from entering the tube. [NFPA 99:5.10.4.2.3]

1322.6 Brazing Procedures. The interior surfaces of tubes, fittings, and other components that are cleaned for oxygen service shall be stored and handled to avoid contamination prior to assembly and brazing. [NFPA 99:5.10.4.3.1]

1322.6.1–1322.6.3 Exterior Surfaces. The interior surfaces of tube ends shall be cleaned prior to brazing to remove any surface oxides. When cleaning the exterior surfaces of tube ends, no matter shall be allowed to enter the tube. [NFPA 99:5.10.4.3.2, 5.10.4.3.3]

1322.6.4 Interior Surfaces. If the interior surfaces of fitting sockets become contaminated prior to brazing, they shall be re-cleaned for oxygen in accordance with Section 1322.6.2. [NFPA 99:5.10.4.3.4]

1322.6.5 Abrasive Pads. Clean, nonshredding, abrasive pads shall be used to clean the exterior surfaces of the tube ends. [NFPA 99:5.10.4.3.5]

1322.6.6 Prohibited. The use of steel wool or sand cloth shall be prohibited. The cleaning process shall not result in grooving of the surfaces to be joined. [NFPA 99:5.10.4.3.6, 5.10.4.3.7]

1322.6.7 Wiped. After being abraded, the surfaces shall be wiped using a clean, lint-free white cloth. [NFPA 99:5.10.4.3.8]

1322.6.8 Examinations. Tubes, fittings, valves, and other components shall be visually examined before being joined to verify that they have not become contaminated for oxygen service and that they are free of obstructions or debris. [NFPA 99:5.10.4.3.9]

1322.6.7.1 On-Site Recleaning. The interior surfaces of tube ends, fittings, and other components that were cleaned for oxygen service by the manufacturer, but that became contaminated prior to being installed, shall be permitted to be re-cleaned on-site by the installer through thorough scrubbing the interior surfaces with a clean, hot water–alkaline solution, such as sodium carbonate or trisodium phosphate, using a solution of 1 pound (0.5 kg) of sodium carbonate or trisodium phosphate to 3 gallons (11 L) of potable water, and thoroughly rinsing them with clean, hot, potable water.

Other aqueous cleaning solutions shall be permitted to be used for on-site recleaning provided that they are as recommended in the mandatory requirements of CGA G-4.1. [NFPA 99:5.10.4.3.10, 5.10.4.3.11]

1322.7 Contaminated Materials. Material that has become contaminated internally and is not clean for oxygen service shall not be installed. [NFPA 99:5.10.4.3.12]

1322.7.1 Timeframe for Brazing. Joints shall be brazed within 8 hours after the surfaces are cleaned for brazing. [NFPA 99:5.10.4.3.13]

1322.7.2 Brazing Dissimilar Metals. Flux shall only be used when brazing dissimilar metals, such as copper and bronze or brass, using a silver (BAg series) brazing filler metal. [NFPA 99:5.10.4.4.1]

1322.7.2.1 Surface Cleaning. Surfaces shall be cleaned for brazing in accordance with Section 1309.6. [NFPA 99:5.10.4.4.2]

1322.7.2.2 Flux. Flux shall be applied sparingly to minimize contamination of the inside of the tube with flux. The flux shall be applied and worked over the cleaned surfaces to be brazed using a stiff bristle brush to ensure complete coverage and wetting of the surfaces with flux. [NFPA 99:5.10.4.4.3, 5.10.4.4.4]

1322.7.2.3 Short Sections of Copper. Where possible, short sections of copper tube shall be brazed onto the non-copper component, and the interior of the subassembly shall be fluxed prior to installation in the piping system. [NFPA 99:5.10.4.4.5]

1322.7.2.4 Flux-Coated Brazing Rods. On joints DN20 (NPS ¾”) (17/8 inch O.D.) size and smaller, flux-coated brazing rods shall be permitted to be used in lieu of applying flux to the surfaces being joined. [NFPA 99:5.10.4.4.6]

1322.7.3 Nitrogen Purge. When brazing, joints shall be continuously purged with oil-free, dry nitrogen NF to prevent the formation of copper oxide on the inside surfaces of the joint. [NFPA 99:5.10.4.5.1]

1322.7.3.1 Source. The source of the purge gas shall be monitored, and the installer shall be audibly alerted when the source content is low. [NFPA 99:5.10.4.5.2]

1322.7.3.2 Flow Rate Control. The purge gas flow rate shall be controlled by the use of a pressure regulator and flowmeter, or combination thereof.

Pressure regulators alone shall not be used to control purge gas flow rates. [NFPA 99:5.10.4.5.3, 5.10.4.5.4]

1322.7.3.3 Oxygen Analyzer. In order to ensure that all ambient air has been removed from the pipeline prior to brazing; an oxygen analyzer shall be used to verify the effectiveness of the purge. The oxygen analyzer shall read below 1 percent oxygen concentration before brazing begins. [NFPA 99:5.10.4.5.5]

1322.7.3.4 During Installation. During and after installation, openings in the piping system shall be kept sealed to maintain a nitrogen atmosphere within the piping to prevent debris or other contaminants from entering the system. [NFPA 99:5.10.4.5.6]

1322.7.3.5 Discharge Opening. While a joint is being brazed, a discharge opening shall be provided on the opposite side of the joint from where the purge gas is being introduced. [NFPA 99:5.10.4.5.7]

1322.7.3.6 Temperature of Joint. The flow of purge gas shall be maintained until the joint is cool to the touch. [NFPA 99:5.10.4.5.8]

1322.7.3.7 Opening to be Sealed. After the joint has cooled, the purge discharge opening shall be sealed to prevent contamination of the inside of the tube and maintain the nitrogen atmosphere within the piping system. [NFPA 99:5.10.4.5.9]

1322.7.3.8 Final Brazed Connection. The final brazed connection of new piping to an existing pipeline containing the system gas shall be permitted to be made without the use of a nitrogen purge. [NFPA 99:5.10.4.5.10]
1309.11 and a pressure rating not less than 300 psi (2068 kPa), and that, when complete, are permanent and nonseparable shall be permitted to be used to join copper or stainless steel (GTAW) autogenous orbital procedure. [NFPA 99:5.1.10.5.1.1]

1309.12 instructions. [NFPA 99:5.1.10.6.1, 5.1.10.6.2]

1309.10 They shall be made up with polytetrafluoroethylene (PTFE) tape or other thread sealant recommended for oxygen service, with sealant applied to the male threads only and care taken to ensure sealant does not enter the pipe. [NFPA 99:5.1.10.8]

1309.10.4 They shall be of brass or copper construction with an approved dielectric.

1309.10.3 (1) They shall be permitted to be a union.

1309.10.2 (2) They shall be tapered pipe threads complying with ASME B1.20.1.

1309.10.1 (3) They shall be permitted to be a union.

1309.10.1 (4) They shall be of brass or copper construction with an approved dielectric.

1309.10.1 (5) They shall be tapered pipe threads complying with ASME B1.20.1.

1309.10.1 (6) Cracks in the braze filler metal.

1309.10.1 (7) Failure of the filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube.

1309.10.1 (8) Unmelted filler metal.

1309.10.1 (9) Source valve.

1309.10.1 (10) Source valve.

1309.8.10 Before the new work is used for patient care, positive pressure gases shall be tested for operational pressure and gas concentration in accordance with Section 1318.14 and Section 1318.16. [NFPA 99:5.1.12.3.9.5]

1323.1.2 Axially Swaged Fittings. Axially swaged, elastic strain preload fittings providing metal-to-metal seals, having a temperature rating not less than 1000°F (538°C) and a standing pressure (see Section 4109.5.1.1225.3.6, Section 1318.10 or Section 4109.10 or Section 4109.10.4.5.1). [NFPA 99:5.1.10.4.7.4]

1322.11.4 Defective Brazed Joints. Brazed joints that are identified as defective under the conditions of Section 4109.10.3(4), 1322.11.3(4), or Section 1309.10.3(3), 1322.11.3(5) shall be permitted to be repaired, except that no joint shall be reheated more than once before being replaced. [NFPA 99:5.1.10.4.7.5, 5.1.10.4.7.8]

1323.0 Welded Joints.

1323.4 Prohibited Brazed Joints. Each brazed joint shall be visually inspected after cleaning the outside surfaces. [NFPA 99:5.1.10.4.7.3]

1323.3 Memory Metal Fittings. Before the new work is used for patient care, positive pressure gases shall be tested for operational pressure and gas concentration in accordance with Section 1318.14 and Section 1318.16. [NFPA 99:5.1.10.4.7.4]

1323.7 Prohibited Joints. The following joints shall be prohibited throughout medical gas and vacuum distribution pipeline systems:
(1) Flared and compression-type connections, including connections to station outlets and inlets, alarm devices, and other components.
(2) Other straight-threaded connections, including unions.
(3) Pipe-crimping tools used to permanently stop the flow of medical gas and vacuum piping.
(4) Removable and nonremovable push-fit fittings that employ a quick assembly push fit connector. [NFPA 99:5.1.10.10]

1310.0-1324.0 Installation of Piping and Equipment.

1310.2-1324.1 Required Pipe Sizing. Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures. [NFPA 99:5.1.10.11.1.1]

1310.2.1-1324.1.1 Mains and Branches. Mains and branches in medical gas piping systems shall be not less than DN15 (NPS 1/2") (7/8 inch O.D.) size. Mains and branches in medical-surgical vacuum piping shall be not less than DN20 (NPS 3/4") (1 1/8 inch O.D.) size. [NFPA 99:5.1.10.11.1.2, 5.1.10.11.1.3]

1310.2.2-1324.1.2 Drops to Individual Stations. Drops to individual station outlets and inlets shall be not less than DN15 (NPS 1/2") (7/8 inch O.D.) size. [NFPA 99:5.1.10.11.1.4]

1310.2.3-1324.1.3 Runouts and Connecting Tubing. Runouts to alarm panels and connecting tubing for gauges and alarm devices shall be permitted to be DN8 (NPS 1/4") (5/8 inch O.D.) size. [NFPA 99:5.1.10.11.1.5]

1310.3-1324.2 Pipe Protection. Piping shall be protected against freezing, corrosion, and physical damage. [NFPA 99:5.1.10.11.2]

1310.3.1-1324.2.1 Exposed Piping. Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be protected. [NFPA 99:5.1.10.11.2.1]

1310.3.2-1324.2.2 Underground Piping. Piping underground within buildings or embedded in concrete floors or walls shall be installed in a continuous conduit. [NFPA 99:5.1.10.11.2.2]

1310.4-1324.3 Location of Piping. Piping risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil. [NFPA 99:5.1.10.11.3.1]

1310.4.1-1324.3.1 Prohibited Locations. Piping shall not be installed in kitchens, stairwells, elevator shafts, elevator machine rooms, areas with open flames, electrical service equipment over 600 volts, and areas prohibited under NFPA 70 except for the following locations:
(1) Room locations for medical air compressor supply systems and medical- surgical vacuum pump supply systems.
(2) Room locations for secondary distribution circuit panels and breakers having a maximum voltage rating of 600 volts. [NFPA 99:5.1.10.11.3.2]

1310.4.2-1324.3.2 Approved Locations. Medical gas piping shall be permitted to be installed in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities, provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130°F (54°C) maximum. [NFPA 99:5.1.10.11.3.3]

1310.4.3-1324.3.3 Prohibited Contact with Oil. Medical gas piping shall not be located where subject to contact with oil, including a possible flooding area in the case of a major oil leak. [NFPA 99:5.1.10.11.3.4]

1310.5-1324.4 Pipe Support. Piping shall be supported from the building structure. [NFPA 99:5.1.10.11.4.1]

1310.5.1-1324.4.1 Mains and Branches. Piping shall be supported at intervals not exceeding 20 feet (6.1 m) for mains and 10 feet (3.0 m) for branches. [NFPA 99:5.1.10.11.4.2]

1310.5.2-1324.4.2 Copper Tube. Supports for copper tube shall be sized for copper tube. [NFPA 99:5.1.10.11.4.3]

1310.5.3-1324.4.3 Damp Locations. In potentially damp locations, copper tube hangers or supports that are in contact with the tube shall be plastic-coated or otherwise be electrically insulated from the tube by a material that will not absorb moisture. [NFPA 99:5.1.10.11.4.5]

1310.5.4-1324.4.4 Maximum Spacing. Maximum support spacing shall be in accordance with Table 1310.5.4(1). [NFPA 99:5.1.10.11.4.6]

1310.5.5-1324.4.5 Seismic Provisions. Where required, medical gas and vacuum piping shall be seismically restrained against earthquakes in accordance with the applicable building code. [NFPA 99:5.1.10.11.4.6 5.1.10.11.4.7]

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1310.6-1324.5 Frost Protection. Buried piping outside of buildings shall be installed below the local level of frost penetration. [NFPA 99:5.1.10.11.5.1]

1310.6.1-1324.5.1 Backfilling and Trenching. The installation procedure for underground piping shall protect the piping from physical damage while being backfilled. [NFPA 99:5.1.10.11.5.2]

1310.6.2-1324.5.2 Conduit, Cover, or Enclosure. If underground piping is protected by a conduit, cover, or other enclosure, the following requirements shall be met:
(1) Access shall be provided at the joints for visual inspection and leak testing.
(2) The conduit, cover, or enclosure shall be self-draining and not retain groundwater in prolonged contact with the pipe. [NFPA 99:5.1.10.11.5.3]

1310.6.3-1324.5.3 Excessive Stresses. Buried piping that is subject to surface loads shall be buried at a depth that will protect the piping or its enclosure from excessive stresses. [NFPA 99:5.1.10.11.5.4]

1310.6.4-1324.5.4 Minimum Backfill. The minimum backfill cover above the top of the pipe or its enclosure for buried piping outside of buildings shall be 36 inches (914 mm), except that the minimum cover shall be reduced to 18 inches (457 mm) where there is no potential for damage from surface loads or surface conditions. [NFPA 99:5.1.10.11.5.5]

1310.6.5-1324.5.5 Trenches. Trenches shall be excavated so that the pipe or its enclosure has firm, substantially continuous bearing on the bottom of the trench. [NFPA 99:5.1.10.11.5.6]

1310.6.6-1324.5.6 Composition of Backfill. Backfill shall be clean, free from material that can damage the pipe, and compacted. [NFPA 99:5.1.10.11.5.7]

1310.6.7-1324.5.7 Marker. A continuous tape or marker placed immediately above the pipe, or its enclosure shall clearly identify the pipeline by specific name. [NFPA 99:5.1.10.11.5.8]

1310.6.8-1324.5.8 Warning. A continuous warning means shall also be provided above the pipeline at approximately one-half the depth of burial. [NFPA 99:5.1.10.11.5.9]

1310.6.9-1324.5.9 Wall Sleeve. Where underground piping is installed through a wall sleeve, the outdoor end of the sleeve shall be sealed to prevent the entrance of groundwater into the building. [NFPA 99:5.1.10.11.5.10]

1310.7-1324.6 Connectors. Hose and flexible connectors, both metallic and nonmetallic, shall be no longer than necessary and shall not penetrate or be concealed in walls, floors, ceilings, or partitions. [NFPA 99:5.1.10.11.6.1]

1310.7.1-1324.6.1 Flexible Connectors. Flexible connectors, metallic or nonmetallic, shall have a minimum burst pressure with a gauge pressure of 1000 psi (6895 kPa). [NFPA 99:5.1.10.11.6.2]

1310.7.2-1324.6.2 Metallic Flexible Joints. Metallic flexible joints shall be permitted in the pipeline where required for expansion joints, seismic protection, thermal expansion, or vibration control and shall be as follows:
(1) For all wetted surfaces, made of bronze, copper, or stainless steel.
(2) Cleaned at the factory for oxygen service and received on the job site with certification of cleanliness.

(3) Suitable for service at 300 psig (2068 kPa) or above and able to withstand temperatures of 1000°F (538°C).

(4) Provided with brazing extensions to allow brazing into the pipeline per Section 1324.4.1.

(5) Supported with pipe hangers and supports as required for their additional weight. [NFPA 99:5.1.10.11.6.3]

1310.7.1.2 Prohibited System Interconnections. Two or more medical gas or vacuum piping systems shall not be interconnected for installation, testing, or any other reason, except as permitted by Section 1310.6.1. [NFPA 99:5.1.10.11.7.1]

1310.6.1.13 Medical Gas and Medical Vacuum. Medical gas and vacuum systems with the same contents shall be permitted to be interconnected with an inline valve installed between the systems. [NFPA 99:5.1.10.11.7.2]

1310.6.2.2 Leak Testing. Leak testing shall be accomplished by separately charging and testing each individual piping system. [NFPA 99:5.1.10.11.7.3]

1310.4 Manufacturer’s Instructions. The installation of individual components shall be made in accordance with the instructions of the manufacturer. Manufacturer’s instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper operation, testing, and maintenance of the medical gas and vacuum systems. Copies of the manufacturer’s instructions shall be left with the system owner. [NFPA 99:5.1.10.11.8.1 – 5.1.10.11.8.3]

1310.3.2 Changes in System Use. Where a positive-pressure medical gas piping distribution system, originally used or constructed for use at one pressure and for one gas, is converted for operation at another pressure or for another gas, all provisions of Section 1309.2 through 1324.12 shall apply as if the system were new. [NFPA 99:5.1.10.11.9.1]

1310.6.1.13.9.1 Medical Vacuum System. A vacuum system shall not be permitted to be converted for use as a gas system. [NFPA 99:5.1.10.11.9.2]

1306.0 Qualifications of Installers.

1306.1 General. 1324.10 Qualifications of Installers. The installation of medical gas and vacuum systems shall be made by qualified, competent technicians who are experienced in performing such installations, including all personnel who actually install the piping system. Installers of medical gas and vacuum piping distribution systems, all appurtenance piping supporting pump and compressor source systems, and appurtenance piping supporting gas manifold systems not including permanently installed bulk source systems, shall be certified in accordance with ASSE 6010. [NFPA 99:5.1.10.11.10.4 – 5.1.10.11.10.2]

1307.4 Brazing Procedures. Brazing procedures and brazing shall be performed by individuals who are qualified in accordance with Section 1307.0 through 1324.11. [NFPA 99:5.1.10.11.10.3]

1307.4.1 Brazing Procedure Specification. The brazing procedure specification shall address cleaning, joint clearance, overlap, internal purge gas, purge gas flow rate, and filler metal. [NFPA 99:5.1.10.11.11.1]

1307.4.2 Brazing Procedure Documentation. Prior to any installation work, the installer of medical gas and vacuum piping shall provide and maintain documentation on the job site for the qualification of brazing procedures and individual brazers that is required under Section 1307.0 through 1324.11. [NFPA 99:5.1.10.11.10.4]

1307.4.3 Health Care Organization Personnel. Health care organization personnel shall be permitted to install piping systems if all of the requirements of Section 1300.1 through 1324.10 are met during the installation. [NFPA 99:5.1.10.11.10.5 – 5.1.10.11.10.7]

1307.5 Brazing Procedures. Brazing procedures and brazing shall be performed by individuals qualified in accordance with either Section IX, “Welding and Brazing Qualifications,” of the ASME Boiler and Pressure Vessel Code, or AWS B2.2, both as modified by the brazer does notbraze with the qualified procedure for the installation of medical gas and vacuum piping systems operate at pressures other than the standard gauge pressure in Table 1305.1, the operating pressure in addition to the name of the gas. [NFPA 99:5.1.10.11.11.1]

1310.6.1.13 Location of Pipe Labeling. Pipe labels shall be located as follows:

(1) At intervals of not more than 20 feet (6096 mm).
(2) At least once in or above every room.
(3) On both sides of walls or partitions penetrated by the piping.
(4) At least once in every story height traversed by risers. [NFPA 99:5.1.10.11.12.1]

1324.13.3 Paint. Medical gas piping shall not be painted. [NFPA 99:5.1.10.11.13.3]

1311.14.13.4 Identification of Shutoff Valves. Shutoff valves shall be identified with the following:

(1) Name or chemical symbol for the specific medical gas or vacuum system.
(2) Room or areas served.
(3) Caution to not close or open valve except in emergency. [NFPA 99:5.1.10.11.2.1]

1311.10.13.4.1 Nonstandard Operating Pressures. Where positive pressure gas piping systems operate at pressures other than the standard gauge pressure of 50 psi (345 kPa) to 55 psi (379 kPa), or a gauge pressure of 160 psi (1103 kPa) to 185 psi (1276 kPa) for nitrogen or instrument air, the valve identification shall also include the nonstandard operating pressure. [NFPA 99:5.1.10.11.2.2]

1311.10.13.4.2 Source Valves. Source valves shall be labeled in substance as follows:
1318.4.1 Distribution piping but before installation of station outlet/inlet rough-in assemblies and other system components (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, line pressure relief valves). [NFPA 99:5.1.11.2.3]

1318.4.1.1 Prior to the installation of components of the distribution piping system that would be damaged by the test pressure (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, line pressure relief valves). [NFPA 99:5.1.11.2.3]

1318.4.1.2 After installation of station outlet/inlet rough-in assemblies.

1318.4.1.3 After blowdown of the distribution piping.

System pressure tests shall be conducted as follows:

1318.4.1.4 Prior to the installation of components of the distribution piping system that would be damaged by the test pressure (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, line pressure relief valves). [NFPA 99:5.1.11.2.3]

1318.4.1.5 After blowdown of the distribution piping but before installation of station outlet/inlet rough-in assemblies and other system components (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, line pressure relief valves). [NFPA 99:5.1.11.2.3]

1318.4.1.6 Prior to the installation of components of the distribution piping system that would be damaged by the test pressure (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, line pressure relief valves). [NFPA 99:5.1.11.2.3]

1318.4.1.7 After blowdown of the distribution piping but before installation of station outlet/inlet rough-in assemblies and other system components (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, line pressure relief valves). [NFPA 99:5.1.11.2.3]

1318.5 Test Gas. The test gas shall be oil-free, dry nitrogen NF. [NFPA 99:5.1.12.2.1.2]

1318.5.1 Initial Piping Blowdown. Piping in medical gas and vacuum distribution systems shall be blown clear by means of oil-free, dry nitrogen NF after installation of the distribution piping but before installation of station outlet/inlet rough-in assemblies and other system components (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, line pressure relief valves, manifolds, compressors, dryers, alarms) shall be inspected and tested. Systems shall be deemed breached at the point of pipeline intrusion by physical separation or by system component removal, replacement, or addition. Breached portions of the systems subject to inspection and testing shall be confined to only the specific altered zone and components in the immediate zone or area that is located upstream for vacuum systems and downstream for pressure gases at the point or area of intrusion. [NFPA 99:5.1.12.1.3 – 5.1.12.1.5]

1318.5.2 Reports. The inspection and testing reports shall be submitted directly to the party that contracted for the testing, who shall submit the report through any others that are required. Reports shall contain detailed listings of all findings and results. [NFPA 99:5.1.12.1.6, 5.1.12.1.7]

1318.5.3 Shutoff Valve. The source shutoff valve shall remain closed during tests specified in Section 1318.5. [NFPA 99:5.1.12.2.3.3]

1318.5.4 Initial Cross-Connection Tests – Medical Gas and Vacuum Systems. It shall be determined that no cross-connections exist between the various medical gas and vacuum piping systems. [NFPA 99:5.1.12.2.4]

1318.5.5 Initial Pressure Tests – Medical Gas and Vacuum Systems. Each section of the piping in medical gas and vacuum systems shall be pressure tested. Initial pressure tests shall be conducted as follows:

(1) After blowdown of the distribution piping.

(2) After installation of station outlet/inlet rough-in assemblies.

(3) Prior to the installation of components of the distribution piping system that would be damaged by the test pressure (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, line pressure relief valves). [NFPA 99:5.1.12.2.3.1, 5.1.12.2.3.2]

1318.5.6.1 Atmospheric Pressure. All piping systems shall be reduced to atmospheric pressure. [NFPA 99:5.1.12.2.4.1]
Sources of Test Gas. Sources of test gas shall be disconnected from all piping systems, except for the one system being tested. [NFPA 99:5.1.12.2.4.2]

System to be Charged. The system under test shall be charged with oil-free, dry nitrogen NF to a gauge pressure of 50 psi (345 kPa). [NFPA 99:5.1.12.2.4.3]

Check Outlets and Inlets. After the installation of the individual faceplates with appropriate adapters matching outlet/inlet labels, each individual outlet/inlet in each installed medical gas and vacuum piping system shall be checked to determine that the test gas is being dispensed only from the piping system being tested. [NFPA 99:5.1.12.2.4.4]

Repeat Test. The cross-connection test referenced in Section 1318.8 shall be repeated for each installed medical gas and vacuum piping system. [NFPA 99:5.1.12.2.4.5]

Identification of System. The proper labeling and identification of system outlets/inlets shall be confirmed during these tests. [NFPA 99:5.1.12.2.4.6]

Medical Gas Piping System Initial Piping Purge Tests. The outlets in each medical gas piping system shall be purged to remove any particulate matter from the distribution piping. [NFPA 99:5.1.12.2.5]

Procedure. Using appropriate adapters, each outlet shall be purged with an intermittent high-volume flow of test gas until the purge produces no discoloration in a clean white cloth. [NFPA 99:5.1.12.2.5.1]

Location. The purging required in Section 1318.4.1 shall be started at the closest outlet/inlet to the zone valve and continue to the farthest outlet/inlet within the zone. [NFPA 99:5.1.12.2.5.2]

System Pressure Tests – for Positive Pressure Medical Gas Piping Systems. After successful completion of the initial pressure tests under Section 1318.5 through Section 1318.5.2, medical gas distribution piping shall be subjected to a standing pressure test. [NFPA 99:5.1.12.2.6]

Time Frame for Testing. Tests shall be conducted after the final installation of station outlet valve bodies, faceplates, and other distribution system components (e.g. pressure alarm devices, pressure indicators, line pressure relief valves, manufactured assemblies, hose). [NFPA 99:5.1.12.2.6.1]

Source Valve. The source valve shall be closed during this test. [NFPA 99:5.1.12.2.6.2]

Length of Testing. The piping systems shall be subjected to a 24 hour standing pressure test using oil-free, dry nitrogen NF. [NFPA 99:5.1.12.2.6.3]

Test Pressure. Test pressures shall be 20 percent above the normal system operating line pressure. [NFPA 99:5.1.12.2.6.4]

Conclusion of Test. At the conclusion of the test, there shall be no change in the test pressure. The leakage over the 24 hour test shall not exceed 0.5 percent of the starting pressure for liquid systems tested at 205 psi (14 bar) or higher pressure. For gas systems tested at 205 psi (14 bar) or higher pressure, the leakage shall not exceed 0.2 percent of the starting pressure. [NFPA 99:5.1.12.2.6.5]

Leaks. Leaks, if any, shall be located, repaired (if permitted), or replaced (if required), and retested. [NFPA 99:5.1.12.2.6.6]

Proof of Testing. The 24 hour standing pressure test of the positive pressure system shall be witnessed by an ASSE 6020 inspector, or the Authority Having Jurisdiction or its designee. A form indicating that this test has been performed and witnessed shall be provided to the verifier at the start of the tests required in Section 1318.16. [NFPA 99:5.1.12.2.6.7]

Standing Pressure Tests – Medical Vacuum Piping Systems. After successful completion of the initial pressure tests under Section 1325.5 through Section 1325.5.2, vacuum distribution piping shall be subjected to a standing vacuum test. [NFPA 99:5.1.12.2.7]

Time Frame for Testing. Tests shall be conducted after installation of all components of the vacuum system. [NFPA 99:5.1.12.2.7.1]

Length of Testing. The piping systems shall be subjected to a 24 hour standing vacuum test. [NFPA 99:5.1.12.2.7.2]

Test Pressure. Test pressure shall be between 12 inches (305 mm) HgV (Vacuum) and full vacuum. [NFPA 99:5.1.12.2.7.3]

Conclusion of Test. At the conclusion of the test, there shall be no change in the test pressure. [NFPA 99:5.1.12.2.7.4]

Proof of Testing. The 24 hour standing pressure test of the vacuum system shall be witnessed by the Authority Having Jurisdiction or its designee. A form indicating that this test has been performed and witnessed shall be provided to the verifier at the start of the tests required in Section 1318.16. [NFPA 99:5.1.12.2.7.5]

Leaks. Leaks, if any, shall be located, repaired (if permitted), or replaced (if required), and retested. [NFPA 99:5.1.12.2.7.6]

System Inspection. System inspections shall be performed prior to concealing piping distribution systems in walls, ceilings, chases, trenches, underground, or otherwise hidden from view. [NFPA 99:5.1.12.2.7.1.1]

Test Gas. The test gas shall be nitrogen NF. [NFPA 99:5.1.12.2.7.1.2]

Inspection Qualification. Inspections shall be performed by a party technically competent and experienced in the field of medical gas and vacuum piping systems and meeting the requirements of ASSE 6030, or ASSE 6030. [NFPA 99:5.1.12.2.7.3.1]

Inspection Personnel. Inspections shall be performed by a party other than the installer contractor. [NFPA 99:5.1.12.2.7.3.4]

System Verification. Verification tests shall be performed only after all tests required in Section 1318.8 through Section 1325.5, andInstaller Performed Tests, have been completed. [NFPA 99:5.1.12.2.7.3.1.3]

Test Gas. The test gas shall be oil-free, dry nitrogen NF or the system gas where permitted. [NFPA 99:5.1.12.2.7.4.1]

Approved Tester. Testing shall be conducted by a party technically competent and experienced in the field of medical gas and vacuum pipeline testing, and meeting the requirements of ASSE 6030, or as required by Section 1325.5.7.3. [NFPA 99:5.1.12.2.7.4.2]

Testing shall be performed by a party other than the installer contractor. [NFPA 99:5.1.12.2.7.4.3]

When Where systems have not been installed by in-house personnel, testing shall be permitted by personnel of that organization who meet the requirements of this section. [NFPA 99:5.1.12.2.7.4.4]

Cryogenic Fluid Testing. Testing of the cryogenic fluid central supply system shall be conducted by a party technically competent and experienced in the field of cryogenic fluid systems and meeting the requirements of ASSE 6035, or as required by Section 1325.5.7.4

Final Tie-In Test. Each final connection that shall be performed after the final brazed connection is made and leak-tested, an outlet in the new piping and an outlet in the existing piping that are immediately downstream from the point or area of intrusion shall be purged in accordance with the applicable requirements of Section 1325.5.7.5

Vacuum Joints. Vacuum joints shall be tested using an ultrasonic leak detector or other means that will allow detection of leaks in an active vacuum system. [NFPA 99:5.1.12.2.7.5.3]

Pressure Gases. For pressure gases, immediately after the final brazed connection is made and leak-tested, an outlet in the new piping and an outlet in the existing piping that are immediately downstream from the point or area of intrusion shall be purged in accordance with the applicable requirements of Section 1325.5.7.5.4

Positive Pressure Gases. Before the new work is used for patient care, positive pressure gases shall be tested for operational pressure and gas quality. Testing shall be performed using continuous negative pressure (CNP) to a level of 500 mm HgV (13 in HgV) in a test for 3 minutes. [NFPA 99:5.1.12.2.7.5.5]

Medical Conduction Test. After purging each system with the gas of system designation, the following shall be performed:

(1) Each pressure gas source and outlet shall be analyzed for concentration of gas, by volume.
(2) Analysis shall be conducted with instruments designed to measure the specific gas dispensed.
Part III—Systems, Equipment, and Components Category 2 Piped Gas and Vacuum Systems

1326.6 Category 2 Piped Gas and Vacuum Systems.

1326.6.1 Category 2 Piped Medical Gas and Medical Vacuum. Category 2 piped gas or piped vacuum system requirements shall be permitted when all of the following criteria are met:

(1) Only moderate sedation; minimal sedation, as defined in Chapter 2; or no sedation is performed. Deep sedation and general anesthesia shall not be permitted.

(2) The loss of the piped gas or piped vacuum systems is likely to cause minor injury to patients, staff, or visitors.

(3) The facility piped gas or piped vacuum systems are intended for Category 2 patient care space as defined in Chapter 2 [NFPA 99:5.2.1.2]

1326.2 Nature of Hazards of Gas and Vacuum Systems. The requirement of Section 1307.2 shall apply to the nature of hazards of gas and vacuum systems. [NFPA 99:5.2.2]

1326.3 Central Supply Systems. Category 2 systems shall comply with Section 1307.3 through Section 1309.13. [NFPA 99:5.2.3.4]

1326.4 Category 2 Medical Air Supply Systems. Category 2 systems shall comply with Section 1313.0, except as follows:

(1) Medical air compressors, dryers, aftercoolers, filters, and regulators shall be permitted to be simplex.

(2) The facility staff shall develop their emergency plan to deal with the loss of medical air. [NFPA 99:5.2.3.5]

1326.5 Oxygen Concentrators. Oxygen supply systems using concentrators shall be permitted to consist of two sources, one of which shall be a cylinder header with sufficient cylinder connections for one average day's supply. [NFPA 99:5.2.3.6]

1326.6 Category 2 Medical-Surgical Vacuum. Category 2 systems shall comply with Section 1314.2, except as follows:

(1) Medical-surgical vacuum systems shall be permitted to be simplex.

(2) The facility shall develop their emergency plan to deal with the loss of medical-surgical vacuum. [NFPA 99:5.2.3.7]

1326.7 Valves. Category 2 systems shall comply with Section 1315.1 through Section 1315.12.1. [NFPA 99:5.2.4]

1326.8 Station Outlets and Inlets. Category 2 systems shall comply with Section 1316.0. [NFPA 99:5.2.5]

1326.9 Pressure and Vacuum Indicators. Category 2 systems shall comply with Section 1317.2. [NFPA 99:5.2.8]

1326.10 Warning Systems (Category 2 Systems). Warning systems associated with Category 2 systems shall provide the master, area, and local alarm functions of a Category 1 system as required in Section 1318.1, except as follows:

(1) Warning systems shall be permitted to be a single alarm panel.

(2) The alarm panel shall be located in an area of continuous surveillance while the facility is in operation.

(3) Pressure and vacuum switches/sensors shall be mounted at the source equipment with a pressure indicator at the master alarm panel. [NFPA 99:5.2.9]

1326.11 Category 2 Distribution. Level 2 systems shall comply with Section 1319.2 through Section 1324.12. [NFPA 99:5.2.10]

1326.12 Labeling and Identification. Category 2 systems shall comply with Section 1324.13 through Section 1324.15. [NFPA 99:5.2.11]

1326.13 Performance Criteria and Testing — Category 2. (Gas, Medical—Surgical and Vacuum). Category 2 systems shall comply with Section 1325.2 through Section 1325.5.11. [NFPA 99:5.2.12]

Part IV—Testing, Inspection, and Certification. Category 3 Piped Gas and Vacuum Systems

1327.0 Category 3 Piped Gas and Vacuum Systems.

1327.1 Category 3 Piped Medical Gas and Medical Vacuum. General. Category 3 piped gas and vacuum systems shall be permitted when all of the following criteria are met:

(1) Only moderate sedation; minimal sedation, as defined in Chapter 2; or no sedation is performed. Deep sedation and general anesthesia shall not be permitted.

(2) The loss of the piped gas and vacuum systems is likely to cause minor injury to patients, staff, or visitors, but can cause discomfort.

(3) The facility piped gas and vacuum systems are intended for Category 3 or Category 4 patient care rooms as defined in Chapter 2. [NFPA 99:5.3.1.2]

1327.2 Nature of Hazards of Gas and Vacuum Systems. The requirement of Section 1309.2 shall apply to the nature of hazards of gas and vacuum systems. [NFPA 99:5.3.2]

1327.3 Medical Air Supply Systems. Category 3 systems shall comply with Section 1310.1, except as follows:

(1) Medical air compressors, dryers, aftercoolers, filters, and regulators shall be permitted to be simplex.

(2) The facility staff shall develop their emergency plan to deal with the loss of medical air. [NFPA 99:5.3.3.5]

1327.4 Oxygen Central Supply Systems Using Concentrators. Category 3 oxygen supply systems using concentrators shall be permitted to consist of two sources, one of which shall be a cylinder header with sufficient cylinder connections for one average day's supply. [NFPA 99:5.3.3.6]

1327.5 Medical—Surgical Vacuum. Category 3 systems shall comply with Section 1312.2 through Section 1314.5, except as follows:

(1) Medical—surgical vacuum systems shall be permitted to be simplex.

(2) The facility staff shall develop their emergency plan to deal with the loss of medical—surgical vacuum. [NFPA 99:5.3.3.7]

1327.6 Valves. Category 3 systems shall comply with Section 1315.0. [NFPA 99:5.3.4]

1327.7 Station Outlets and Inlets. Category 3 systems shall comply with Section 1316.0. [NFPA 99:5.3.5]

1327.8 Pressure and Vacuum Indicators. Category 3 systems shall comply with Section 1317.2. [NFPA 99:5.3.8]
1327.9 Warning Systems. Warning systems associated with Category 3 systems shall provide the master, area, and local alarm functions of a Category 1 system as required in Section 1318.6, except as follows:

(1) Warning systems shall be permitted to be a single alarm panel.

(2) The alarm panel shall be located in an area of continuous surveillance while the facility is in operation.

(3) Pressure and vacuum switches/sensors shall be mounted at the source equipment with a pressure indicator at the master alarm panel. [NFPA 99:5.3.9]

1327.10 Distribution. Category 3 systems shall comply with Section 1319.2 through Section 1324.12. [NFPA 99:5.3.10]

1327.11 Labeling and Identification. Category 3 systems shall comply with Section 1324.13 through Section 1324.15. [NFPA 99:5.3.11]

Part V – Dental Gas and Vacuum Systems

1328.0 Dental Gas and Vacuum Systems.

1328.1 General. Dental gas and vacuum systems shall comply with this Code and NFPA 99.

1328.2 Emergency Shutoff Valves. Category 3 Central medical gas systems shall comply with Section 1311.10, except as follows the following:

(1) Where a central Category 3 medical gas supply is remote from a single treatment facility, the main supply line shall be provided with an emergency shutoff valve located in the single treatment facility so as to be accessible from all use-point locations in an emergency.

(2) Where a central Category 3 medical gas supply system supplies two treatment facilities, each facility shall be provided with an emergency shutoff valve located in the treatment facility so as to be accessible from all use-point locations in an emergency.

(3) Emergency shutoff valves shall be labeled to indicate the gas controlled by the shutoff valve and shall shut off only the gas to the treatment facility that they serve.

(4) A remotely activated shutoff valve at a supply manifold shall not be used for emergency shutoff. For clinical purposes, such a remote valve actuator shall not fail-closed in the event of a loss of electric power. Where remote actuators are the type that fail-open, it shall be mandatory that cylinder shutoff valves be closed whenever the system is not in use. [NFPA 99:5.3.9.15.4.2.6.4.2]

1328.3 Category 3 Systems. Warning Systems (Oxygen and Nitrous Oxide). Category 2 warning systems shall comply with Section 1317.2, 1326.10 except as follows:

(1) Warning systems shall be permitted to be a single alarm panel.

(2) The alarm panel shall be located in an area of continuous surveillance while the facility is in operation.

(3) Pressure and vacuum switches/sensors shall be mounted at the source equipment with a pressure indicator at the master alarm panel.

(4) Warning systems for medical gas systems shall provide the following alarms:

(a) Oxygen main line pressure low.

(b) Oxygen main line pressure high.

(c) Oxygen changeover to secondary bank or about to changeover (if automatic).

(d) Nitrous oxide main line pressure low.

(e) Nitrous oxide main line pressure high.

(f) Nitrous oxide changeover to secondary bank or about to changeover (if automatic).

(5) Audible and noncancelable alarm visual signals shall indicate if the pressure in the main line increases or decreases 20 percent from the normal operating pressure.

(6) Visual indications shall remain until the situation that caused the alarm is resolved.

(7) Pressure switches/sensors shall be installed downstream of any emergency shutoff valves and any other shutoff valves in the system and shall cause an alarm for the medical gas if the pressure decreases or increases 20 percent from the normal operating pressure.

(8) A cancelable audible indication of each alarm condition that produces a sound at the alarm panel shall reinitiate the audible signal if another alarm condition occurs while the audible signal is silenced. [NFPA 99:5.3.9.15.4.2.10]

1328.4 Initial Pressure Test. Each section of the piping in positive-pressure gas systems and copper vacuum systems shall be pressure tested. Plastic vacuum and plastic scavenging piping shall not be pressure tested. [NFPA 99:15.4.7.4.4.1]

1328.4.1 Pressure Test. Initial pressure tests shall be conducted as follows:

(1) After blowdown of the distribution piping.

(2) After installation of station outlet/inlet rough-in assemblies.

(3) Prior to the installation of components of the distribution piping system that would be damaged by the test pressure (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, and line pressure relief valves). [NFPA 99:15.4.7.4.4.2]

1328.4.2 Source Shutoff Valve. The source shutoff valve shall remain closed during the pressure tests. [NFPA 99:15.4.7.4.4.3]

1328.4.3 Test Pressure. The test pressure for oxygen and nitrous oxide piping shall be 1.5 times the system operating pressure but not less than a gauge pressure of 150 psi (1035 kPa). [NFPA 99:15.4.7.4.4.4]

1328.4.4 Examine for Leaks. The test pressure shall be maintained until each joint has been examined for leakage by means of a leak detector that is safe for use with oxygen and does not contain ammonia. [NFPA 99:15.4.7.4.4.5]

1328.4.5 Leaks Located. Any leaks shall be located, required (if permitted), or replaced (if required) by the installer, and retested. [NFPA 99:15.4.7.4.4.6]

1328.5 Maximum Copper Tube Support Spacing. The maximum support spacing for copper tube shall be in accordance with Table 1328.5. [NFPA 99:15.4.5.6.5]

1328.6 Maximum Plastic Pipe Support Spacing. The maximum support spacing for plastic pipe shall be in accordance with Table 1328.6. [NFPA 99:15.4.5.6.6]

<table>
<thead>
<tr>
<th>TABLE 1328.5</th>
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<tbody>
<tr>
<td>MAXIMUM COPPER TUBE SUPPORT SPACING</td>
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<tr>
<td>[NFPA 99: TABLE 15.4.5.6.5]</td>
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<table>
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<tr>
<th>PIPE SIZE</th>
<th>MAXIMUM SUPPORT SPACING (FEET)</th>
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<tbody>
<tr>
<td>DN8 (NPS 3/4)</td>
<td>6 of an O.D.</td>
</tr>
<tr>
<td>DN10 (NPS 1)</td>
<td>6 of an O.D.</td>
</tr>
<tr>
<td>DN15 (NPS 1-1/4)</td>
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<td>DN20 (NPS 1-1/2)</td>
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<tr>
<td>DN25 (NPS 2)</td>
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TABLE 1318.4.5.6.1328.6
MAXIMUM PLASTIC PIPE SUPPORT SPACING
[NFPA 99: TABLE 5.3.10.1.4.1]
(portions of table not shown remain unchanged)

1318.14-1328.7 Standing Pressure Tests for Category 3 Gas Powered Device Distribution for Oxygen and Nitrous Oxide Piping. After successful completion of the initial pressure tests using Section 1318.8, 1328.4, Category 3 gas powered device distribution piping shall be subjected to a standing pressure test, which includes the following:
(1) 1328.7.1 Tests Required. Tests shall be conducted after the final installation of station outlet valves, bodies, faceplates, and other distribution system components (e.g., pressure alarm devices, pressure indicators, and line pressure relief valves, manufactured assemblies, and hoses). [NFPA 99: 5.4.7.4.6.2]
(2) 1328.7.2 Source Valve. The source valve shall be closed unless the source gas is being used for the during this test. [NFPA 99: 5.4.7.4.6.3]
(3) 1328.7.3 Piping Systems. The piping systems shall be subjected to a 24-hour standing pressure leakage test using oil-free, dry nitrogen NF or the system gas. [NFPA 99: 5.4.7.4.6.4]
(4) 1328.7.4 Test Pressure. Test pressures shall be 20 percent above the normal system operating line pressure. [NFPA 99: 5.4.7.4.6.5]
(5) 1328.7.5 Change in Test Pressure. At the conclusion of the tests, there shall be no change in the test pressure greater than a gauge pressure of 5 psi (34 kPa) except that attributed to specific changes in ambient temperature. [NFPA 99: 5.4.7.4.6.6]
(6) 1328.7.6 Leaks. Leaks, if any, Any leaks shall be located, repaired (if permitted), or replaced (if required) by the installer, and retested. The piping shall be repurged if necessary. [NFPA 99: 5.1.12.3, 15.4.7.4.6.7]
(7) 1328.8 Verify Operational Pressure Test. Operational pressure tests shall be performed at each station outlet/inlet or terminal where the user makes connections and disconnections. [NFPA 99: 5.1.12.3.10, 15.4.7.5.6.1]

TABLE 1318.4.5.6.6
MAXIMUM PLASTIC PIPE SUPPORT SPACING
[NFPA 99: TABLE 5.3.10.1.4.1]
(portions of table not shown remain unchanged)

DN32 (NPS 1") (1\% of an inch O.D.) 9
DN30 and DN25 (NPS 1") (1\% of an inch O.D.) 10
Vertical risers, all sizes, every floor, but not to exceed 15

For SI units: 1 inch = 25 mm; 1 foot = 304.8 mm

1318.14-1328.8 Medical Gas Outlets. All medical gas outlets with a gauge pressure of 50 psi (345 kPa), including, but not limited to, oxygen, oxygen, medical air, and carbon dioxide, shall deliver 4.8 standard cubic feet per minute (SCFM) (202 SLPM) with a pressure drop of not more than 5 psi (34 kPa) and static pressure of 50 psi (345 kPa) to 55 psi (379 kPa). [NFPA 99: 5.1.12.3.10, 15.4.7.5.6.2]
1313.5.2 Source of Dental Air Compressor Intake. Dental air sources for a compressor(s) shall meet the following requirements:
(1) The capacity to prevent short cycling of the compressor(s).
(2) Compliance with Section VIII, “Unfired Pressure Vessels” of the ASME Boiler and Pressure Vessel Code. [NFPA 99:5.3.6.1.2]

1314.3.2 Category 3 Medical-Surgical Vacuum. Category 3 medical-surgical vacuum systems if used, shall comply with Section 1314.2. [NFPA 99:5.3.3.9]

1313.7.4 Category 3 Dental Air. Receivers shall have the following:
(1) The capacity to prevent short cycling of the compressor(s).
(2) Compliance with Section VIII, “Unfired Pressure Vessels” of the ASME Boiler and Pressure Vessel Code. [NFPA 99:5.3.6.1.2]

1314.3.1 Category 3 Dental Air Pressure Relief Valve Discharge. Pressure relief valves for dental air systems having less than 3000 cubic feet (84.950 L) at STP shall be permitted to discharge locally indoors in a safe manner that will not restrict the flow. [NFPA 99:5.3.6.1.4]

1318.6 Initial Pressure Test – Category 3 Copper Piping Systems. Initial pressure tests shall be conducted as follows:
(1) After blowdown of the distribution piping.
(2) After installation of outlet and inlet shutoff valves station outlets and inlets.
(3) Prior to the installation of components of the distribution piping system that would be damaged by the test pressure (e.g., pressure/vacuum indicators, line pressure relief valves).
(4) The source shutoff valves for the piping systems shall remain closed during the tests, unless being used for the pressure test gas.
(5) With test pressure 1.5 times the system operating pressure but not less than a gauge pressure of 160 psi (1100 kPa).
(6) The individual gas outlet and vacuum inlet with each installed gas-powered device and copper vacuum piping system shall be checked to determine that the test gas pressure is present only at the piping system being tested.
(7) The proper labeling and identification of system outlets/inlets shall be confirmed during the tests. [NFPA 99:5.3.12.2.6]

1318.8.8 Cross-Connection Test – Category 3 Copper Piping Systems. Initial cross-connection tests for copper piping systems shall be conducted as follows:
(1) Tests shall be conducted to determine that no cross-connections exist between the Category 3 copper piping systems and Category 3 copper vacuum piping systems.
(2) The piping systems shall be at atmospheric pressure.
(3) The test gas shall be oil-free, dry nitrogen NF or dental air.
(4) The source of test gas shall be connected only to the piping system being tested.
(5) The piping system being tested shall be pressurized to a gauge pressure of 150 psi (1034 kPa).
(6) The individual gas outlet and vacuum inlet with each installed gas-powered device and copper vacuum piping system shall be checked to determine that the test vacuum is only present at the piping system being tested.
(7) The cross-connection test shall be repeated for each installed Category 3 piping system for gas-powered devices and for vacuum with copper piping.
(8) The proper labeling and identification of system outlets/inlets shall be confirmed during the tests. [NFPA 99:5.3.12.2.6]

1318.8.6 Cross-Connection Test – Category 3 Plastic Vacuum Piping Systems. Initial cross-connection tests for plastic vacuum piping systems shall be conducted as follows:
(1) Tests shall be conducted to determine that no cross-connections exist between any Category 3 plastic vacuum piping systems or Category 3 copper piping systems.
(2) The vacuum source shutoff valves for the vacuum piping systems shall remain closed during the tests, unless being used for the test vacuum piping system.
(3) The cross-connection test vacuum shall be a minimum of 12 inch (305 mm) HgV.
(4) The source of test vacuum shall be connected only to the vacuum piping system being tested.
(5) The individual gas powered device system gas outlets and vacuum system inlets shall be checked to determine that the test vacuum is only present at the piping system being tested.
(6) The cross-connection tests shall be repeated for each installed vacuum system with plastic piping.
(7) The proper labeling and identification of system outlets/inlets shall be confirmed during the tests. [NFPA 99:5.3.12.2.6]

1318.13 Category 3 Dental Air and Nitrogen Supply Systems Purge Tests. The purge tests for dental air and nitrogen supply systems shall be conducted as follows:
(1) The outlets in each Category 3 dental air and nitrogen supply piping system shall be purged to remove any particulate matter from the distribution piping.
(2) The test gas shall be oil-free, dry nitrogen NF or the system gas.
(3) Each outlet shall be purged with an intermittent high-volume flow of test gas until the purge produces no discoloration in a clean white cloth.
(4) The purging shall be started at the furthest outlet in the system and proceed toward the source equipment. [NFPA 99:5.3.12.2.6]

### TABLE 17011

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<td>Medical Gas Systems Inspectors</td>
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### TABLE 1: Mandatory Referenced Standards

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<td>Specification for HEPA Filters Used by DOE Contractors</td>
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<td>NFPA 70-2017</td>
<td>National Electrical Code</td>
<td>1210.12.5(2), 1211.2.4, 1211.6, 1310.4.1, 1314.2, 1317.1(31)</td>
</tr>
<tr>
<td>NFPA 99-2015</td>
<td>Health Care Facilities Code</td>
<td>1301.3, 1309.8.6(6), 1309.13, 1317.1(9), 1325.5.9.4, 1328.1</td>
</tr>
</tbody>
</table>

Note: The ASME, ASSE, ASTM, CGA, DOE, and NFPA standards meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
The above sections have been revised to correlate with NFPA 99-2018 (latest version) in accordance with IAPMO’s Regulations Governing Committee Projects (Extract Guidelines).
Item #: 164
UPC 2021 Section: 1501.2

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

1501.2 System Design. Alternate water source systems shall be designed in accordance with this chapter by a licensed plumbing contractor, registered design professional, or licensed person who demonstrates competency to design the alternate water source system as required by the Authority Having Jurisdiction. Components, piping, and fittings used in any alternate water source system shall be listed.

SUBSTANTIATION:
The licensed plumbing contractor is not the only competent installer, but is competent and qualified to design these systems.
SUBMITTER: Billy Smith
ASPE
RECOMMENDATION:
Revise text

1501.3 Permit. It shall be unlawful for a person to construct, install, alter, or cause to be constructed, installed, or altered an alternate water source system in a building or on a premise without first obtaining a permit to do such work from the Authority Having Jurisdiction.

Exception: For single family dwellings, a construction permit shall not be required for a clothes washer only system meeting the requirements of Section 501.3.1. A written notification shall be provided to the Authority Having Jurisdiction in accordance with Section 501.3.1.

1501.3.1 Clothes Washer System. A clothes washer system in compliance with all of the following is exempt from the construction permit specified in Section 501.3 and shall be permitted to be installed or altered without a construction permit:

(1) Where required, notification has been provided to the enforcing agency regarding the proposed location and installation of a gray water irrigation or disposal system.

(2) The design shall allow the user to direct the flow to the irrigation or disposal field or the building sewer. The direction control of the gray water shall be clearly labeled and readily accessible to the user.

(3) The installation, change, alteration, or repair of the system does not include a potable water connection or a pump and does not affect other building, plumbing, electrical, or mechanical components including structural features, egress, fire-life safety, sanitation, potable water supply piping, or accessibility. The pump in a clothes washer shall not be considered part of the gray water system.

(4) The gray water shall be contained on the site where it is generated.

(5) Gray water shall be directed to and contained within an irrigation or disposal field.

(6) Ponding or runoff is prohibited and shall be considered a nuisance.

(7) Gray water shall be permitted to be released above the ground surface provided at least 2 inches (51 mm) of mulch, rock, or soil, or a solid shield covers the release point. Other methods which provide equivalent separation are also acceptable.

(8) Gray water systems shall be designed to minimize contact with humans and domestic pets.

(9) Water used to wash diapers or similarly soiled or infectious garments shall not be used and shall be diverted to the building sewer.

(10) Gray water shall not contain hazardous chemicals derived from activities such as cleaning car parts, washing greasy or oily rags, or disposing of waste solutions from home photo labs or similar hobbyist or home occupational activities.

(11) Exemption from construction permit requirements of this code shall not be deemed to grant authorization for any gray water system to be installed in a manner that violates other provisions of this code or any other laws or ordinances of the Authority Having Jurisdiction.

(12) An operation and maintenance manual shall be provided to the owner. Directions shall indicate that the manual is to remain with the building throughout the life of the system and upon change of ownership or occupancy.

(13) Gray water discharge from a clothes washer system through a standpipe shall be properly trapped in accordance with the plumbing code.

SUBSTANTIATION:
Clothes washer only systems that do not alter the existing plumbing (and follow basic health and safety guidelines) are extremely low risk and should be allowed to be installed with no permit. California has had great success with this code and there are many incentive programs across the state for the clothes washer graywater system due to its permit-exempt status. This applies ONLY to single family residential systems.
Item #: 166
UPC 2021  Section: 1501.5

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

1501.5 Maintenance and Inspection. Alternate water source systems and components shall be inspected and maintained in accordance with Section 1501.5.1 through Section 1501.5.3, the manufacturer’s recommendations, or as required by the Authority Having Jurisdiction.

SUBSTANTIATION:
Requiring systems to be maintained and inspected in accordance with the manufacturer is a simple and more effective way to achieve the same goal of having well maintained systems.
Item #: 167
UPC 2021  Section: 1501.6

SUBMITTER:  Billy Smith
        ASPE

RECOMMENDATION:
Revise text

1501.6 Operation and Maintenance Manual. An operation and maintenance manual for gray water and on-site treated water systems required to have a permit in accordance with Section 1501.3 shall be supplied to the building owner by the system designer. The operating and maintenance manual shall include the following:

(1) **Detailed Diagram of the entire system and the location of system components.**
(2) (remaining text unchanged)
(3) Details on maintaining the required water quality as determined by the Authority Having Jurisdiction for on-site nonpotable water systems.
(4) – (6) (remaining text unchanged)

(7) **Directions to the owner or occupant that the manual shall remain with the building throughout the life of the structure.**

SUBSTANTIATION:
(1) The diagram of the entire system is a "site plan" which is not a detailed drawing, rather a drawing that shows all the components and their locations. Each component may have its own detailed cut-sheets, but this is not the place to include that level of detail. (3) It should be clarified that the water quality is addressed in this code. (7) This addition should be added so the system owner knows they must pass on the O&M manual to future owners.
SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

1501.7 Minimum Water Quality Requirements. The minimum water quality for alternate water source systems shall meet the applicable water quality requirements for the intended application as determined by the Authority Having Jurisdiction. In the absence of water quality requirements, for on-site treated nonpotable systems, the water quality requirements of NSF 350 shall apply. The EPA/625/R-04/108 contains recommended water reuse guidelines to assist regulatory agencies to develop, revise, or expand alternate water source water quality standards.

Exception: Water treatment is not required for gray water used for subsurface irrigation.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF 350-2014</td>
<td>Onsite Residential and Commercial Water Reuse</td>
<td>Miscellaneous</td>
<td>1501.7, 1506.7</td>
</tr>
<tr>
<td></td>
<td>Treatment Systems</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

SUBSTANTIATION:
This would make it easier for projects to permit NSF 350 certified systems. Since most jurisdictions do not have the time, resources, or technical expertise to develop their own standards, the result of not including an outside standard like NSF 350 will result in more difficulty in permitting these systems.
Item #: 169
UPC 2021  Section: 1502.1

SUBMITTER: Billy Smith
      ASPE

RECOMMENDATION:
      Revise text

1502.1 General. Alternate water source systems shall be inspected and tested in accordance with Section 1502.2 through Section 502.3.4.

Exception: Non-pressurized graywater or on-site nonpotable water systems without any connection to a potable water system.

SUBSTANTIATION:
      Non-pressurized systems without any connection to a pressurized water systems would not require inspection for cross-connection nor inspection for testing potable water piping.
Proposals

Edit Proposal

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

1503.2 System Requirements. Gray water shall be permitted to be diverted away from a sewer or private sewage disposal system, and discharge to a subsurface irrigation or subsoil irrigation system. The gray water shall be permitted to discharge to a mulch basin for single-family and multi-family dwellings. Gray water shall not be used to irrigate root crops or food crops intended for human consumption that come in contact with soil.

1503.2.1 Surge Capacity. Gray water systems shall be designed to have the capacity to accommodate peak flow rates and distribute the total amount of estimated gray water on a daily basis to a subsurface irrigation field, subsoil irrigation field, or mulch basin without surfacing, ponding, or runoff. A surge tank is required for systems that are unable to accommodate peak flow rates and distribute the total amount of gray water by gravity drainage. The water discharge for gray water systems shall be determined in accordance with Section 1503.8.1 or Section 1503.8.2.

1503.2 Gray Water Collection Piping. New single-family dwellings shall have a separate waste piping system for all gray water fixtures per the Plumbing Code. The separate piping system shall be piped to outside the building and terminate into an approved Gray Water Diverter Valve per Section 502.5 before connecting to the waste system from non-gray water fixtures.

Exception: Where ground conditions do not provide percolation or where prohibited by the Plumbing Code.

1503.2.1 Diverter. The diverter valve shall be connected and installed in the open position to the building sewer. The gray water diversion port shall remain capped off for future use until a gray water irrigation/reuse system is installed.

1503.2.2 Access. The diverter and sewer connection shall be readily accessible for connection, inspection, maintenance, and servicing.

1503.2.3 Regulatory. Gray water reuse and irrigation system components shall meet local, and state code and regulatory requirements.

1503.3 Discharge. Gray water diverted away from a sewer or private sewage disposal system of single family and multi-family dwellings, shall discharge to a subsurface irrigation or subsoil irrigation system, or to a mulch basin, or disposal field. Gray water shall not be used to irrigate root crops or food crops intended for human consumption that come in contact with soil.

1503.4 Surge Capacity. Gray water systems shall be designed to have the capacity to accommodate flow rates entering the system and distribute the total amount of estimated gray water entering the system on a daily basis to a subsurface irrigation field, subsoil irrigation field, or mulch basin without surfacing, ponding, or runoff. A surge tank is required for systems that are unable to accommodate peak flow rates and distribute the total amount of gray water by gravity drainage. The water discharge for gray water systems shall be determined in accordance with Section 502.12.1 or Section 502.12.2. Systems that produce more gray water than needed by the landscape shall discharge excess water into the sewer or private sewage disposal system.

1503.2.2 1503.5 Diversion. The gray water system shall connect to the sanitary drainage system downstream of fixture traps and vent connections through an approved gray water diverter valve(s) approved by the Authority Having Jurisdiction. The gray water diverter shall be installed in an accessible location and clearly indicate the direction of flow.

Exception: A clothes washer system in compliance with Section 501.3.1

1503.2.3 1503.6 Backwater Valves. Gray water drains subject to backflow shall be provided with a backwater valve so located as to be accessible for inspection and maintenance.

[Renumber the remaining sections]

SUBSTANTIATION:
Total gray water systems cannot be installed unless the waste piping from all the fixtures allowed on a gray water system are piped together to outside the building initially as part of the original dwelling construction. It would be cost prohibitive to try to implement a total gray water system for all the allowed fixtures after the building is built, especially if the house is a slab on ground construction. Pre-plumbing piping systems into buildings is beginning to show in green building programs. Retrofitting grey water into existing, occupied structures is unlikely to occur due to costs and difficulty in re-piping.
SUBMITTER: Gary Sato  
GreenSmart Sustainable Concepts

RECOMMENDATION:
Revise text

1503.2.2 Diversion. The gray water system shall connect to the sanitary drainage system downstream of fixture traps and vent connections through an approved gray water diverter valve. The gray water diverter valve shall comply with IAPMO PS 59 and be installed in an accessible location and clearly indicate the direction of flow.

<table>
<thead>
<tr>
<th>TABLE 1701.1</th>
<th>REFERENCED STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD NUMBER</td>
<td>STANDARD TITLE</td>
</tr>
<tr>
<td>IAPMO PS 59-2016</td>
<td>Wastewater Diverter Valves and Diversion Systems</td>
</tr>
</tbody>
</table>

Note: IAPMO PS 59 meets the requirements for mandatory reference standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
Many of the diverter valves installed for use in grey water systems to date are not intended for this application. A common type being used for greywater diversion are pool and spa diverter valves. These valves have ridges, pockets, 90 Degree changes in direction and other aspects that promote the capture solids in the valve body. These captured solids can foul and compromise the health and safety of the public. This proposal provides clear directions to the end user of the code which diverter valves are safe and approved for this use.
SUBMITTER: Garry Sato  
Greensmart Sustainable Concepts  

RECOMMENDATION:  
Add new text  

1503.0 Gray Water Systems.  
(remaining text unchanged)  

1503.2 System Requirements.  

1503.2.2 Diversion. The gray water system shall connect to the sanitary drainage system downstream of fixture traps and vent connections through an approved gray water diverter valve. The gray water diverter valve shall be installed in an accessible location and clearly indicate the direction of flow.  

1503.2.4 Rainwater Diversion Valves. Butterfly valves, gate valves, ball valves or other approved valves shall be used in rainwater diversion systems. The requirements of Section 1503.2.2 shall apply. Valve shall be accessible for service and inspection. Installations with rainwater drains subject to debris buildup shall include a debris collection device, catchment, or filter, located upstream of the valve, and accessible for inspection and maintenance.  

SUBSTANTIATION:  
The usage of butterfly type valve designs in large Alternate Non Potable Water Source Systems, relating to rainwater collection and treatment. From a technical standpoint there are no certifiable ball valves manufactured in 6" and larger that would pass a third party testing of the current test standards available for standard listed/approved usage. These valves would only be approved for use in Alternative Non Potable Water Source Systems.
SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

1504.6 Mulch Basin Design and Construction. A mulch basin shall comply with Section 1504.6.1 through Section 1504.6.42.

1504.6.1 Single Family and Multi-Family Dwellings. The grey water discharge to a mulch basin is limited to single family and multi-family dwellings.

[renumber remaining sub-sections]

SUBSTANTIATION:
Using a mulch basin is a method of filtering and distributing graywater subsurface. It is an affordable and simple method to increase absorption in the soil, decrease soil compaction, and provide surge capacity. If a designer/installers wants to use this method it should not matter what type of building the water is coming from. The amount of flow and types of plants that will be irrigated will determine if this method is preferable over others. Evergreen Lodge near Yosemite, CA is a great example of mulch basin irrigation being used in a commercial application. They have 40 cabins, a commercial laundry, and staff showers and laundry all on greywater with mulch basins.
SUBMITTER: Jack Tseng  
Greenergy Group, Inc.

RECOMMENDATION:  
Revise text

1506.0 On-Site Treated Nonpotable Water Systems.  

1506.7 On-Site Treated Nonpotable Water Devices and Systems. Devices or equipment used to treat on-site treated nonpotable water to maintain the minimum water quality requirements determined by the Authority Having Jurisdiction shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) or approved for the intended application. Devices or equipment used to treat on-site treated nonpotable water for use in the water closet and urinal flushing, surface irrigation, and similar applications shall comply with IAPMO IGC 324 for use in single family dwellings, NSF 350 where used in residential or commercial applications or be approved by the Authority Having Jurisdiction.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO IGC 324</td>
<td>Alternate Water Source Systems for Single Family Dwellings</td>
<td>Miscellaneous</td>
<td>1506.7</td>
</tr>
</tbody>
</table>

Note: IAPMO IGC 324 meets the requirements for mandatory reference standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
Systems compliant with IGC 324 are limited to use in single family dwellings. This addition will improve the health and safety of the public by providing access to affordable systems, where the alternative is a do-it-yourself greywater pond or tank installed without a permit or the help of a professional plumber. The existing requirements in this section of the code, instead of facilitating growth in this much-needed technology, has in fact stifled the market, and created very little choice in products for the public. In the face of a growing water shortage and the importance of these types of systems. IAPMO IGC 324 is a realistic approach to test and list water reuse systems for use in single family homes.
SUBMITTER: Bob Brill, Brian O'Neil, Kevin Schwalb (TRSA); Daniel Soussa (Patriot Linen Services); Dave Prink (ALSCO); David Cotter (TCATA); David Netusil (JENSEN USA.); Gary Von (Valet Services); Jeff Kosek (Thermal Engineering of Arizona); Joanna Chanaj, Joel Bell, Keith Smedley, Kevin Garrett, Randall Chambers, Sara White, Tim Cosgrave (UniFirst); Keith Pooler (Sacramento Linen and Laundry Service); Kevin Minissian (Norchem); Noel Richardson (Shasta Linen Supply)

RECOMMENDATION:
Revise text

1506.0 On-Site Treated Nonpotable Water Systems.

1506.7 On-Site Treated Nonpotable Water Devices and Systems. Devices or equipment used to treat on-site treated nonpotable water to maintain the minimum water quality requirements determined by the Authority Having Jurisdiction shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) or approved for the intended application. Devices or equipment used to treat on-site treated nonpotable water for use in the water closet and urinal flushing, surface irrigation, and similar applications shall comply with NSF 350 or be approved by the Authority Having Jurisdiction.

SUBSTANTIATION:
Commercial laundries have had the installation of water reuse systems in their plants stopped by plumbing inspectors because the systems being installed are not NSF 350 certified which is required by section 1504.7 of the UPC. These water reuse systems would drastically reduce wastewater while also provide clean safe reusable water for laundry systems which would not come into contact with the public. Currently, NSF/ANSI Standard 350 does not have the appropriate categories to test and certify commercial laundry facilities. Also, during the initial Standards Development process, the NSF International 350 Task Group did not have representatives from the commercial laundry sector. As such, the current NSF/ANSI 350 Standard should not be used or required for commercial laundry facilities. Deleting the NSF 350 certification requirement would allow more efficient and updated systems be installed which leads to cleaner, safer water and a reduction in wastewater. NSF has supplied a letter (uploaded) supporting the exclusion of NSF 350 as it pertains to section 1504.7 of the UPC and commercial laundries.
Item #: 176

UPC 2021 Section: 1601.2

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

1601.2 System Design. Rainwater catchment systems shall be designed in accordance with this chapter by a person registered or licensed to perform plumbing design work licensed plumbing contractor, registered design professional, or who demonstrates competency to design the rainwater catchment system as required by the Authority Having Jurisdiction. Components, piping, and fittings used in any rainwater catchment systems shall be listed.

Exceptions:

(1) A person registered or licensed to perform plumbing design work is not required to design rainwater catchment systems used for irrigation with a maximum storage capacity of 360 gallons (1,361 L) where the tank is supported directly upon grade and the ratio of height to width (or diameter) does not exceed 2 to 1.

(2) A person registered or licensed to perform plumbing design work is not required to design rainwater catchment systems for single family dwellings where outlets, piping, and system components are located on the exterior of the building.

SUBSTANTIATION:
The licensed plumbing contractor is not the only competent installer, but is competent and qualified to design these systems. 360 gallons is very small, this water would be used up in a less than week to irrigate a 1,000 square foot lawn during the summer. There is no real difference in the complexity or design of a 360 gallon system versus a 5,000 gallons system, so long as the tank is stable on a stable foundation. By using the 5,000 gallons number this code would be consistent with most existing codes for water storage- no permit is needed so long as the tank is under 5,000 gallons. This would also be consistent with California's rainwater code.
Item #: 177
UPC 2021  Section: 1601.3

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

1601.3 Permit. It shall be unlawful for a person to construct, install, alter, or cause to be constructed, installed, or altered a rainwater catchment system in a building or on a premise without first obtaining a permit to do such work from the Authority Having Jurisdiction.

Exceptions:

(1) A permit is not required for exterior rainwater catchment systems used for outdoor drip and subsurface irrigation with a maximum storage capacity of 5,000 gallons (18,927 L) where the tank is supported directly upon grade and the ratio of height to width (or diameter) does not exceed 2 to 1 and it does not require electrical power or a make-up water supply connection.

(2) A plumbing permit is not required for rainwater catchment systems for single family dwellings where outlets, piping, and system components are located on the exterior of the building. This does not exempt the need for permits where required for electrical connections, tank supports, or enclosures.

SUBSTANTIATION:
Exempting permits from systems with the tanks smaller than 5,000 gallons would be consistent with most codes for water storage tanks as well as California's rainwater code. If the tank is stable, upon grade, and doesn't require power or make-up water it is a very safe and low-risk system and thus should not require permits.
Item #: 178

UPC 2021 Section: 1601.7

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION: Revise text

1601.7 Minimum Water Quality Requirements. The minimum water quality for rainwater catchment systems shall meet the applicable water quality requirements for the intended application as determined by the Authority Having Jurisdiction. Water quality for nonpotable rainwater catchment systems shall comply with Section 1602.9.6.

Exceptions:

(1) Water treatment is not required for rainwater catchment systems used for aboveground irrigation with a maximum storage capacity of 360 gallons (1363 L).

(2) Water treatment is not required for rainwater catchment systems used for nonspray subsurface or drip irrigation.

SUBSTANTIATION: This should specify nonspray irrigation to avoid confusion from regulators that may interpret drip irrigation as requiring treatment, even though it says below that drip does not require treatment- it is a form of above ground irrigation.
Item #: 179
UPC 2021  Section: 1602.1

SUBMITTER: Billy Smith  
ASPE

RECOMMENDATION:  
Revise text

1602.1 General. The installation, construction, alteration, and repair of rainwater catchments systems intended to supply uses such as water closets, urinals, trap primers for floor drains and floor sinks, irrigation, industrial processes, water features, cooling tower makeup and other uses shall be approved by the Authority Having Jurisdiction. Additional design criteria can be found in the ARCSA/ASPE 63 Standard.

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCSA/ASPE 63-2013</td>
<td>Rainwater Catchment Systems</td>
<td>Miscellaneous</td>
</tr>
</tbody>
</table>

(portion of table not shown remains unchanged)

SUBSTANTIATION:
the ARCSA/ASPE 63 is an ANSI standard that has additional design criteria for rainwater catchments systems.
Item #: 180
UPC 2021  Section: 1602.8

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

1602.8 Rainwater Catchment Water System Color and Marking Information. Rainwater catchment systems shall have a colored background in accordance with Section 601.3. Rainwater catchment systems shall be marked or field-marked, in lettering in accordance with Section 601.3.3, with the words: “CAUTION: NONPOTABLE RAINWATER WATER, DO NOT DRINK.”

SUBSTANTIATION:
Most systems are marked in the field. Rainwater Water is redundant. Propose to remove the redundancy.
Item #: 181
UPC 2021  Section: 1603.0, 1603.1

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

1602.9 1603.0 Design and Installation.
1602.9.1 1603.1 Outside Hose Bibbs. Outside hose bibbs shall be allowed on rainwater piping systems. Hose bibbs supplying rainwater shall be marked with the words: “CAUTION: NONPOTABLE RAINWATER, DO NOT DRINK” and in Figure 1602.9.1.

SUBSTANTIATION:
Change numbering to indicate a new section for Design and Installation. Add the word “Rain” to water since this section concerns rainwater.
Item #: 182
UPC 2021 Section: 1603.3 - 1603.5

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

1602.9.3 1603.3 Rainwater Catchment System Collection Surfaces. Rainwater shall be collected from roof surfaces or other manmade, aboveground collection surfaces.

1602.9.4 1603.3.1 Other Surfaces. Natural precipitation collected from surface water runoff, vehicular parking surfaces or manmade surfaces at or below grade shall be in accordance with the stormwater requirements for on-site treated nonpotable water systems in Section 1506.0.

1602.9.5 1603.3.2 Prohibited Discharges. Overflows and bleed-off pipes from roof-mounted equipment and appliances shall not discharge onto roof surfaces that are intended to collect rainwater without prior approval from the Authority Having Jurisdiction.

1602.9.6 1603.4 Minimum Water Quality. The minimum water quality for harvested rainwater shall meet the applicable water quality requirements for the intended applications as determined by the Authority Having Jurisdiction. In the absence of water quality requirements determined by the Authority Having Jurisdiction, the minimum treatment and water quality shall be in accordance with Table 1602.9.6 1603.4.

Exception: No treatment is required for rainwater used for subsurface or nonsprinkled surface irrigation where the maximum storage volume is less than 360 gallons (1,363 L).

1603.4.1 Treatment. If the quality of the tested water cannot consistently be maintained at the minimum levels specified in Table 1603.4, then the system shall be equipped with an appropriate treatment device meeting applicable NSF Standard referenced in Table 1701.1.

<table>
<thead>
<tr>
<th>APPLICATION</th>
<th>MINIMUM TREATMENT</th>
<th>MINIMUM WATER QUALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car washing</td>
<td>Debris excluder or other approved means in accordance with Section 1603.14, and 100 microns in accordance with Section 1603.15 for drip irrigation.</td>
<td>N/A</td>
</tr>
<tr>
<td>Subsurface and drip irrigation</td>
<td>Debris excluder or other approved means in accordance with Section 1603.14, and 100 microns in accordance with Section 1603.15 for drip irrigation.</td>
<td>N/A</td>
</tr>
<tr>
<td>Spray irrigation where the maximum storage volume is less than 360 gallons</td>
<td>Debris excluder or other approved means in accordance with Section 1603.14, and disinfection in accordance with Section 1603.12.</td>
<td>N/A</td>
</tr>
<tr>
<td>Spray irrigation where the maximum storage volume is equal to or more than 360 gallons</td>
<td>Debris excluder or other approved means in accordance with Section 1603.14.</td>
<td>Escherichia coli: &lt; 100 CFU/100 mL, and Turbidity: &lt; 10 NTU</td>
</tr>
<tr>
<td>Urinal and water closet flushing, clothes washing, and trap priming</td>
<td>Debris excluder or other approved means in accordance with Section 1603.14, and 100 microns in accordance with Section 1603.15.</td>
<td>Escherichia coli: &lt; 100 CFU/100 mL, and Turbidity: &lt; 10 NTU</td>
</tr>
<tr>
<td>Ornamental fountains and other water features</td>
<td>Debris excluder or other approved means in accordance with Section 1603.14.</td>
<td>Escherichia coli: &lt; 100 CFU/100 mL, and Turbidity: &lt; 10 NTU</td>
</tr>
<tr>
<td>Cooling tower make-up water</td>
<td>Debris excluder or other approved means in accordance with Section 1603.14, and 100 microns in accordance with Section 1603.15.</td>
<td>Escherichia coli: &lt; 100 CFU/100 mL, and Turbidity: &lt; 10 NTU</td>
</tr>
</tbody>
</table>

For SI units: 1 micron = 1 µm, 1 gallon = 3.785 L
1603.0 1603.5 Rainwater Storage Tanks. 1603.1 General. Rainwater storage tanks shall be constructed and installed in accordance with Section 1603.5.1 through Section 1603.5.8. [renumber remaining Sections]

SUBSTANTIATION:
Changing the heading of proposed 1603.3 to Collection Surfaces and renumbering the following two as sub-sections. Adding an Exception to 1603.4 for small systems that do not need a permit. Adding a new section on Treatment to recommend minimum requirements.
Item #: 183
UPC 2021 Section: Appendix E

SUBMITTER: IAPMO Staff - Update Extracts
NFPA 501A Extract Update

RECOMMENDATION:
Revise text

E 401.3 Location of Gas Supply Connection. The gas supply to the manufactured home shall be located within 4 feet (1219 mm) of the manufactured home stand.

Exception: The requirements of E 401.3 shall not apply to gas supply connections for manufactured homes located on all-weather wood, concrete, or concrete block foundation systems or on foundations constructed in accordance with the local building code or, in the absence of a local code, with a recognized model building code. [NFPA 501A:4.1.3]

E 402.3 Shutoff Valve. Each manufactured home site shall have a listed gas shutoff valve installed upstream of the manufactured home site gas outlet. The gas shutoff valve shall be located on the outlet riser at a height of not less than 6 inches (152 mm) above grade. A gas shutoff valve shall not be located under any manufactured home. The outlet shall be equipped with a cap or plug to prevent discharge of gas whenever the manufactured home site outlet is not connected to a manufactured home. [NFPA 501A:4.2.2.1 – 4.2.2.4]

Exception: Gas shutoff valves shall conform to Section E 402.3, except for manufactured homes located on foundations constructed in accordance with the local building code or, in the absence of a local code, with a recognized model building code. [NFPA 501A:4.2.2]

TABLE E 403.2
DEMAND FACTORS FOR USE IN CALCULATING GAS PIPING SYSTEMS IN MANUFACTURED HOME COMMUNITIES
[NFPA 501A: TABLE 4.3.4.1]

<table>
<thead>
<tr>
<th>NUMBER OF MANUFACTURED HOME SITES</th>
<th>BRITISH THERMAL UNITS PER MANUFACTURED HOME SITE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>125,000</td>
</tr>
<tr>
<td>2</td>
<td>117,000</td>
</tr>
<tr>
<td>3</td>
<td>104,000</td>
</tr>
<tr>
<td>4</td>
<td>96,000</td>
</tr>
<tr>
<td>5</td>
<td>92,000</td>
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<tr>
<td>6</td>
<td>87,000</td>
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<tr>
<td>7</td>
<td>83,000</td>
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<td>8</td>
<td>81,000</td>
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<tr>
<td>9</td>
<td>79,000</td>
</tr>
<tr>
<td>10</td>
<td>77,000</td>
</tr>
<tr>
<td>11–20</td>
<td>66,000</td>
</tr>
<tr>
<td>21–30</td>
<td>62,000</td>
</tr>
<tr>
<td>31–40</td>
<td>58,000</td>
</tr>
<tr>
<td>41–60</td>
<td>55,000</td>
</tr>
<tr>
<td>Over 60</td>
<td>50,000</td>
</tr>
</tbody>
</table>

For SI units: 1000 British thermal units per hour = 0.293 kW

E 403.8.4 Plastic Gas Piping. Plastic gas piping shall be used only underground and shall be installed with an electrically conductive wire for locating the pipe. The wire used to locate the plastic pipe shall be copper, not smaller in size than 18 AWG, with insulation approved for direct burial. Every portion of a plastic gas piping system consisting of metallic pipe shall be cathodically protected against corrosion. [NFPA 501A:4.3.7.3.1 – 4.3.7.3.3]

E 403.9 Gas Piping System Shutoff Valve. An accessible and identifiable shutoff valve controlling the flow of gas to the entire manufactured home community gas piping system shall be installed in a location acceptable to the Authority Having Jurisdiction and near the point of connection to the service piping or to the supply connection of an LP-
E 404.0 Fuel Supply Systems Installation.

E 404.1 Flexible Gas Connector. Except for manufactured homes located on an all-weather wood, concrete, or concrete block foundation system or on a foundation constructed in accordance with the local building code or, in the absence of a local code, with a recognized model building code, each gas supply connector shall be listed for outside manufactured home use, shall be not more than 6 feet (1829 mm) in length, and shall have a capacity rating to supply the connected load. [NFPA 501A:4.4.1]

E 404.3 Mechanical Protection. All gas outlet risers, regulators, meters, valves, and other exposed equipment shall be protected against accidental damage. [NFPA 501A:4.4.3]

E 404.6 Oil Tanks. Oil tanks tank capacities shall comply with the following:

(1) No more than one 660 gallon (2498 L) tank or two tanks with an aggregate capacity of 660 gallons (2498 L) or less shall be connected to one oil-burning appliance.

(2) Two supply tanks, where used, shall be cross-connected and provided with a single fill and single vent, as described in NFPA 31 and shall be on a common slab and rigidly secured, one to the other.

(3) Tanks having a capacity of 660 gallons (2498 L) or less shall be securely supported by rigid, noncombustible supports to prevent settling, sliding, or lifting. [NFPA 501A:4.4.6]

SUBSTANTIATION:
In accordance with IAPMO Governing Consensus Project, Section Appendix E is being revised to the latest edition of NFPA 501A-2017.
An installer has a 120 000 British thermal units per hour (Btu/h) (35 kW) input appliance with a 5 inch (127 mm) diameter draft hood outlet that needs to be vented into a 10 foot (3048 mm) high Type B vent system. What size vent shall be used assuming: (1) a 5 foot (1524 mm) lateral single-wall metal vent connector is used with two 90 degree (1.57 rad) elbows or (2) a 5 foot (1524 mm) lateral single-wall metal vent connector is used with three 90 degree (1.57 rad) elbows in the vent system? (See Figure G 101.3)

Solution:

Table 510.1.2(2) shall be used to solve this problem because single-wall metal vent connectors are being used with a Type B vent, as follows:

1. Read down the first column in Table 510.1.2(2) until the row associated with a 10 foot (3048 mm) height and 5 foot (1524 mm) lateral is found. Read across this row until a vent capacity exceeding 120 000 Btu/h (35 kW) is located in the shaded columns labeled NAT Max for draft-hood-equipped appliances. In this case, a 5 inch (127 mm) diameter vent has a capacity of 122 000 Btu/h (35.7 kW) and shall not be permitted to be used for this application.

2. Where three 90 degree (1.57 rad) elbows are used in the vent system, the maximum vent capacity listed in the tables shall be reduced by 10 percent. This implies that the 5 inch (127 mm) diameter vent has an adjusted capacity of only 110 000 Btu/h (32 kW). In this case, the vent system shall be increased to 6 inches (152 mm) in diameter.

See the following calculations:

\[ 122 000 \text{ Btu/h (35.7 kW)} \times 0.90 = 110 000 \text{ Btu/h (32 kW)} \]

This figure is exceeding the required 120 000 Btu/h (35 kW). Therefore, use a 6 inch (152 mm) vent and connector where three elbows are used.

**G 101.4 Example 2: Single Fan-Assisted Appliance.** An installer has an 80 000 Btu/h (23.4 kW) input fan-assisted appliance that shall be installed using 10 feet (3048 mm) of lateral connector attached to a 30 foot high (9144 mm) Type B vent. Two 90 degree (1.57 rad) elbows are needed for the installation. Can a single-wall metal vent connector be used for this application? (See Figure G 101.4)

Solution:

Table 510.1.2(2) refers to the use of single-wall metal vent connectors with Type B vent. In the first column find the row associated with a 30 foot (9144 mm) height and a 10 foot (3048 mm) lateral. Read across this row, looking at the FAN Min and FAN Max columns, to find that a 3 inch (76 mm) diameter single-wall metal vent connector is not recommended. Moving to the next larger size single-wall connector [4 inch (102 mm)] we find that a 4 inch (102 mm) diameter single-wall metal vent connector has a recommended minimum vent capacity of 91 000 Btu/h and a recommended maximum vent capacity of 144 000 Btu/h (42 kW). The 80 000 Btu/h (23.4 kW) fan-assisted appliance is outside this range, so the conclusion is that a single-wall metal vent connector cannot be used to vent this appliance using a 10 foot (3048 mm) of lateral for the connector. However, if the 80 000 Btu/h (23.4 kW) input appliance is moved within 5 feet (1524 mm) of the vertical vent, a 4 inch (102 mm) single-wall metal connector could be used to vent the appliance. Table G101.1.2(2) shows the acceptable range of vent capacities for a 4 inch (102 mm) vent with 5 feet (1524 mm) of lateral to be between 72 000 Btu/h (21.1 kW) and 157 000 Btu/h (49 kW).

If the appliance cannot be moved closer to the vertical vent, then a Type B vent shall be used as the connector material. In this case, Table G 101.1.2(1) shows that, for a 30 foot (9144 mm) high vent with 10 feet (3048 mm) of lateral, the acceptable range of vent capacities for a 4 inch (102 mm) diameter vent attached to a fan-assisted appliance is between 37 000 Btu/h (10.8 kW) and 150 000 Btu/h (44 kW).

**G 101.6 Example 4: Common Venting Two Draft Hood-Equipped Appliances.** A 35 000 Btu/h (10.3 kW) water heater is to be common vented with a 150 000 Btu/h (44 kW) furnace, using a common vent with a total height of 30 feet (9144 mm). The connector rise is 2 feet (610 mm) for the water heater with a horizontal length of 4 feet (1219 mm). The connector rise for the furnace is 3 feet (914 mm) with a horizontal length of 8 feet (2438 mm). Assume single-wall metal connectors will be used with Type B vent. What size connectors and combined vent should be used in this installation? (See Figure G 101.6)

Solution:

Table 510.2(2) shall be used to solve this problem because single-wall metal vent connectors are being used with a Type B vent. In the first column find the row associated with a 30 foot (9144 mm) height and a 10 foot (3048 mm) lateral for the connector. Moving to the next larger size single-wall connector [4 inch (102 mm)] we find that a 4 inch (102 mm) diameter single-wall metal vent connector has a capacity of 37 000 Btu/h (10.8 kW). Therefore, a 3 inch (76 mm) single-wall metal vent connector can be used for the water heater. For a draft-hood-equipped furnace with a 3 foot (914 mm) rise, read across the acceptable row to find that a 5 inch (127 mm) diameter vent connector has a maximum capacity of 120 000 Btu/h (35 kW) which is too small for the furnace, and a 6 inch (152 mm) diameter vent connector has a maximum vent capacity of 172 000 Btu/h (50 kW). Therefore, a 6 inch (152 mm) diameter vent connector shall be used with the 150 000 Btu/h (44 kW) furnace. Since both vent connector, horizontal lengths are less than the maximum lengths listed in Section 510.2.1; the table values shall be used without adjustments.
In the common vent capacity portion of Table 510.2(2), find the row associated with a 30 foot (9144 mm) vent height and read over to the NAT + NAT portion of the 6 inch (152 mm) diameter column to find a maximum combined capacity of 257,000 Btu/h (75 kW). Since the two appliances total only 185,000 Btu/h (54 kW), a 6 inch (152 mm) common vent shall can be used.

G 101.9 Example 5(c): Common Venting into an Exterior Masonry Chimney. In this case, the water heater and fan-assisted furnace of G 101.7 Example 5(a) and G 101.8 Example 5(b) are to be common-vented into an exterior masonry chimney. The chimney height, clay-tile-liner dimensions, and vent connector heights and laterals are the same as in G 101.8 Example 5(b). This system is being installed in Charlotte, North Carolina. Does this exterior masonry chimney need to be relined? If so, what corrugated metallic liner size is recommended? What vent connector diameters are recommended? [See Table G 101.8 and Figure 510.1.10]

Solution:

According to Section 510.2.20, Type B vent connectors are required to be used with exterior masonry chimneys. Use Table 510.2(8) and Table 510.2(9) to size FAN+NAT common venting installations involving Type-B double-wall connectors into exterior masonry chimneys.

The local 99 percent winter design temperature needed to use Table 510.2(8) and Table 510.2(9) can be found in ASHRAE Handbook – Fundamentals. For Charlotte, North Carolina, this design temperature is 19°F (-7.2°C).

Chimney Liner Requirement. As in Example 5(b), use the 63 square inches (0.04 m²) Internal Area column for this size clay tile liner. Read down the 63 square inches (0.04 m²) column of Table 510.2(8) to the 30 foot (9144 mm) height row to find that the combined appliance maximum input is 747,000 Btu/h (218.9 kW). The combined input rating of the appliances in this installation, 135,000 Btu/h (40 kW), is less than the maximum value, so this criterion is satisfied. Table 510.2(9), at a 19°F (-7.2°C) design temperature, and at the same vent height and the internal area used earlier, shows that the minimum allowable input rating of a space-heating appliance is 470,000 Btu/h (137.7 kW). The furnace input rating of 100,000 Btu/h (29 kW) is less than this minimum value. So this criterion is not satisfied, and an alternative venting design needs to be used, such as a Type B vent shown in Example 5(a) or a listed chimney liner system as shown in the remainder of the example.

According to Section 510.2.19, Table 510.2(1) or Table 510.2(2) is used for sizing corrugated metallic liners in masonry chimneys, with the maximum common vent capacities reduced by 20 percent. This example will be continued assuming Type B vent connectors.

Water Heater Vent Connector Diameter. Using Table 510.2(1) Vent Connector Capacity, read down the total Vent Height (H) column to 30 feet (9144 mm), and read across the 2 feet (610 mm) Connector Rise (R) row to the first Btu/hour rating in the NAT Max column that is equal to or greater than the water heater input rating. The table shows that a 3 inch (76 mm) vent connector has a maximum capacity of 39,000 Btu/h (11.4 kW). Although this rating is greater than the water heater input rating, a 3 inch (76 mm) vent connector is prohibited by Section 510.2.20. A 4 inch (102 mm) vent connector has a maximum input rating of 70,000 Btu/h (20.5 kW) and is equal to the draft hood outlet diameter. A 4 inch (102 mm) vent connector is selected.

Furnace Vent Connector Diameter. Using Table 510.2(1), Vent Connector Capacity, read down the total Vent Height (H) column to 30 feet (9144 mm), and read across the 3 feet (914 mm) Connector Rise (R) row to the first Btu/h rating in the FAN MAX column that is equal to or greater than the furnace input rating. The 100,000 Btu/h (29 kW) furnace in this example falls within this range, so a 4 inch (102 mm) connector is adequate.

Chimney Liner Diameter. The total input to the common vent is 135,000 Btu/h (40 kW). Using the Common Vent Capacity portion of Table 510.2(1), read down the total Vent Height (H) column to 30 feet (9144 mm) and across this row to find the smallest vent diameter in the FAN + NAT column that has a Btu/h rating greater than 135,000 Btu/h (40 kW). The 4 inch (102 mm) common vent has a capacity of 138,000 Btu/h (40.4 kW). Reducing the maximum capacity by 20 percent results in a maximum capacity for a 4 inch (102 mm) corrugated liner of 110,000 Btu/h (32 kW), less than the total input of 135,000 Btu/h (40 kW). So a larger liner is needed. The 5 inch (127 mm) common vent capacity listed in Table 510.2(1) is 210,000 Btu/h (62 kW), and after reducing by 20 percent is 168,000 Btu/h (49.2 kW). Therefore, a 5 inch (127 mm) corrugated metal liner should be used in this example.

Single Wall Connectors. Once it has been established that relining the chimney is necessary, Type B double-wall vent connectors are not specifically required. This example could be redone using Table 510.2(2) for single-wall vent connectors. For this case, the vent connector and liner diameters would be the same as found for Type B double-wall connectors.

SUBSTANTIATION:
In accordance with IAPMO Governing Consensus Project, Section Appendix G is being revised to the latest edition of NFPA 54-2018.
Item #: 185
UPC 2021  Section: K 101.7

SUBMITTER: Billy Smith  
ASPE

RECOMMENDATION:  
Revise text

K 101.7 Minimum Water Quality Requirements. The minimum water quality for all potable rainwater catchment systems shall comply with the applicable water quality requirements as determined by the Public Health Authority Having Jurisdiction. In the absence of water quality requirements, the guidelines EPA/625/R-04/108 contains recommended water reuse guidelines to assist regulatory agencies develop, revise, or expand alternate water source water quality standards.

SUBSTANTIATION:  
As stated in the provisions, EPA/625/R-04/108 is a recommended guideline to assist regulators when there are no water quality requirements. See EPA/625/R-04/108 attachment
Item #: 186
UPC 2021  Section: K 103.2

SUBMITTER:  Billy Smith
ASPE

RECOMMENDATION:
Revise text

K 103.2 Rainwater Catchment System Drainage Materials. Materials used in rainwater catchment drainage systems, including gutters, downspouts, conductors, and leaders shall be in accordance with the requirements of this code for storm drainage. Gutters and downspouts used in rainwater catchment drainage systems shall comply with NSF Protocol P151, and leaders and conductors shall be listed to NSF 61.

Note: NSF 61 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
Recommend applying the appropriate Standards for gutters, downspouts, leaders and conductors when used for a potable rainwater catchment system.
K 104.3 Minimum Water Quality. Upon initial system startup, the quality of the water for the intended application shall be verified at the point(s) of use, as determined by the Authority Having Jurisdiction in accordance with Section K 104.3.1 and Section K 104.3.2. Water quality maintenance shall be according to Section K 104.3.3. In the absence of water quality requirements determined by the Authority Having Jurisdiction, the minimum water quality shall be in accordance with Table K 104.3(1). Normal system maintenance will require system testing every 3 months. Systems shall comply with Table K 104.3(2).

K 104.3.1 Private Potable Water System. In the absence of water quality requirements determined by the Authority Having Jurisdiction, the minimum water quality for a private potable water system at the point of use shall comply with Table K 104.3.1.

**TABLE K 104.3(1) MINIMUM WATER QUALITY**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escherichia coli (fecal coliform)</td>
<td>99.9% reduction</td>
</tr>
<tr>
<td></td>
<td>Non-detectable</td>
</tr>
<tr>
<td>Protozoan Cysts</td>
<td>99.9% reduction</td>
</tr>
<tr>
<td></td>
<td>Non-detectable</td>
</tr>
<tr>
<td>Viruses</td>
<td>99.9% reduction</td>
</tr>
<tr>
<td></td>
<td>Non-detectable</td>
</tr>
<tr>
<td>Turbidity</td>
<td>&lt;0.3 NTU</td>
</tr>
</tbody>
</table>

**Notes:**
1. Upon failure of the fecal coliform test, the system shall be re-commissioned involving cleaning and retesting in accordance with Section K 104.3.
2. One sample shall be analyzed for applications serving up to 1000 persons. Where the treated water shall serve 1000 - 2500 persons two samples shall be analyzed, and for 2501 - 3300 persons three samples shall be analyzed.

K 104.3.2 Public Use Occupancies. The minimum water quality for a potable water system for public use occupancies at the point of use and testing procedures shall comply with the Environmental Protection Agency (EPA) Safe Drinking Water Act for a public water system.

K 104.3.3 Maintenance. Normal system maintenance shall require system testing for Escherichia coli (fecal coliform) and turbidity every 3 months in accordance with Table K 104.3.3. Upon failure of the fecal coliform test, system shall be re-commissioned involving cleaning, and retesting in accordance with section K 104.3. Testing for viruses and cysts shall occur once after 3 months of initial operation and once every 12 months thereafter.

**Exception:** Upon failure of the virus or cyst test, the tests will be repeated every 3 months until the tests results are negative for two consecutive tests.

**TABLE K 104.3(2) MINIMUM SYSTEM MAINTENANCE REQUIREMENTS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escherichia coli (fecal coliform)</td>
<td>99.9% reduction</td>
</tr>
<tr>
<td></td>
<td>Non-detectable</td>
</tr>
<tr>
<td>Turbidity</td>
<td>&lt;0.3 NTU</td>
</tr>
</tbody>
</table>

**Notes:**
1. Upon failure of the fecal coliform test, the system shall be re-commissioned involving cleaning and retesting in accordance with Section K 104.3.
2. One sample shall be analyzed for applications serving up to 1000 persons. Where the treated water shall serve 1000 - 2500 persons two samples shall be analyzed, and for 2501 - 3300 persons three samples shall be analyzed.
**Public Water System.** A system for the provision to the public of water for human consumption through pipes or other constructed conveyances. If such system has at least fifteen service connections or regularly serves an average of twenty-five individuals daily for at least 60 days per year.

**SUBSTANTIATION:**
Two sub-sections were created to distinguish private potable water systems from public use occupancies that would fall under the EPA requirements. A percentage reduction is not applicable for testing, but rather non-detectable is the applicable testing result. The cost of testing should neither be onerous or the basis to eliminate testing.
Item #: 188

UPC 2021  Section: K 104.4 - K 104.5

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

K-106.0  K 104.4  Water Quality Devices and Equipment. K-106.1  General. Devices and equipment used to treat rainwater to maintain the minimum water quality requirements determined by the Authority Having Jurisdiction shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) and approved for the intended application.

K-104.4  K 104.4.1  Filtration Devices. Potable water filters shall comply with NSF 53 and shall be installed in accordance with the manufacturer’s installation instructions.

K-104.4  K 104.4.2  Disinfection Devices. Chlorination, ozone, ultraviolet, or other disinfection methods approved by the Authority Having Jurisdiction, or the product is listed and certified according to a microbiological reduction performance standard for drinking water, shall be used to treat harvested rainwater to meet the required water quality permitted. The disinfection devices and systems shall be installed in accordance with the manufacturer’s installation instructions and the conditions of listing. Disinfection devices and systems shall be located downstream of the storage tank.

K-104.5  K 104.5.1  Filtration and Disinfection Systems. Filtration and disinfection systems shall be located after the water storage tank. Where a chlorination system is installed, it shall be installed upstream of filtration systems. Where an ultraviolet disinfection system is installed, a filter not more than 5 microns (5 µm) shall be installed upstream of the disinfection system.

K-104.6  K 104.5.2  Overhanging Tree Branches and Vegetation. Tree branches and vegetation shall not be located over the roof or other aboveground rainwater collection surface. Where existing tree branch and vegetation growth extends over the rainwater collection surface, it shall be removed in accordance with Section K 101.5.

(renumber remaining sections)

SUBSTANTIATION:
Moving sections from K 106.0 and K 106.2 to K 104.4 and K 104.4.3 to combine all the provisions together that are applicable to Water Quality Devices and Equipment.
Item #: 189
UPC 2021  Section: K 105.11

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

K 105.11 Pumps. Pumps serving rainwater catchment systems shall be listed for potable water use. Pumps supplying water to water closets, urinals, and trap primers shall be capable of delivering not less than 15 pounds-force per square inch (psi) (103 kPa), the minimum residual pressure required by the highest and most remote outlet served. Where the water pressure in the rainwater supply system within the building exceeds 80 psi (552 kPa), a pressure reducing valve reducing the pressure to 80 psi (552 kPa) or less to water outlets in the building shall be installed in accordance with this code.

SUBSTANTIATION:
Per ASME A112.19.2, the testing requirements for products, specifically flushometer water closets, are such that the residual pressure is higher than 15psi. In the interest of clarity, consistency and product performance, the system should be designed to accommodate the relevant fixture requirements.
Evapotranspiration (ET). The combination of water transpired from vegetation, and evaporated from the soil, water, and plant surfaces. Evapotranspiration rates are values expressed in inches (mm) per unit of time (day, week, month, or year). Evapotranspiration rates vary by climate, components of weather conditions, including insolation, humidity, temperatures and wind, and time of year. Common usage includes evapotranspiration as the base rate (water demand of 4-6 inch (102 mm – 152 mm) for cool season grass), with coefficients for specific plant types. Evapotranspiration rates are used as a factor in estimating the irrigation water needs of landscapes. Local agriculture extension, state departments of agriculture, water agencies, irrigation professionals, and internet websites are common sources for obtaining local evapotranspiration rates.

Irrigation Control System. An irrigation control system consists of a combination of a programmable controller using one or more inputs or sensors that, in combination, estimate or measure the availability of moisture for plants in order to operate an irrigation system, in such a manner that the system replenishes water as needed while minimizing excess water use. A properly programmed irrigation control system requires initial site specific set-up and will make irrigation schedule adjustments, including run times and required cycles throughout the irrigation season without human intervention.

Irrigation Demand. The amount of water not supplied by natural precipitation that is needed to maintain landscape plant life in good condition. Irrigation demand is calculated by subtracting natural effective precipitation from the ET rate adjusted by the landscape coefficient which includes the functional purpose and desired quality of the plant being irrigated.

Modified Evapotranspiration. Numeric values, expressed in inches/hr., of evapotranspiration rates, derived by altering ETo rates by applying factors of specific needs of the vegetation and local climate conditions. Modified evapotranspiration rates are used as a factor in estimating the irrigation water needs of landscapes. Common usage includes reference evapotranspiration as the base rate, modified by coefficients or factors for specific plant types and densities.

Reference Evapotranspiration (ETo). Numeric value, expressed in inches/hr., calculated as the water necessary to produce maximum biomass based upon a cool-season turf grass 4-6 inches tall. Common sources for obtaining local reference evapotranspiration rates are local agriculture extension services, state departments of agriculture, water agencies, irrigation professionals, the United States Geological Survey, and internet websites.

SUBSTANTIATION:
Recommend adding new landscaping terms to the definitions. The definition for Evapotranspiration (ET) is amended as a definition without the added commentary.
Item #: 191
UPC 2021  Section: L 201.0

SUBMITTER: Billy Smith
        ASPE

RECOMMENDATION:
Revise text

L 201.0 Definitions

Gang Showers. Shower compartments designed and intended for use by multiple persons simultaneously in non-residential occupancies.

SUBSTANTIATION:
Striking out the last clause because it is not an essential element of the meaning.
Item #: 192
UPC 2021 Section: L 201.0

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Add new text

L 201.0 Definitions

**WaterSense.** A voluntary program of the U.S. Environmental Protection Agency designed to identify and promote water-efficient products and practices.

SUBSTANTIATION:
The term is used several times in Appendix L.
Item #: 193
UPC 2021 Section: L 301.3

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Add new text

L 301.0 General Regulations.

L 301.3 System Design Considerations. The design of the water distribution systems shall be in accordance with ASHRAE 188.
Exception: Single-family residential buildings.

TABLE 1701.1 REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTION</th>
</tr>
</thead>
</table>

Note: ASHRAE 188 meets the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
There are factors that influence bacteriological growth in building water systems. These include the water’s age, temperature, the amount of residual disinfectant and the design of the water system. ASHRAE has developed and published standard 188 as an American National Standard to address Legionella risk mitigation. The requirements contained within this standard will work to mitigate the risks of legionellosis outbreaks from all building water systems.
Item #: 194

UPC 2021  Section: L 302.1

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

**L 302.1 Disposal.** It shall be unlawful for a person to cause, suffer, or permit the disposal of sewage, human excrement, or other liquid wastes, in a place or manner, except through and by means of an approved drainage system, installed and maintained in accordance with the provisions of this code.

*Exception: Composting toilets.*

SUBSTANTIATION:
Composting toilets do not utilize a drainage system.
Item #: 195

UPC 2021: Section: L 402.2, L 402.2.2, Table L 402.1

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 402.2 Water Closets. No water closet shall have a flush volume exceeding 1.6 gallons per flush (gpf) (6.0 Lpf).

L 402.2.2 Flushometer-Valve Activated Water Closets. Flushometer-valve activated water closets shall have a maximum flush volume of not more than 1.6 gallons (6.0 L) of water per flush in accordance with ASME A112.19.2/CSA B45.1 and shall be listed to the EPA WaterSense Specification for Flushometer-Valve Water Closets.

<table>
<thead>
<tr>
<th>TABLE L 402.1</th>
</tr>
</thead>
<tbody>
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For SI units: 1 gallon per minute = 0.06 L/s, 1 pound-force per square inch = 6.8947 kPa, 1 inch = 25.4 mm, 1 gallon = 3.785 L

Notes:
1 For multiple showerheads serving one shower compartment see Section L 402.6.1
2 Shall also be listed to EPA WaterSense Tank-Type Toilet Specification.
3 Shall also be listed to EPA WaterSense Flushing Urinal Specification. Nonwater urinals shall comply with specifications listed in Section L 402.3.1.
4 Remote location is where a water closet is located not less than 30 feet (9.144 meters) upstream of the nearest drain line connection or fixture and is located where less than 1.5 drainage fixture units are upstream of the water closet drain line connection.
5 See Section L 402.4.

SUBSTANTIATION:
The advancement of product and building design, the success of dual-flush toilets with a maximum full flush of 1.28 gpf, and the release of a WaterSense specification for labeling flushometer valve/bowl combination water closets makes adjustments to the flush volume requirements of this standard feasible. As proposed, the above revisions make this standard consistent with the provisions of ASHRAE SS189.1. See EPA WaterSense Specification for Flushometer-Valve Water Closets attachment.

246
Item #: 196
UPC 2021  Section: L 402.3.1

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 402.3.1 Nonwater Urinals. Nonwater urinals shall comply with ASME A112.19.3/CSA B45.4, ASME A112.19.19 or CSA B45.5/IAPMO Z124. Nonwater urinals shall be cleaned and maintained in accordance with the manufacturer’s instructions after installation. Where nonwater urinals are installed, they shall have a water distribution line roughed-in to the urinal location at a height not less than 56 inches (1422 mm) to allow for the installation of an approved backflow prevention device in the event of a retrofit. Such water distribution lines shall be installed with shutoff valves located as close as possible to the distributing main to prevent the creation of dead ends. Where nonwater urinals are installed, not less than one water supplied fixture rated at not less than 1 drainage fixture unit (DFU) shall be installed upstream on the same drain line to facilitate drain line flow and rinsing.

Exception: Nonwater urinals used as part of a composting toilet system.

SUBSTANTIATION:
Nonwater urinals that serve a urine diversion system with composting toilets should be exempt from the requirement of a water distribution line since a urine diversion system is not designed for a flush volume of water to mix with and enter into a urine holding tank.
SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 402.6 Showerheads. Showerheads shall comply with the requirements of the Energy Policy Act of 1992, except that the flow rate shall not exceed 2.0 gpm (7.6 L/m) at 80 psi (552 kPa), where and shall be listed to ASME A112.18.1/CSA B125.1 and the EPA WaterSense Specification for Showerheads.

SUBSTANTIATION:
The Energy Policy Act does not contain any showerhead requirements not already included within EPA WaterSense, ASME A112.18.1/CSA B125.1 and 2.0 gpm at 80 psi. See EPA WaterSense Specification for Showerheads attachment.
**Item #: 198**

UPC 2021  Section: L 402.6.1

**SUBMITTER:** Billy Smith  
ASPE

**RECOMMENDATION:**  
Revise text

**L 402.6.1 Multiple Showerheads Serving One Shower Compartment.** The total allowable flow rate of water from multiple showerheads flowing at a given time, with or without a diverter, including rain systems, waterfalls, bodysprays, and jets, shall not exceed 2.0 gpm (7.6 L/m) per shower compartment, where the floor area of the shower compartment is less than 1800 square inches (1.161 m²). For each increment of 1800 square inches (1.161 m²) of floor area after that or part thereof, additional showerheads are allowed, provided the total flow rate of water from flowing devices shall not exceed 2.0 gpm (7.6 L/m) for each such increment.

**Exceptions:**

(1) Gang showers in non-residential occupancies. Singular showerheads or multiple shower outlets serving one showering position in gang showers shall not have more than 2.0 gpm (7.6 L/m) total flow.

(2) Where provided, accessible shower compartments required for persons with disabilities in accordance with Table 1701.1 shall not be permitted to have more than 4.0 gpm (15 L/m) total flow, where one outlet is the hand shower. The hand shower shall have control with a nonpositive shutoff feature.

**SUBSTANTIATION:**

It is redundant and unnecessary to require specific product accessibility features, such as nonpositive shutoff, in this standard because appropriate accessibility requirements will be adopted by the local Authority Having Jurisdiction.
Item #: 199
UPC 2021  Section: L 402.6.2

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 402.6.2 Bath and Shower Diverters. The rate of leakage out of the tub spout of bath and shower diverters while operating in the shower mode shall not exceed 0.1 gpm (0.4 L/min) in accordance with ASME A112.18.1/CSA B125.1. Tub spout bath and shower diverters, while operating in the shower mode, shall perform with zero leakage.

SUBSTANTIATION:
The California Energy Commission (CEC) database of August 12, 2015 shows there are 475 models of certified no-leak tub spout diverters available today in the U.S. marketplace. These models come from over 2 dozen different manufacturers. This provision does nothing to prevent the marketplace continuing to function just as it does now throughout the U.S. It ONLY sets a more up-to-date and aggressive water-efficient threshold for those intending to utilize the WE-Stand document (identical to the situation created for many other water efficient products). Arguments have been made that there is no listing process available for these no-leak products, yet that is NOT the case. The CEC’s database has existed since the standard was set by that organization 20 years ago. It is readily accessible from anywhere in the U.S., centralized (unlike for other plumbing products where listings are maintained by multiple different accredited certification bodies), easy to use, and fully capable of supporting the inquiries and actions needed by the authorities having jurisdiction, plumbers, contractors, engineers, design professionals, and members of the general public. The arguments in opposition to no-leak TSDs offered by manufacturers are merely another roadblock intended to again thwart change and movement toward more water-efficient designs and practices.
Item #: 200

UPC 2021  Section: L 402.6.3

SUBMITTER: Billy Smith  
ASPE

RECOMMENDATION:  
Revise text

L 402.6.3 Shower Valves. Shower valves shall comply with the temperature control performance requirements of ASSE 1016 or ASSE 1016/ASME A112.18.1/CSA B125.1 where when tested for the rated flow rate of the installed showerhead at 2.0 gpm (7.6 L/min).

L 402.6.3.1 Marking. Control valves for showers and tub-shower combinations shall be tagged, labeled, or marked with the manufacturer’s minimum rated flow and such marking shall be visible after installation.

Note: ASSE 1016/ASME A112.18.1/CSA B125.1 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:  
Revised the standard for shower valves to the harmonized standard. The harmonized standard allows for the testing of flow rates lower than 2.0gpm. The marking/labeling provision is important to protect against scalding when considering aftermarket changes to the shower components, especially showerheads. See ASSE 1016/ASME A112.18.1/CSA B125.1 attachment.
Item #: 201  
UPC 2021  Section: L 402.7  

SUBMITTER: Billy Smith  
ASPE  

RECOMMENDATION:  
Revise text  

L 402.7 Commercial Pre-Rinse Spray Valves. The flow rate for a pre-rinse spray valve installed in a commercial kitchen to remove food waste from cookware and dishes before cleaning shall not be more than 1.28 gpm (4.8 L/m) at 60 psi (414 kPa). Where pre-rinse spray valves with maximum flow rates of 1.0 gpm (3.8 L/m) or less are installed, the static pressure shall be not less than 30 psi (207 kPa). Commercial kitchen pre-rinse spray valves shall be equipped with an integral automatic shutoff. Pre-rinse spray valves shall be listed to the EPA WaterSense Commercial Pre-rinse Spray Valve Specification.  

SUBSTANTIATION:  
The recommended flow rates reflect the EPA WaterSense specification.
Item #: 202

UPC 2021  Section: L 402.9

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 402.9 Drinking Fountains and Bottle Filling Stations. Bottle filling stations shall be included on or used as a substitute to meet the requirements of drinking fountains in at least 50 percent of the requirements for drinking fountains. Bottle filling stations and drinking fountains shall be self-closing.

SUBSTANTIATION:
Less water is wasted during the drinking process as virtually no water is lost down the drain unlike traditional drinking fountains which generate up to 50% wastewater into the drainage system. This 50% waste in traditional fountains has been documented in calculations in the outdated ARI 1010 standard (which used 60% for pre-chilling calculations) and confirmed in product testing. Bottle filling stations will reduce the amount of waste generated from plastic bottles that are used to provide drinking water.
Item #: 203
UPC 2021 Section: L 403.0 - L 403.9.13

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Add new text

L 403.0 Composting Toilet and Urine Diversion Systems

L 403.1 General. The provisions of this section shall apply to the design, construction, performance, alteration, and repair of composting toilet and urine diversion systems.

L 403.2 Design and Construction Requirements. Composting toilets, composting toilet systems, and urine diversion systems shall meet the design, construction, and performance requirements of Section L 403.2.1 or Section L 403.2.2.

L 403.2.1 Listed Composting Toilets and Composting Toilet Systems. Composting toilets and composting toilet systems shall be listed to NSF 41.

L 403.2.2 Alternative Design Systems. Where approved by the Authority Having Jurisdiction, composting toilet and urine diversion systems for residential and commercial applications shall comply with the provisions of Section L 403.3 through Section L 403.9.

L 403.3 System Materials and Components. Pipe, pipe fittings, traps, fixtures, material, and devices used in composting toilet and urine diversion systems that are expected to contact excreta or diverted urine shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body), unless otherwise approved by the Authority Having Jurisdiction. Materials and components shall comply to approved applicable recognized standards referenced in this standard and the plumbing code, and shall be free from defects. Unless otherwise provided for in this standard, materials, fixtures, or devices used or entering into the construction of plumbing systems, or parts thereof, shall be submitted to the Authority Having Jurisdiction for approval.

L 403.4 System Design. Composting toilet and urine diversion systems complying with Section L 403.0 shall be designed by a person registered or licensed to perform plumbing design work or who demonstrates competency to design composting toilet and urine diversion systems.

L 403.5 Permit. It shall be unlawful for any person to construct, install, alter, or cause to be constructed, installed, or altered any composting toilet and urine diversion system in a building or on a premise without first obtaining a permit to do such work from the Authority Having Jurisdiction.

L 403.6 Maintenance and Inspection. Composting toilet and urine diversion systems and components shall be maintained and inspected in accordance with Section L 403.6.1 through Section L 403.6.3.

L 403.6.1 Maintenance Responsibility. The required maintenance and inspection of composting toilet and urine diversion systems shall be the responsibility of the property owner, unless otherwise required by the Authority Having Jurisdiction. The property owner is responsible for retaining test result records in accordance with Section L 403.6.5.2 and making them available to the Authority Having Jurisdiction upon request. Upon transfer of property or tenancy, all test records shall be transferred and humus shall be re-tested after its first treatment period and a record retained.

L 403.6.2 Operation. Composting toilet and urine diversion systems shall be operated in a safe and sanitary condition in accordance with the owner’s manual in accordance with Section L 403.7.

L 403.6.3 Inspection. In the event of a nuisance complaint or documented system failure, the composting toilet and urine diversion system shall be made available for inspection and the owner or owner’s agent shall conduct sufficient repairs or alterations to the composting toilet system. At the request of the Authority Having Jurisdiction, results of all laboratory testing and new tests in accordance with Section L 403.8.5 following repairs to alleviate dangerous or unsanitary conditions shall be provided at the owner’s expense.

L 403.7 Operation and Maintenance Manual. An owner’s manual shall present clear instructions for maintenance and be transferred to the new owner upon transfer of property or tenancy. The owner’s manual shall include:

1. Schedule for addition of necessary compost additives.
2. Source or provider of necessary compost additives. Source may be on-site.
3. Schedule and instructions for all regular maintenance tasks.
4. Expected input of and capacity for excreta and compost additives to compost toilet system specifying loading of commode(s) and compost processor(s).
5. Plan for container transfer and cleaning where transfer is used.
6. Expected schedule for removing humus from composting processors and where used secondary composting bins.
7. Plan for on-site disposal of humus or professional removal.
9. Plan for microbial testing in accordance with Section L 403.8.5.2.

L 403.8 Composting Toilet System Design Requirements. The design and installation of composting toilet systems shall be in accordance with Section L 403.8.1 through Section L 403.8.6.

L 403.8.1 Corrosion Resistance. All components expected to contact excreta or leachate shall be constructed of corrosion-resistant material such as stainless steel or durable polymers. Concrete in contact with excreta or leachate shall meet requirements of Section L 403.8.2.

L 403.8.2 Concrete Construction. Concrete construction shall be reinforced, watertight and able to withstand loading weight. Where drainage is required, the processor floor shall be sloped not less than ¼-inch per foot. The flange of each sub-drain shall be set level.
L 403.8.3 Commodes.

L 403.8.3.1 Structure. Commodes shall be designed to support users.

L 403.8.3.2 Odor. Commode design or use shall mitigate the infiltration of odors into the building during normal operation and in the event of temporary power failure.

L 403.8.3.3 Contact. Commodes shall transport excreta into the compost processor or contain excreta for transfer as designed according to the owner’s manual.

L 403.8.3.4 Vectors. Commodes shall limit vectors and prevent human contact except for regular maintenance as designed according to the owner’s manual.

L 403.8.4 Compost Processors. Compost processors shall be designed in accordance with Sections L 403.8.4.1 through L 403.8.4.9 and shall maintain unsaturated aerobic composting conditions within the compost mass, through the drainage, absorption, or desiccation of leachate, and aeration of the processor.

L 403.8.4.1 Leachate. Leachate shall be collected for removal or recirculation within the processor, evaporated, or drained to an approved plumbing drainage system or other location approved by the Authority Having Jurisdiction. Leachate storage tanks shall be constructed and installed in accordance with the following:

L 403.8.4.1.1 Vents. Leachate storage tanks shall be vented as required for pressure equalization. When required, vents shall be installed on leachate storage tanks and shall extend from the top of the tank. The connection of storage tank vents to the plumbing venting system shall be six inches above the floor level rim of the highest fixture. Vents extending to the outdoor shall terminate no less than 12 inches above grade. The vent terminal shall be directed downward and covered with a 3/32 inch mesh screen to prevent the entry of vermin and insects.

L 403.8.4.1.1.1 Vent Size. Pressure equalization vents that prevent nitrogen loss by the use of restrictions, or of piping or tubing that is less than the minimum pipe diameter required in the plumbing code shall be approved by the Authority Having Jurisdiction.

L 403.8.4.1.2 Overflow. Where storage tank overflows are installed they shall be connected to the plumbing drainage system.

L 403.8.4.1.2.1 Backwater Valve. Storage tank overflows, when subject to backflow, shall be provided with a backwater valve at the point of connection to the plumbing drainage system. The backwater valve shall be accessible for inspections and maintenance.

L 403.8.4.1.3 Construction. Leachate storage tanks shall be constructed of polyethylene terephthalate (PET), polyethylene naphthalate (PEN), polyamide (Nylon) or a blend of PET, PEN, ethyl vinyl alcohol (EVOH), Nylon, HDPE, or other tanks listed or certified to US 49 CFR Section 178.274 Specifications for UN Portable Tanks.

L 403.8.4.1.4 Above Grade. Above grade storage tanks are prohibited where subject to freezing conditions or shall be provided with an adequate means of freeze protection. The above grade leachate storage tank shall be provided with a high-water alarm. The alarm shall report when 80 percent volume is reached.

L 403.8.4.1.5 Below Grade. Leachate storage tanks installed below grade shall be structurally designed to withstand all anticipated earth or other loads. Tank covers shall be capable of supporting an earth load of not less than 300 pounds per square foot (lb/ft²) (1465 kg/m²) when the tank is designed for underground installation. Below grade leachate tanks installed underground shall be provided with manholes. The manhole opening shall be a minimum diameter of 20 inches (508 mm) and located a minimum of 4 inches (102 mm) above the surrounding grade. The surrounding grade shall be sloped away from the manhole. Underground tanks shall be ballasted, anchored, or otherwise secured. In vent the tank from floating out of the ground when empty. The combined weight of the tank and hold down system should meet or exceed the buoyancy force of the tank. The below grade leachate storage tank level shall be provided with a high-water alarm.

L 403.8.4.1.6 Marking. Where openings are provided to allow a person to enter the tank, the opening shall be marked with the following words: “DANGER-CONFINED SPACE.”

L 403.8.4.1.7 Openings. All openings shall be covered and secured to prevent tampering. Openings shall be screened or covered to prevent rodent infiltration and be protected against unauthorized human entry.

L 403.8.4.2 Vectors. The compost processor shall be designed and installed to limit vector access through management as required in the owner’s manual.

L 403.8.4.3 Transfer. Where unfinished excreta or diverted urine is transferred between processors or from commode to processor, transfer and cleaning of containers and provisions for limiting user exposure shall be according to the owner’s manual.

L 403.8.4.4 Watertightness. Processors shall be constructed of watertight material in accordance with Section L 403.8.1.

L 403.8.4.5 Rodentproofing. The compost processor shall be protected to prevent the entrance of insects, birds, or rodents. No unsecured opening other than vents, drainage, or commode may exceed ½-inch in the least dimension.

L 403.8.4.6 Active Conditions. The compost processor or processors shall be sized to compost excreta for a minimum of one year of biologically active conditions. Biologically active conditions are at or above a daily average of 42°F (6°C).

Exception: Systems with shorter retention shall be permitted where either:

(a) Humus from the compost processor has been tested according to Section L 403.8.5.2 and there is either a secondary composting stage where humus is retained in a well maintained compost bin or other facility designated for the exclusive purpose of containing humus removed from the compost processor, or

(b) Humus is removed off site for processing or disposal at an approved facility.

L 403.8.4.7 Secondary Composting. Humus to be transferred to secondary composting shall first be tested according to Section L 403.8.5.2. Secondary composting shall be labeled and protected from human contact. Contact with precipitation and surface waters is prohibited.

L 403.8.4.8 Ventilation. Negative ventilation between the commode and compost processor shall be provided when the compost processor is connected directly to the commode without a trap. Commodes that are not connected to the compost processor do not require a vent.

L 403.8.4.9.1 Vent Terminals. Vent stacks shall terminate exterior the building as required by the plumbing or mechanical code.

L 403.8.4.9.1 Sizing. The compost processor shall be sized to accommodate the maximum daily adult usage as specified by the manufactures published ratings. Site built compost processors shall be sized to hold a minimum of 10 gallons of material per person per year while allowing for the removal of the humus, or as specified by the system designer.

L 403.8.5 Testing. Composting toilet systems shall be tested in accordance with Section L 403.8.5.1 and Section L 403.8.5.2.

L 403.8.5.1 Compost Processors. Compost processors shall be tested for water tightness by filling the system to the maximum designed liquid storage capacity of the unit for a duration of 24 hours.

L 403.8.5.2 Humus. The owner or owner’s agent of the composting toilet system shall verify user’s compliance with the manufacturer’s maintenance and operation manual in accordance with Section L 403.7 by submitting a sample of the humus from the first treatment period after a minimum of one year of biologically active conditions to a certified laboratory before removal of humus from the composting processor. Where multiple compost processors are used, the humus sample shall be removed from the last compost processor. The sample collection shall be tested in accordance with EPA/625/R-92/013, Appendix F, Section 1.2. Humus shall not have a moisture content exceeding 75 percent by weight, and shall not exceed 200 fecal coliforms/gm.

L 403.8.6 Humus Removal. Humus shall be removed according to the owner’s manual. Humus from the compost processor used around ornamental shrubs, flowers, trees, or fruit trees shall be mixed with soil or mulch and covered with no less than 3 inches of cover material. Depositing humus from any composting toilet system around any edible vegetable or vegetation shall be prohibited.

L 403.9 Urine Diversion System Design Requirements. The design and installation of urine diversion systems shall be in accordance with Section L 403.9.1 through Section L 403.9.13.

L 403.9.1 Purpose. The purpose of this section is to enable the installation of urine diversion and collection systems to improve the function of composting toilet systems and prevent nutrient pollution of ground and surface waters.

L 403.9.2 Material Requirements. Material used for urine diversion shall be stainless steel or non-metallic pipe. Concrete piping is prohibited.
L 403.9.3 Identification. All urine diversion piping shall be identified.

L 403.9.4 Change of Direction. Changes in direction of urine diversion piping shall be made by a long-sweep 90 degree fitting or other approved fittings of equivalent sweep.

L 403.9.5 Sizing. Pipe sizes shall be in accordance with the plumbing code. Each urine diversion fixture shall be rated as one drainage fixture unit. Piping or tubing for urine diversion that is less than the minimum pipe diameter required in the plumbing code shall be approved by the Authority Having Jurisdiction.

L 403.9.6 Traps. Fixtures discharging into urine diversion piping connected to the plumbing drainage system shall be trapped and vented according to the plumbing code.

L 403.9.7 Grade of Horizontal Piping. Urine diversion piping shall be installed at a minimum grade of 1/2-inch per foot, or 4 percent toward the point of disposal.

L 403.9.8 Cleanouts. A cleanout shall be provided at the upper terminal of each drain pipe, every 50 feet and at an aggregate horizontal change of direction exceeding 135 degrees.

L 403.9.9 Venting. Commode fixtures without traps that require ventilation shall be connected to either a dry toilet ventilation stack or a urine diversion ventilation stack. Nonwater urinals used as urine diversion systems shall be connected to a dry toilet ventilation stack or a urine diversion ventilation stack.

L 403.9.10 Discharge. A urine-diversion system shall be diverted to a storage tank or discharge to an approved plumbing drainage system.

L 403.9.11 Urine Storage Tanks. Urine storage tanks shall be constructed and installed in accordance with Section L 403.9.11.1 through Section L 403.9.11.8.

L 403.9.11.1 Venting. Urine storage tanks shall be vented as required for pressure equalization. When required, vents shall be installed on urine storage tanks and shall extend from the top of the tank. The connection of storage tank vents to the plumbing venting system shall be six inches above the flood level rim of the highest fixture. Vents extending to the outdoor shall terminate no less than 12 inches above grade. The vent terminal shall be directed downward and covered with a 3/32 inch mesh screen to prevent the entry of vermin and insects.

L 403.9.11.1.1 Vent Size. Pressure equalization vents that prevent nitrogen loss by the use of restrictions, or of piping or tubing that is less than the minimum pipe diameter required in the plumbing code shall be approved by the Authority Having Jurisdiction.

L 403.9.11.2 Traps. Urine storage tanks shall prevent odors and nitrogen loss from the tank inlet by means of a P-trap, mechanical trap, submerged inlet piping, or other means approved by the Authority Having Jurisdiction. Submerged inlet piping shall remain submerged during use and after pumpout.

Exception: Tanks of five gallons or less connected to fixtures with active ventilation or having an integrated seal.

L 403.9.11.3 Overflow. Where storage tank overflows are installed they shall be connected to a plumbing drainage system.

L 403.9.11.3.1 Backwater Valve. Storage tank overflows subject to backflow shall be provided with a backwater valve at the point of connection to the plumbing drainage system when connected to a public sewer system or on-site wastewater system. The backwater valve shall be accessible for inspections and maintenance.

L 403.9.11.4 Construction. Urine storage tanks shall be constructed of polyethylene terephthalate (PET), polyethylene naphthalate (PEN), polyamide (Nylon) or a blend of PET, PEN, ethyl vinyl alcohol (EVOH), Nylon, HDPE, or other tanks listed or certified to US 49 CFR Section 178.274 Specifications for UN Portable Tanks.

L 403.9.11.5 Above Grade. Above grade storage tanks shall be prohibited where subject to freezing conditions, or shall be provided with an adequate means of freeze protection. The above grade urine storage tank shall be provided with a high-water alarm. The alarm shall sound when 80 percent volume is reached.

L 403.9.11.6 Below Grade. Urine storage tanks installed below grade shall be structurally designed to withstand all anticipated earth or other loads. Tank covers shall be capable of supporting an earth load of not less than 300 pounds per square foot (29 kN/m2) when the tank is designed for underground installation. Below grade urine tanks installed underground shall be provided with manholes. The manhole opening shall be a minimum diameter of 20 inches (508 mm) and located a minimum of 4 inches (102 mm) above the surrounding grade. The surrounding grade shall be sloped away from the manhole. Underground tanks shall be ballasted, anchored, or otherwise secured, to prevent the tank from floating out of the ground when unused. The combined weight of the tank and hold down system should meet or exceed the buoyancy force of the tank. The below grade urine storage tank level shall be provided with a high-water alarm. The alarm shall sound when 80 percent volume is reached.

L 403.9.11.7 Marking. Where openings are provided to allow a person to enter the tank, the opening shall be marked with the following words: “DANGER-CONFINED SPACE.”

L 403.9.11.8 Openings. All openings shall be covered and secured to prevent tampering. Openings shall be screened or covered to prevent rodent infiltration and be protected against unauthorized human entry.

L 403.9.12 Maintenance Plan. Every urine diversion system shall have a maintenance plan that includes both a pumpout schedule and contract, or an onsite discharge plan. The maintenance plan shall also include a pipe cleaning schedule.

L 403.9.13 Treatment, Reuse, and Disposal. Where urine is to be reused onsite, a treatment method for sanitization shall be included in the owner’s manual. Approved methods of treatment shall include:

1. Retention without addition for six months before usage. Two or more holding tanks shall be required for retention.
2. Application to the compost processor.
3. Pasteurization to 158° F. (70°C) for thirty minutes, or
4. Other method approved by the Authority Having Jurisdiction.

[Add the following to the Section L 201.0 Definitions]:

Commode. The composting toilet fixture for collecting, containing, or transporting excreta to the compost processor.

Compost Additives. Any material such as sawdust, wood shavings, and other compostable material added to the commode or compost processor to maintain operational conditions within the composting toilet system.

Composting Toilet System. A system designed to safely collect and process excreta and compost additives into humus through aerobic decomposition.

Compost Processor. The site of aerobic decomposition transforming excreta and compost additives into humus.

Desiccation. The process of dehydrating excreta or leachate.

Diverted Urine. Urine that is collected and has not made contact with feces.

Excreta. Includes but is not limited to urine, feces, menses, toilet paper, and other human body emissions and biodegradable cleaning products.

Humus. The biologically decomposed, soil-like output of the compost processor.

Leachate. Liquid draining from the compost processor.

Owner’s Manual. A manual provided to the owner containing instructions for all management aspects of that system.

Secondary Composting. Additional retention and continued decomposition of humus removed from compost processors in order to meet a safe retention time.

Transfer. The controlled transfer of excreta or partially processed humus between commode and composting processor or between multi-stage composting processors.

Urine Diverter. Separation of urine from other excreta that occurs at the commode.
Vectors. An organism that has the potential to transmit disease.

SUBSTANTIATION:
Water scarcity and pollution concerns are driving the adoption of composting and urine diversion toilet systems in the US and internationally. The composting provisions provide for strict protections on public health while also encouraging the growth of domestic industry and innovation in composting and urine diversion systems. In combination with performance testing, prescriptive guidelines for ventilation, screening, and retention time of compost and urine present simple, easy-to-follow and inspection requirements that protect public health even in the event of system failure and poor owner maintenance. These provisions mandate that unsaturated aerobic decomposition conditions be maintained, that temperature stay within the range of beneficial decomposing organisms, and that decomposition occur for at least one year, outside the survival time of pathogens. In the event of maintenance failure, watertightness, screening, and ventilation requirements prevent both public health threats from arising and major inconvenience in the home. Urine diversion can reduce nitrogen in domestic wastewater by 80%, and Composting Toilet Systems can reduce household nitrogen by close to 90%, both at installed costs of $3-6000. This is a higher performance than Alternative Treatment Technologies (ATTs) and sand filters currently required in many jurisdictions with surface and groundwater concerns, and at a fraction of the cost. These provisions bring new, lower cost options for environmental protection to homeowners. Two pathways of compliance are paved for either listed systems to the NSF/ANSI Standard 41, or alternative systems meeting the prescriptive requirements contained in this section.
Item #: 204

UPC 2021  Section: L 404.2

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 404.2 Ice Makers. Ice makers shall be air cooled and shall be in accordance with Energy Star for commercial ice machines. Ice makers producing cubed-type ice shall not exceed 20 gallons of water per 100 pounds of ice produced. Ice makers producing nugget and flake ice shall not exceed 14 gallons of water per 100 pound of ice produced.

SUBSTANTIATION:
The most energy and water efficient machine (nugget and flake ice) do not yet have Energy Star labeling.
Item #: 205

UPC 2021  Section: L 404.3, L 404.4

SUBMITTER:  Billy Smith
            ASPE

RECOMMENDATION:
Revise text

L 404.3 Food Steamers.  **Boilerless type** steamers shall consume not more than 5.0 2.0 gallons (19 L) per compartment hour per steamer pan in the fully operational mode.  **Boiler type** steamers shall not consume more than 1.5 gallons (5.7 L) per pan per hour.

L 404.4 Combination Ovens.  Combination ovens shall not use water in the convection mode except when utilizing a moisture nozzle for food products in the oven.  The total amount of water used by the moisture nozzle in the convection mode shall not exceed a half a gallon per hour per oven cavity.  When operating in the steamer mode, combination ovens shall not consume more than 3.5 1.5 gallons per hour (gph) (13.2 5.7 L) per pan in the fully operational mode.

SUBSTANTIATION:
This now complies with water use levels in the new LEED Version 4.0.  Proposed changes for both food steamers and combination ovens are recommended by the Food Service Technology Center and extracted from the 2017 WEStand.
Item #: 206

UPC 2021  Section: L 404.6, L 404.6.1, L 404.6.2

SUBMITTER: Billy Smith  
ASPE

RECOMMENDATION:
Revise text

L 404.6 Dipper Well Faucets. Where dipper wells with a permanent water supply are installed, the water supply to a dipper well shall have a shut off valve and flow control. The flow of water into a dipper well shall be limited by not less than one of the following methods: Section L 404.6.1 or Section L 404.6.2.

L 404.6.1 Maximum Continuous Flow. Water flow shall not exceed the water capacity of the dipper well in one minute at supply pressure of 60 psi (414 kPa), and the maximum flow shall not exceed 2.2 0.2 gpm (8.3 0.8 L/m) at a supply pressure of 60 psi (414 kPa). The water capacity of a dipper well shall be the maximum amount of water that the fixture can hold before water flows into the drain.

L 404.6.2 Metered or Sensor Activated Flow. The volume of water dispensed into a dipper well in each activation cycle of a self-closing fixture fitting shall not exceed the water capacity of the dipper well, and the maximum flow shall not exceed 2.2 0.2 gpm (8.3 0.8 L/m) at a supply pressure of 60 psi (414 kPa).

SUBSTANTIATION:
Not all dipper wells have a permanent water supply to utensil holders. The water efficiency provisions are only applicable where a permanent water supply is provided.
Item #: 207
UPC 2021  Section: L 404.7 - L 404.7.5

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Add new text

L 404.7 Food Waste Devices. Where installed food waste devices shall be in accordance with Section L 404.7.1 through Section L 404.7.5.

L 404.7.1 Pulpers and Mechanical Strainers. The water use for the pulpers or mechanical strainers shall not exceed 2 gpm. A flow restrictor shall be installed on the water supply to limit the water flow.

L 404.7.2 Food Waste Disposers. The water use for the food waste grinder shall not exceed the 8 gpm under full load condition and 1 gpm under no-load condition. Flow restrictors shall be installed on the water supply to limit the water flow rate to a maximum of 8 gpm. A load sensing device shall be installed to monitor current demand and regulate water flow.

L 404.7.3 Time Out and Shut Off. Pulpers, mechanical strainers, and food waste disposers shall have a time out system with push button to reactivate. The maximum allowable run time cycle shall be 10 minutes.

L 404.7.4 Sink Drain Outlets. Where a strainer or basket is installed they shall be readily removable.

L 404.7.5 Strainer Baskets. Strainer (scrapper) baskets shall either fit over a sink compartment or be attached to a drain system. The strainer baskets shall be readily removable for emptying.

[renumber remaining sections]

SUBSTANTIATION:
Water efficient provisions for food waste devices were developed by a task group for inclusion in the 2015 GPMCS and is extracted from the 2017 WEStand.
Item #: 208
UPC 2021 Section: L 405.0, L 405.1

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 405.0 Leak Detection and Control.

L 405.1 General. Where installed, leak detection and control devices shall comply with IAPMO IGC 115 be approved by the Authority Having Jurisdiction. Leak detection and control devices shall not be installed where they isolate fire sprinkler systems help protect property from water damage and also conserve water by shutting off the flow when leaks are detected.

SUBSTANTIATION:
These devices should never be installed in a manner where they interfere with the operation of a fire sprinkler system in the case of a system activation. If they shut or reduce the flow of water to the sprinkler head it is a life safety issue.
L 407.0 Meters.

L 407.1 Required. A water meter shall be required for each building site connected to a public water system, including municipally supplied reclaimed (recycled) water. In other than single-family houses, a dedicated meter shall be installed in accordance to Table L 407.1. Multifamily structures of three stories or fewer above grade, and modular houses, a separate meter or submeter shall be installed in the following locations:

1. The water supply for irrigated landscape with an accumulative area exceeding 2500 square feet (232.3 m²).
2. The water supply to a water using process where the consumption exceeds 1000 gallons per day (gal/d) (0.0438 L/s), except for manufacturing processes.
3. The water supply to each building on a property with multiple buildings where the water consumption exceeds 500 gals/d (0.021 L/s).
4. The water supply to an individual tenant space on a property where one or more of the following applies:
   a. Water consumption exceeds 500 gals/d (0.021 L/s) for that tenant.
   b. Tenant space is occupied by a commercial laundry, cleaning operation, restaurant, food service, medical office, dental office, laboratory, beauty salon, or barbershop.
   c. Total building area exceeds 50,000 square feet (4645 m²).
5. The makeup water supply to a swimming pool.

TABLE L 407.1
DEDICATED WATER METERING REQUIREMENTS

<table>
<thead>
<tr>
<th>APPLICATION</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Towers</td>
<td>The makeup water supply to cooling towers, evaporative condensers, and fluid coolers. Cooling towers sharing a common basin can be grouped together using one meter.</td>
</tr>
<tr>
<td>Evaporative Coolers</td>
<td>The makeup water supply to an evaporative cooler having an air flow exceeding 30,000 cubic feet per minute (CFM) (50.97 m³/min).</td>
</tr>
<tr>
<td>Fluid Coolers and Chillers – Open Systems</td>
<td>The makeup water supply on water-cooled fluid coolers and chillers not utilizing closed-loop recirculation.</td>
</tr>
<tr>
<td>Hydronic Cooling Systems – Closed Loop</td>
<td>Systems with 30 ton (175 843W) or greater of cooling capacity and where a make-up water supply is connected.</td>
</tr>
<tr>
<td>Hydronic Heating Systems</td>
<td>The makeup water supply to one or more boilers collectively exceeding 1,000,000 British thermal units per hour (Btu/h) (293 171 W).</td>
</tr>
<tr>
<td>Industrial Processes</td>
<td>The water supply to an industrial water-using process where the average consumption exceeds 1000 gallons per day (gal/d) (3.785 L/s). Like equipment sharing one common water supply can be grouped together using one meter.</td>
</tr>
<tr>
<td>Landscape Irrigation</td>
<td>Landscape irrigation water where either of the following conditions exist:</td>
</tr>
<tr>
<td></td>
<td>1. Total accumulated landscape area with in-ground irrigation system exceeds 2500 sq. ft. (232 m²) or</td>
</tr>
<tr>
<td></td>
<td>2. Total accumulated landscape area using an automatic irrigation controller exceeds 1500 sq. ft. (139 m²)</td>
</tr>
<tr>
<td></td>
<td><strong>Exception:</strong> Where the water supply provides a separate water supply meter that serves only the irrigation system, an additional dedicated meter is not required.</td>
</tr>
<tr>
<td>Onsite Water Collection Systems</td>
<td>Potable or reclaimed water supplies for supplementing onsite alternative water collection systems.</td>
</tr>
</tbody>
</table>
**Ornamental Water Features**
Protable or reclaimed water supplies for ornamental water features where the water feature uses an automatic refill valve.

**Pools and Spas**
A makeup water supply to a swimming pool or spa.

*Exception:* Where the pool or spa has less than 100 square feet (9 m²) of water surface and is refilled from a hose bib without an automatic refill valve.

**Roof Spray Systems**
Roof spray systems for irrigating vegetated roofs or thermal conditioning covering an area greater than 300 square feet (28 m²).

*Exception:* Temporary above-surface spray systems connected to a hose bib and without an automatic controller are not required to have a dedicated meter.

**Tenant Buildings - Common Areas**
Water supplies used in common areas of a site. The dedicated meter for common area water use shall not include water supplied inside tenant space. Water supplies for sanitary fixtures and other water use in common areas can be grouped together for metering requirements, except where dedicated water meter installations are otherwise required.

**Tenant Spaces - Residential**
All water supplies to each residential tenant space for indoor water use.

*Exception:* Where a water purveyor has individual meters for each tenant space, and the other meter requirements included in Table 411.1 do not apply, no additional dedicated meter is required.

**Tenant Spaces - Non-residential, car washes**
All water supplies to individual non-residential tenant spaces for indoor water use where any of the following conditions exist:

1. The nominal size of a water supply pipe(s) to the individual tenant space is greater than 1/2", or
2. Water consumption within in the tenant space is estimated or expected to average greater than 1000 gallons/day (3785 L/d).

Where water is supplied to tenant space that is not required to have dedicated meter, the water supply pipe(s) shall be accessible to install a meter.

*Exception:* Where a water purveyor has individual meters for each tenant space and the other meter requirements included in Table 411.1 do not apply, no additional dedicated meter is required.

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**L 407.2 Approval.** Dedicated meters, other than water utility meters used for billing purposes shall be approved by the Authority Having Jurisdiction for the intended use.

**L 407.3 Consumption Data.** A means of communicating water consumption data from submeters to the water consumer shall be provided. Remote Data Transfer Requirements. Where more than 10 non-utility-owned water meters are located at a building site, the meters shall include remote data transfer capability to collect and analyze the data at a single location.

[Add the following to L 201.0 Definitions]:

**Dedicated Meter.** A water measuring device used at a subsection or end use of a water supply system for any of the following purposes: billing, water management, collecting and analyzing water usage data, detection of leaks, equipment failure, water waste, and irregular or abnormal use for a specific application. Also called a submeter.

**SUBSTANTIATION:**
Meter requirements were expanded into a Table format and aligns with ASHRAE 191. The meter requirements and provisions are extracted from the 2017 WEStand. See the 2017 WEStand attachment.
SUBMITTER: Tim Keane  
Legionella Risk Management, Inc.  
Rep: Self  

RECOMMENDATION:  
Revise text  

L 410.0 Water Softeners and Treatment Devices  

L 410.1 Water Softeners. Actuation of regeneration of water softeners shall be by demand initiation. Water softeners shall be listed to NSF 44. Water softeners shall have a rated salt efficiency exceeding 3400 grains (gr) (0.222 kg) of total hardness exchange per pound (0.5 kg) of salt, based on sodium chloride (NaCl) equivalency, and shall not generate more than 5 gallons (19 L) of water per 1000 grains (0.0647 kg) of hardness removed during the service cycle. 

Water softeners for non-residential potable use applications shall be sized as small as possible for the application and to regenerate every 72 hours or less. When using fixture count to determine peak water demand the softener sizing shall be based on softener rated peak flow. Softeners used for water intended for cold potable water use shall be approved by the Authority Having Jurisdiction. 

SUBSTANTIATION:  
Water softeners are a known Legionella risk. There is a serious need for more detailed softener sizing design guidance in codes. As with many items if an engineer is unsure of the proper sizing they will typically error on the next size bigger. With piping, water storage tanks and media filters such as water softeners the next size bigger is the wrong way to go we know calculations based on Hunter’s curves already result in oversized piping. Bigger sizing of pipes means lower velocity of water and lower velocity results in higher potential for suspended solids to settle, greater water aging and consequently more bacteria growth. When media filters such as softeners are oversized the results can be dramatically worse than oversizing pipes. If a softener is oversized: 1) The flow rate (velocity) through the softener is too slow and the water may take the path of least resistance and channel through the resin causing a small portion of the media to have flow and the rest to be bypassed, 2) The softener bed is not regenerated daily as recommended or every three days but even longer time between backwash and regeneration due to excess capacity and over this longer period of time the crud accumulating on the surface of the bed may become compacted resulting in: a. poor regeneration or b. high organic loading in the bed consuming incoming disinfectant increasing the risk for Legionella and other bacteria. A properly sized softener should consume no more than 10% of incoming municipal water disinfectant, an oversized softener can easily consume all incoming disinfectant. In addition to serious issues with bacteria growth, an oversized softener will consume more salt and waste more water in backwashing than a properly sized softener.
Item #: 211
UPC 2021  Section: L 410.1

SUBMITTER: Billy Smith  
ASPE

RECOMMENDATION:
Revise text

L 410.1 Water Softeners. Actuation of regeneration of water softeners shall be by demand initiation. Water softeners shall be listed to NSF 44. Water softeners shall have a rated salt efficiency exceeding 3400 grains (gr) (0.222 kg) of total hardness exchange per pound (0.5 kg) of salt, based on sodium chloride (NaCl) equivalency, and shall not generate more than $\frac{8}{4}$ gallons ($15.1$ L) of water per 1000 grains (0.0647 kg) of hardness removed during the service cycle.

SUBSTANTIATION:
The first sentence does not make sense. NSF/ANSI 44 applies to water softeners as a whole not just the single function of regeneration. Recommend deleting “Actuation of regeneration of...” Also, it should be noted that the requirement in this section goes above and beyond the current requirements of NSF/ANSI 44 so it is unclear how conformance would be demonstrated. The specific requirement regarding efficiency requirements should be added to NSF/ANSI 44 as a minimum requirement. The current specification for water consumption is the minimum voluntary performance specification contained in NSF44, which more than 60% of residential demand-initiated regeneration (DIR) models meet. Furthermore, at least half the residential DIR systems on the market use 4.0 gallons of water or less per 1000 grains of hardness removed. Thus, there is ample room to specify a water consumption specification that is substantially more resource-efficient than the minimum in NSF 44. This specification has been approved by the WESTand technical committee for the 2017 WESTand.
L 410.4 Drinking Water Treatment Systems. Drinking water treatment systems shall be listed to WQA/ASPE S-803.

SUBSTANTIATION:
Despite the presence of existing safety/performance standards (i.e. NSF/ANSI 42 and NSF/ANSI 53), up to this point, no sustainability standards have existed for drinking water treatment products. The Water Quality Association (WQA) partnered with PE INTERNATIONAL Inc. (PE) to assemble a team of manufacturers, component suppliers, industry experts and other key stakeholders, tasked with the development of a voluntary product sustainability standards for the water products industry, in order to improve the overall sustainability of this sector. WQA has also now partnered with ASPE to take this standard through the ANSI accreditation process. This standard has been developed by the WQA for drinking water contact products. The overall goal of this standard is to provide meaningful product sustainability performance information to consumers and stakeholders and to drive innovation and continual improvement in the sustainability performance of these products. The purposes of the WQA S-803 are as follows: A. Encourage more strategic participation among product manufacturers for the advancement of sustainable products and business practices through improvements in the areas of product design, manufacture and production site management, distribution, disposal, etc.; B. Facilitate this enhanced focus on Sustainability to leverage increased competitiveness in the market for products which qualify under these standards. C. Develop a streamlined series of standards that allow for evaluation of drinking water treatment products based on product categories, as well as the environmental performance of entire production facilities, as opposed to evaluating all the details on a product-by-product basis. D. Reduce organizational burden and cost of evaluating products for sustainability. E. Reduce regulatory expense and risk, reduce production costs, and potentially preempt pending/proposed regulations at the government level through the adoption of a voluntary management based approach to problem solving throughout the industry. F. This standard translates these principles into measurable criteria against which the internal strategy and external commitments of organizations and their suppliers may be evaluated. The standard was developed in order to provide the marketplace with a meaningful standard that will: 1. Create a set of credible metrics for measuring sustainability performance; 2. Provide the industry with a voluntary, objective, international standard to determine if the sustainability performance of candidate products (measured via the criteria and metrics in this standard) meets the minimum requirements expected by the industry and interested stakeholders for products claiming to be sustainable; 3. Thereby enable product manufacturers, certification bodies, municipalities, governments, retailers, customers/consumers and other program developers with a means to easily differentiate products that conform to these minimum requirements. Referencing the WQA/ASPE S-803 standard within the Green Supplement to the UPC will increase visibility, recognition and eventual adoption of this new Sustainability Standard. It should eventually lead to more demand for certification of products to this standard and thereby contribute to accomplishing the goals laid out above: first and foremost to advance the sustainability achievement levels within the Water Treatment Products industry.
Item #: 213
UPC 2021  Section: L 411.0, L 411.1

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 411.0 Landscape Irrigation Systems.

L 411.1 General. Where landscape irrigation systems are installed, they shall use low application irrigation methods and shall be in accordance with Section L 411.2 through Section L 411.12. Requirements limiting the amount or type of plant material used in landscapes shall be established by the Authority Having Jurisdiction.

Exception: Plants grown for food production.

SUBSTANTIATION:
Sprinklers with 'lower' precipitation (application) rates tend to be less efficient because they tend to produce a higher portion of small water droplets that are more easily blown off-target by slight wind and tend to more easily evaporate before hitting the ground. These smaller water droplets have less mass. Light wind easily moves these water droplets off target. The smaller surface to mass ratio of the small water droplets exposes more surface area to the air greatly increasing evaporative water losses.
SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 411.12 Qualifications. **L 411.1.1 Irrigation Design and Installation.** The Authority Having Jurisdiction shall have the authority to require landscape irrigation contractors, installers, or designers to demonstrate competency. The system shall be designed and record drawings showing changes during installation shall be made available for the owner and for any required inspections. Where required by the Authority Having Jurisdiction, the contractor, installer, or designer shall be licensed, certified, or both to perform such work.

L 411.2 Maximum Velocity. Velocity of water flow shall not exceed 5 feet per second (1.5 m/s) for thermoplastic irrigation pipes. Velocity of water flow shall not exceed 7.5 feet per second (2.3 m/s) for metal irrigation pipes.

L 411.2.3 Backflow. [Section remains the same]

L 411.3 Use of Alternate Water Sources for Landscape Irrigation. [Section remains the same]

L 411.4.1 Master Valve. Where continuously pressurized alternate water sources supply an existing irrigation system, a master valve shall be installed at the point where the alternate water sources supply piping connects to the existing irrigation system downstream of the backflow preventer where required.

L 411.4.2 Identification. Where alternate water sources supply an existing irrigation system, the existing sprinkler heads, valve boxes, the continuously pressurized line supplying the irrigation master valve, or any other components required by the Authority Having Jurisdiction, shall be colored purple. The piping supplying the irrigation master valve shall be identified in accordance with Section 601.3.

L 411.4.2.1 Additional Zones. Newly installed zones shall have purple pipe.

SUBSTANTIATION:
Propose moving Section L 411.12 Qualifications forward into L 411.1.1 to emphasize the use of irrigation professionals and the expectation that an irrigation plan and record drawings by the installation contractor are important, but subject to the requirements of the AHJ. For Section L 411.2 Velocity, irrigation valves are particularly sensitive to water flow velocity to actuate solenoid valves and should not be subject to high velocity flow. In addition, irrigation fittings are vulnerable to water hammer when subject to high velocity flows due to quick closing solenoid valves. The recommendation aligns with the Irrigation Association & American Society of Irrigation Consultants Landscape Best Management Practices. Two subsections (L 411.4.1 and L 411.42) are proposed to address identification of irrigation systems using alternate water sources. Since irrigation lines are not continuously pressurized, the identification requirements apply only to the continuously pressurized line that supplies the irrigation system. A master valve is required at the point of connection where the alternate water source supplies the irrigation system. The line is continuously pressurized upstream this valve and requires identification. Sprinkler heads and valve boxes typically exposed to sight are required to be colored purple.
Item #: 215
UPC 2021 Section: L 411.4

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

**L 411.45 Irrigation Control Systems.** Where installed as part of a landscape irrigation system, irrigation control systems shall:

1. Automatically adjust the irrigation schedule to respond to plant water needs determined by weather or soil moisture conditions.
2. Utilize on-site sensors to inhibit or suspend irrigation when adequate soil moisture is present or during a rainfall or freezing conditions.
3. Utilize either one or more on-site sensors or a weather-based irrigation controller listed to the US EPA WaterSense Weather Based Irrigation Controllers Specification to suspend irrigation where adequate soil moisture is present for plant growth.
4. Have the capability to program multiple and different run times for each irrigation zone to enable cycling of water applications and durations to mitigate water flowing off of the intended irrigation zone.
5. Be capable of indicating to the user when it is not receiving a signal or local sensor input.
6. Be capable of allowing for a manual operation troubleshooting test cycle and shall automatically return to sensor input mode within some period of time as designated by the manufacturer, even when the switch is still positioned for manual operation.

(6 7) The site-specific settings of the irrigation control system affecting the irrigation and shall be posted at the control system location. The posted data, where applicable to the settings of the controller, shall include:

(a) Precipitation rate for each zone.
(b) Plant evapotranspiration coefficients for each zone.
(c) Soil type and basic intake rate absorption rate for each zone.
(d) Rain sensor settings.
(e) Soil moisture setting.
(f) Peak demand schedule including run times for each zone and the number of cycles to mitigate runoff and monthly adjustments or percentage change from peak demand schedule.

SUBSTANTIATION:
Though both requirements (5) and (6) must be met to earn the WaterSense label, (5) allows sensor-based controllers that are not WaterSense labeled. This provision would assure that sensor-based controllers that are not WaterSense labeled meet these water-saving requirements. See US?EPA WaterSense Weather Based Irrigation Controllers Specification attachment.
Item #: 216
UPC 2021  Section: L 411.5, L 411.6

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 411.57 Low Flow Irrigation. Irrigation zones using low flow irrigation emitters shall comply with ASABE/ICC 802 Landscape Irrigation Sprinkler and Emitter Standard and shall be equipped with filters sized for the irrigation emission devices according to manufacturer’s recommendation for the specific low flow emitter, and with a pressure regulator installed upstream of the irrigation emission devices as necessary to reduce the operating water pressure in accordance with the manufacturers’ equipment requirements.

L 411.88 Mulched Planting Areas. Only low volume flow emitters are allowed to be installed in mulched planting areas with vegetation taller than 12 inches (305 mm).

SUBSTANTIATION:
Including the applicable standard ASABE/ICC 802 for low flow emitters and keeping the term consistent in proposed Section L 411.8.
SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Add new text

L 411.6 Irrigation Flow Sensing System. On commercial landscape irrigation systems, an irrigation flow sensing system shall be installed that shall interface with the control system to suspend irrigation for abnormal flow conditions. If equipped with totalizer capabilities, the irrigation flow sensing system shall also function as a meter for irrigation water.

SUBSTANTIATION:
An irrigation flow sensing system in combination with a controller can suspend the irrigation system or irrigation zone when there are flows that are considered abnormal such as a missing nozzle, broken sprinkler or broken pipe. If the flow sensor is equipped with a totalizer then it can also function as a meter for irrigation water.
Item #: 218  
UPC 2021  Section: L 411.7  

SUBMITTER: Billy Smith  
ASPE  

RECOMMENDATION:  
Revise text  

L 411.7 System Performance Requirements. The landscape irrigation system shall be designed and installed to:  

(1) Prevent irrigation water from runoff out of the irrigation zone.  

(2) Prevent water in the supply-line drainage from draining out between irrigation events.  

(3) Not allow irrigation water to be applied onto or enter non-targeted areas including adjacent property and vegetation areas, adjacent hydrozones not requiring the irrigation water to meet its irrigation demand, non-vegetative areas, impermeable surfaces, roadways, and structures.  

Exception: Landscape features outside of the public right of way such as paved walkways, jogging paths, and golf cart paths, are exempted from this requirement where run off drains into the same hydrozone without puddling.  

SUBSTANTIATION:  
Proposed exemption to the prohibition of water applied to non-targeted areas. The exemption to these non-targeted areas applies only where the run off drains into the same hydrozone without puddling.
Item #: 219
UPC 2021 Section: L 411.8

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 411.8.19 Narrow or Irregularly Shaped Landscape Areas. Narrow or irregularly shaped landscape areas, less than 4 feet (1219 mm) in any direction across opposing boundaries, shall not be irrigated by an irrigation emission device except low flow emitters.

SUBSTANTIATION:
The purpose of the restriction on the type of irrigation emitter used in narrow and irregularly shaped landscape areas is to reduce or eliminate over-spray and runoff. Sub-surface irrigation emitters accomplish this purpose regardless of their flow rate. Requiring that subsurface irrigation emitters also have low flow rates is an unnecessary restriction that makes no contribution to water efficiency.
Item #: 220  
UPC 2021  
Section: L 411.9, L 411.11

SUBMITTER: Billy Smith  
ASPE

RECOMMENDATION:  
Revise text

L 411.9 Sloped Areas. Where soil surface rises more than 1 foot (305 mm) per 4 feet (1219 mm) of length, the irrigation zone system average precipitation rate shall not exceed 0.75 inches (19 mm) per hour as verified through either of the following methods:

1. Manufacturer’s documentation that the precipitation rate for the installed sprinkler head does not exceed 0.75 inches (19 mm) per hour where the sprinkler heads are installed not closer than the specified radius and where the water pressure of the irrigation system is not more than the manufacturer’s recommendations.

2. Catch can test in accordance with the requirements of the Authority Having Jurisdiction and where emitted water volume is measured with a minimum of six catchment containers at random places within the irrigation zone for a minimum of 15 minutes to determine the average precipitation rate, expressed as inches per hour (mm/h).

L 411.11 Irrigation Zone Performance Criteria. Irrigation zones shall be designed and installed to ensure the average precipitation rate of the sprinkler heads over the irrigated area does not exceed 1 inch per hour (25.4 mm/h) as verified through either of the following methods:

1. Manufacturer’s documentation that the precipitation rate for the installed sprinkler head does not exceed 1 inch per hour (25.4 mm/h) where the sprinkler heads are installed not closer that the specified radius and where the water pressure of the irrigation system is not more than the manufacturer’s recommendations.

2. Catch can test in accordance with the requirements of the Authority Having Jurisdiction and where emitted water volume is measured with a minimum of six catchment containers at random places within the irrigation zone for a minimum of 15 minutes to determine the average precipitation rate, expressed as inches per hour (mm/h).

L 411.12 Qualifications. The Authority Having Jurisdiction shall have the authority to require landscape irrigation contractors, installers, or designers to demonstrate competency. Where required by the Authority Having Jurisdiction, the contractor, installer, or designer shall be certified to perform such work.

L 411.11 Irrigation System Inspection and Performance Check. The irrigation system shall be inspected to verify compliance with the irrigation design in accordance with the following:

1. Inspection and performance check shall be by an independent third party having credentials in accordance with the US EPA WaterSense program or the Authority Having Jurisdiction.

2. Sprinklers shall be installed as specified with proper spacing and required nozzle.

3. Sprinklers shall be activated and visually inspected for covering areas without causing overspray or runoff.

4. Valves shall be installed as specified.

5. Drip irrigation systems shall be inspected to verify the proper valve, pressure regulation, filtering device, location of flush valves, and that the installed emitters comply with the irrigation plan.

6. Control system shall be installed as specified and include a US EPA WaterSense labeled controller and all sensors shall be installed and verified for proper operation.

7. The peak hour irrigation schedule shall be posted near the controller or the scheduling parameters for the controller shall be listed for each station including cycle and soak times.

8. Record drawings of the irrigation system shall be completed and provided for the irrigation inspection.

9. An inspection report shall be provided to the property owner or management company identifying problems and what corrective actions are required.

SUBSTANTIATION:
Recommend eliminating Sections L 411.9 and L 411.11 for the proposed new section for inspection and performance check. Precipitation rate limits are not an effective way to reduce or eliminate runoff waste. Runoff is the problem, not high Precipitation Rates. In fact, lower precipitation rates can increase water losses more than savings from lower precipitation rates due to wind drift and evaporation. The most effective solution to eliminating runoff waste is to breakdown irrigation Run Times into Short Cycles that stop before runoff begins and waits for water to soak into the ground before starting another cycle. Substantiation for the Problem: Proof that wind drift and evaporation of lower precipitation rate sprinklers cause significant water waste is found in the Univ. of Arizona, "Assessment of Application Efficiency and Uniformity of Fixed Spray and Multi-Stream Report Apr 2013 Brown Gilbert study. Proof that run-off can be eliminated with "cycle and soak" programming of controllers is found in Cal Poly "Effect of Nozzles and Cycle and Soak Scheduling on Landscape Irrigation Efficiency- Kumar-Vis" study. The elimination of runoff can be accomplished without setting a precipitation rate limit and without increasing other water losses that may be greater than any savings from lower precipitation rates.
Item #: 221
UPC 2021 Section: L 411.10 - L 411.10.3

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 411.10.12 Sprinkler Head Installations. All installed sprinkler heads shall comply with ASABE/ICC 802.

L 411.10.12.1 Sprinkler Heads in Common Irrigation Zones. Sprinkler heads installed in irrigation zones served by a common valve shall be limited to applying water to plants with similar irrigation needs, and shall have matched precipitation rates (identical inches of water application per hour as rated or tested; plus or minus 5 percent plus or minus 7 percent as labeled or declared in manufacturer’s published performance data).

L 411.10.12.2 [the rest remains the same]

L 411.10.12.3 Pop-up Type Sprinkler Heads. Where pop-up type sprinkler heads are installed, the sprinkler heads shall pop-up to a height above vegetation level and of not less than 4 inches (102 mm) above the soil level when emitting water.

SUBSTANTIATION:
Lists the applicable standard at the beginning of the section. Strike the wording of low precipitation rate sprinklers heads because the arbitrary precipitation rate in the definitions has no scientific justification. Scheduling and management are what improve water use efficiency. The change in proposed Section L 411.12.1 better reflects what an inspector can verify for compliance.
Item #: 222

UPC 2021  Section: L 411.13

SUBMITTER: Billy Smith
          ASPE

RECOMMENDATION:
Add new text

L 411.13 Outside Hose Bibbs. Outside hose bibbs shall be allowed on irrigation pipe downstream of the backflow preventer. Hose bibbs supplying water from the irrigation system
shall be indicated by posted signs marked with the words: “CAUTION: NONPOTABLE WATER. DO NOT DRINK.” and the symbol in Figure 503.9.

SUBSTANTIATION:
Irrigation water downstream of the backflow preventer is by definition non-potable. Should the irrigation design specify hose bibb installation some provision for protecting public
health is advised if a domestic water supply is used.
Item #: 223

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Add new text

L 411.14 Depth of Irrigation Pipe. Irrigation pipe downstream from the backflow preventer shall be buried at a minimum depth according to Section L 411.14.1 and Section L 411.14.2.

L 411.14.1 Landscape Areas. Irrigated landscaped areas not exceeding 10,000 square feet (929 m²) shall have irrigation main lines buried a minimum of 12 inches (305 mm) and irrigation lateral lines buried a minimum of 8 inches (203 mm). Irrigated landscaped areas greater than 10,000 square feet (929 m²) shall have irrigation main lines buried a minimum of 18 inches (457 mm) and irrigation lateral lines buried a minimum of 12 inches (305 mm).

L 411.14.2 Vehicular Surfaces. Irrigation pipe installed under vehicular paving and pervious pavers, including landscaped fire lanes, shall be sleeved with a minimum of one 1-inch pipe (25 mm) size greater than the irrigation pipe and buried at a minimum depth of 24 inches (610 mm) in all cases.

L 411.15 Backfill. All excavation for irrigation pipe installation shall be backfilled in thin layers to 12 inches (305 mm) with clean earth, which shall not contain stones, boulders, cinderfill, frozen earth, construction debris, or other materials that would damage or break the piping. Fill shall be properly compacted. Suitable precautions shall be taken to ensure permanent stability for pipe laid in filled or made ground.

SUBSTANTIATION:
The UPC specifies pipe bury depth of 24-inches for freeze protection purposes. In parts of the country where freeze damage is a concern irrigation pipe is winterized by draining or purging with compressed air. Therefore, the requirement for a 24 inch bury depth is onerous and unnecessarily increases installation cost. These recommendations align with the Irrigation Association & American Society of Irrigation Consultants Landscape Best Management Practices.
SUBMITTER: Billy Smith
ASPE
RECOMMENDATION:
Revise text

L 501.2 Insulation. Hot water supply and return piping shall be thermally insulated. The wall thickness of the insulation shall be equal to the nominal diameter of the pipe up to 2 inches (50 mm). The wall thickness shall be not less than 2 inches (51 mm) for nominal pipe diameters exceeding 2 inches (50 mm). The conductivity of the insulation \([k]-factor (\text{Btu} \cdot \text{in)/(h} \cdot \text{ft}^2 \cdot \text{°F})\), measured radially, shall not be more than 0.28 \([\text{Btu} \cdot \text{in}/(h} \cdot \text{ft}^2 \cdot \text{°F})\] \([0.04 \text{ W/(m} \cdot \text{k})\]). Hot water piping to be insulated shall be installed such that insulation is continuous. Pipe insulation shall be installed to within 1/4 of an inch (6.4 mm) of appliances, appurtenances, fixtures, structural members, or a wall where the pipe passes through to connect to a fixture within 24 inches (610 mm). Building cavities shall be large enough to accommodate the combined diameter of the pipe, the insulation, and other objects in the cavity that the piping shall cross. Pipe supports shall be installed on the outside of the pipe insulation.

Exceptions:
(1) Where the hot water pipe is installed in a wall that is not of a width to accommodate the pipe and insulation, the insulation thickness shall be permitted to have the maximum thickness that the wall is capable of accommodating and not less than 1/2 of an inch (12.7 mm) thick.

(2) Hot water supply piping exposed under sinks, lavatories, and similar fixtures.

(3) Where hot water distribution piping is installed within an attic, crawlspace, or wall insulation.
(a) In attics and crawlspaces, the insulation shall cover the pipe not less than 5 1/2 inches (140 mm) further away from the conditioned space.
(b) In walls, the insulation shall completely surround the pipe with not less than 1 inch (25.4 mm) of insulation.
(c) Where burial within the insulation will not completely or continuously surround the pipe, then these exceptions do not apply.

L 501.2.1 Pipe Supports. Pipe supports shall be installed on the outside of the pipe insulation.

Exception: Vertical supports, and horizontal and vertical anchors shall be installed on the pipe inside the pipe insulation.

L 501.2.2 Building Cavities. Building cavities used for hot water supply and return piping shall be large enough to accommodate the combined diameter of the pipe plus the insulation, plus any other objects in the cavity that the piping must cross.

SUBSTANTIATION:
The strikeout in Section L 501.2 is moved to subsections L 501.2.1 and L 501.2.2.
SUBMITTER: Billy Smith
ASPE
RECOMMENDATION: Revise text

L 502.7 Maximum Volume and Length of Hot Water. The maximum volume of water contained in a hot water distribution pipe branch shall be in accordance with Section L 502.7.1 or Section L 502.7.2. The water volume shall be calculated using Table L 502.7.2. The maximum length per volume of piping shall comply with Section L 502.7.2.

L 502.7.1 Maximum Volume of Hot Water Without Recirculation or Heat Trace in a Branch. The maximum volume of water contained in hot water distribution pipe between the water heater and any fixture fitting shall not exceed 32 ounces (946 mL). Where a fixture fitting shutoff valve (supply stop) is installed ahead of the fixture fitting, the maximum volume of water is permitted to be calculated between the water heater and the fitting shutoff valve (supply stop).

The water volume per foot of piping shall be calculated using Table L 502.7.1. The maximum volume of water in a fixture branch between any source of hot water (water heaters, recirculation loops and electrically heat traced pipe shall be considered sources of hot water) and the fixture fitting shall be:

1. 24 oz. where a single branch serves a single fixture.
2. 40 oz. where a series branch incorporating one or more Flow-Through Design configurations that serves two or more fixtures.
3. 60 oz. where a ring branch incorporating two or more Flow-Through Design configurations that serves two or more fixtures.

Exceptions:
1. The maximum volume of a single branch or series branch between any source of hot water and a kitchen sink and dishwasher located on an island or a peninsula where the floor is a concrete slab shall not contain more than 40 oz.
2. The maximum volume of a single branch to a standalone tub shall not contain more than 80 oz.

L 502.7.2 Maximum Volume of Hot Water with Recirculation or Heat Trace. The maximum volume of water contained in the branches between the recirculation loop or electrically heat traced pipe, and the fixture fitting shall not exceed 16 oz (473 mL). Where a fixture fitting shutoff valve (supply stop) is installed ahead of the fixture fitting, the maximum volume of water is permitted to be calculated between the recirculation loop or electrically heat traced pipe and the fixture fitting shutoff valve (supply stop).

Exception: Whirlpool bathtubs or bathtubs that are not equipped with a shower are exempted from the requirements of Section L 502.7.

L 502.7.2 Maximum Length per Volume of Water in a Branch. For fixture branches in accordance with Section L 502.7.1, the maximum length of piping shall be calculated using Table L 502.7.2(1) through Table L 502.7.2(4). Where a fixture fitting shutoff valve (supply stop) is installed ahead of the fixture fitting, the maximum length is measured between the source of hot water and the fixture fitting shutoff valve (supply stop).

TABLE L 502.7.1

<table>
<thead>
<tr>
<th>NOMINAL SIZE (IN)</th>
<th>COPPER TYPE M</th>
<th>COPPER TYPE L</th>
<th>COPPER TYPE K</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8</td>
<td>1.06</td>
<td>0.97</td>
<td>0.84</td>
</tr>
<tr>
<td>1/2</td>
<td>1.69</td>
<td>1.55</td>
<td>1.45</td>
</tr>
<tr>
<td>1/4</td>
<td>3.43</td>
<td>3.22</td>
<td>2.90</td>
</tr>
<tr>
<td>1</td>
<td>5.81</td>
<td>5.49</td>
<td>5.17</td>
</tr>
<tr>
<td>1 1/4</td>
<td>8.70</td>
<td>8.36</td>
<td>8.09</td>
</tr>
<tr>
<td>1 1/2</td>
<td>12.18</td>
<td>11.83</td>
<td>11.45</td>
</tr>
<tr>
<td>2</td>
<td>21.68</td>
<td>20.58</td>
<td>20.04</td>
</tr>
</tbody>
</table>

For SI units: 1 foot = 304.8 mm, 1 ounce = 29.573 mL.
*NA: Not Applicable

TABLE L 502.7(2)(1)

<table>
<thead>
<tr>
<th>COPPER TYPE M</th>
<th>COPPER TYPE L</th>
<th>COPPER TYPE K</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Flow-Through Design. A fitting or a fitting configuration with two primary inlet connections and one or more outlet connections with the purpose to supply water to a fixture fitting.

SUBSTANTIATION:
This proposal seeks to acknowledge other basic plumbing design schemes that should not be limited to only 24 oz. as is currently the limit for a “single branch” serving only one end point plumbing fixture. By recognizing the advantage of multiple point draw usages off the same branch line using “flow-through” design configurations it is possible to save additional energy and water rather than each fixture being served by its own branch line. Additionally, water stagnation can be reduced if not eliminated entirely helping to address potential human health concerns. There are three basic types of fixture branches being covered in this proposal; Single Branch, Series Branch, and Ring Branch. Typical flow-through design configurations allow water to flow through the piping system continuously, ensuring fresh water supply to each fixture and minimizing water stagnation.

For SI units, 1 foot = 304.8 mm, 1 ounce = 29.573 ml.

### TABLE L 302.7.31) LENGTH (FT) PER VOLUME OF PIPING

<table>
<thead>
<tr>
<th>NOMINAL SIZE Listed (DN)</th>
<th>24 OZ</th>
<th>40 OZ</th>
<th>60 OZ</th>
<th>40 OZ</th>
<th>60 OZ</th>
<th>40 OZ</th>
<th>60 OZ</th>
<th>40 OZ</th>
<th>60 OZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPVC SCH 40 PIPE</td>
<td>5.0</td>
<td>6.6</td>
<td>7.3</td>
<td>6.6</td>
<td>7.3</td>
<td>6.6</td>
<td>7.3</td>
<td>6.6</td>
<td>7.3</td>
</tr>
<tr>
<td>CPVC SCH 80 PIPE</td>
<td>3.5</td>
<td>4.3</td>
<td>4.9</td>
<td>4.3</td>
<td>4.9</td>
<td>4.3</td>
<td>4.9</td>
<td>4.3</td>
<td>4.9</td>
</tr>
<tr>
<td>CPVC SCH 11 PIPE</td>
<td>2.2</td>
<td>2.8</td>
<td>3.3</td>
<td>2.8</td>
<td>3.3</td>
<td>2.8</td>
<td>3.3</td>
<td>2.8</td>
<td>3.3</td>
</tr>
</tbody>
</table>

For SI units, 1 foot = 304.8 mm, 1 ounce = 29.573 ml.

### TABLE L 302.7.32) LENGTH (FT) PER VOLUME OF PIPING

<table>
<thead>
<tr>
<th>NOMINAL SIZE Listed (DN)</th>
<th>PEX &amp; PE-RT CTS SCH 30</th>
<th>PEX-AL-PEx (DN)</th>
<th>PE-AL-PE (DN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (2.8)</td>
<td>9.7</td>
<td>11.2</td>
<td>13.8</td>
</tr>
<tr>
<td>2 (4.3)</td>
<td>10.2</td>
<td>12.2</td>
<td>14.3</td>
</tr>
</tbody>
</table>

For SI units, 1 foot = 304.8 mm, 1 ounce = 29.573 ml.

### TABLE L 302.7.33) LENGTH (FT) PER VOLUME OF PIPING

<table>
<thead>
<tr>
<th>NOMINAL SIZE Listed (DN)</th>
<th>PP SDR 6 (DN)</th>
<th>PP SDR 11 (DN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (2.8)</td>
<td>6.4</td>
<td>7.4</td>
</tr>
<tr>
<td>2 (5.0)</td>
<td>7.2</td>
<td>9.3</td>
</tr>
</tbody>
</table>

For SI units, 1 foot = 304.8 mm, 1 ounce = 29.573 ml.

---

L 201.0 Definitions

### Flow-Through Design
A fitting or a fitting configuration with two primary inlet connections and one or more outlet connections with the purpose to supply water to a fixture fitting.
through design configurations are not a specialized product but can be simply fabricated out of traditional "tees." Without defining "flow-through design" it is not possible to address "Series Branch" and "Ring Branch" volume limitations. Therefore, a definition is recommended. Section L 502.7.1 clearly defines the three types of branches being discussed while leaving the existing exceptions stand with only minor revisions to reflect only volume limitations. Also, new volumes vs. length tables are being proposed for all piping materials currently shown in Table L 502.7.1. Section L 502.7 is being revised for consistency and to make reference to the new volume/length tables. These new tables will make it easier for plumbing inspectors to insure that piping lengths are not longer than allowable for the volume limitations of the type of branch being served. It should also be noted that existing Table L 502.7.1 has some very minor revisions for consistency of how the volumes/foot were calculated based upon the piping standard's nominal dimensions using average OD and average wall thicknesses. Actual flow testing was conducted at the Hot Water Research Lab of Southern California Gas Company's Energy Resource Center to insure wait times for hot water were not adversely affected with the increased volumes allowed for "Series Branch" and "Ring Branch."
Item #: 226

UPC 2021 Section: L 503.3.6

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Revise text

L 503.3.6 Pools. Pool heating systems shall comply with Section L 503.3.6(1) through Section L 503.3.6(3).

(1) Pool heaters shall be equipped with a readily accessible ON/OFF switch to allow shutting off the heater without adjusting the thermostat setting. Pool heaters fired by natural gas shall not have continuously burning pilot lights. [ASHRAE 90.1:7.4.5.1]

(2) Heated pools and inground permanently installed spas and portable spas shall be provided with a vapor retardant cover. Portable spa covers shall meet the requirements of APSP-14. shall be equipped with a vapor retardant pool cover on or at the water surface. Pools heated to more than 90°F (32°C) shall have a pool cover with a minimum insulation value of R-12.

Exception: Where more than 70 percent of the energy for heating, computed over an operating season, is from site-recovered energy such as from a heat pump or solar energy source. Pools that are deriving over 60 percent of the energy for heating from site-recovered energy or solar energy. [ASHRAE 90.1:7.4.5.2]

(3) Time switches shall be installed on swimming pool heaters and pumps.

Exceptions:

(1) Where public health standards require 24-hour pump operation.

(2) Where pumps are required to operate solar and waste heat recovery pool heating systems. [ASHRAE 90.1:7.4.5.3]

(4) Pool pumps and replacement pool pump motors shall meet requirements of APSP-15.

SUBSTANTIATION:
APSP-15 is a standard reducing energy use through more efficient pumps and limiting the size and performance of those pumps based on pool size.
Item #: 227

UPC 2021  Section: L 507.0, L 507.1

SUBMITTER: Billy Smith
ASPE

RECOMMENDATION:
Add new text

L 507.0 Heat Recovery from Steam Boiler Blowdown.

L 507.1 General. Where heat recovery can be used beneficially to heat boiler makeup water or for other purposes, boiler blowdown from steam boilers exceeding 15 psi and 3.4 million BTU’s per hour (100 HP) shall be directed to a heat recovery system that reduces the temperature of the blowdown discharge to below 140°F without using tempering water.

SUBSTANTIATION:
When boilers are blowdown, large volumes of water under pressure is discharged to the sanitary sewer. As it is discharged, an equal or greater volume of makeup water is simultaneously fed to the deaerator. Most blowdown systems simply use tempering water to cool the water below 140°F. Several different types of technology are available to capture and beneficially reuse the heat in the boiler blowdown.
SUBMITTER: Tim Keane
Legionella Risk Management, Inc.
Rep: Self

RECOMMENDATION:
Add new text

Appendix N
Health and Safety impact of water temperature on Legionella and scald risks

N 101.0 General.

N 101.1 Applicability. This appendix provides guidance on the impact of water temperature on both scald and Legionella risk. Having only one or two definitions of water temperature in the code, with the primary intent of preventing scalding, does not adequately address the multiple temperature ranges in plumbing systems or the significant risk of waterborne pathogen growth resulting from these temperatures. This appendix presents a more comprehensive approach for plumbing industry professionals to understand the health and safety impact of these interrelated aspects of plumbing system design and operation.

Private residences with circulated hot water systems are a low risk for Legionella growth. Private residences without circulated hot water systems are a very low risk for Legionella growth. Buildings with recirculated, central hot water systems are an established and known risk for Legionella growth. A key issue in controlling the risk associated with Legionella in building water systems is controlling the environmental conditions that promote the growth of Legionella. One key environmental condition necessary for the growth of Legionella is water temperature. If the temperature is too cold or too hot the Legionella cannot reproduce, the Legionella population cannot grow. And if the temperature is high enough the bacteria will die.

N102 Temperature Ranges

N102.1 Cold Water. Water at a temperature less than 77°F (25°C) is cold water. Water in this temperature range poses no risk for scalding and no significant risk for Legionella growth.

N102.2 Tepid Cold Water. Water at a temperature not less than 77°F (25°C) and less than 85°F (29°C) is tepid cold water. Water in this temperature range poses no risk for scalding and a very low risk for Legionella growth. Items requiring temperatures above cold water such as eye wash and safety showers and hand washing would pose a dramatically lower Legionella growth risk if maintained in this temperature range.

N102.3 Tepid Water. Water at a temperature not less than 85°F (29°C) and less than 110°F (43°C) is tepid water. Water in this temperature range poses no risk for scalding and the highest risk for growth of Legionella and other waterborne pathogens. This temperature should be avoided whenever possible in plumbing system design. Maintenance of a disinfectant or other control measures may be required to control Legionella risk.

N102.4 Warm Water. Water at a temperature not less than 110°F (43°C) and less than 120°F (49°C) is warm water. Water in this temperature range poses no risk for scalding and a moderate to high risk for Legionella. This temperature range provides an unnecessarily high safety of margin for scald protection that produces a dangerously high risk for waterborne pathogen growth. Maintenance of a disinfectant or other control measures may be required to control Legionella risk.

N102.5 Tempered Hot Water. Water at a temperature not less than 120°F (49°C) and less than 130°F (54°C) is tempered hot water. Water in this temperature range poses a very low risk of scalding in sinks, a moderate scalding risk in showers and tubs and a very low risk for Legionella growth.

N102.6 Hot Water. Water at a temperature not less than 130°F (54°C) and less than 140°F (60°C) is hot water. Water in this temperature range poses a moderate to high risk of scalding in sinks, a high risk of scalding in tubs and showers and no risk for Legionella growth. Water in this temperature range could pose an immediate risk to the infirm, elderly, and the very young.

N102.7 Very Hot Water. Water at a temperature not less than 140°F (60°C) and less than 160°F (71°C) is very hot water. This temperature range poses a high risk of scalding in sinks, showers and tubs and no risk for Legionella growth.

N102.8 Disinfecting Hot Water. Water at a temperature not less than 160°F (71°C) is disinfecting hot water. This temperature range poses an immediate, instantaneous scalding risk. Water maintained in this temperature range without disinfectant will kill Legionella and other waterborne pathogens almost instantaneously.

N103.0 Correlation.

N103.1 General. The correlations between temperature ranges and Legionella and scald risk are shown in Table N103.1(1) and Table N103.1(2).

Table N103.1(1)
CORRELATION BETWEEN TEMPERATURE RANGES, LEGIONELLA, AND SCALD RISK

<table>
<thead>
<tr>
<th>Description</th>
<th>°F</th>
<th>Scald Risk</th>
<th>Legionella Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold</td>
<td>&lt;77</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Warm</td>
<td>110-120</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Hot</td>
<td>130-140</td>
<td>High</td>
<td>No</td>
</tr>
<tr>
<td>Very Hot</td>
<td>140-160</td>
<td>Very High</td>
<td>No</td>
</tr>
<tr>
<td>Disinfecting</td>
<td>&gt;160</td>
<td>Immediate</td>
<td>No</td>
</tr>
<tr>
<td>Description</td>
<td>°F</td>
<td>Scald Risk</td>
<td>Legionella Risk</td>
</tr>
<tr>
<td>-------------------</td>
<td>------</td>
<td>------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Cold</td>
<td>&lt;77</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Tepid Cold</td>
<td>=77 to &lt;85</td>
<td>No</td>
<td>Low to Very Low</td>
</tr>
<tr>
<td>Tepid</td>
<td>&gt;85 to &lt;110</td>
<td>No</td>
<td>Very High</td>
</tr>
<tr>
<td>Warm</td>
<td>=110 to &lt;120</td>
<td>No</td>
<td>Moderate</td>
</tr>
<tr>
<td>Tempered</td>
<td>=120 to &lt;130</td>
<td>Low to Very Low</td>
<td>Very Low</td>
</tr>
<tr>
<td>Prevention Notes</td>
<td></td>
<td>Prolonged contact, &gt; 25 seconds required for second degree burns.</td>
<td></td>
</tr>
<tr>
<td>Hot</td>
<td>=130 to &lt;140</td>
<td>Moderate to High</td>
<td>No</td>
</tr>
<tr>
<td>Prevention Notes</td>
<td></td>
<td>Significant risk for elderly, impaired and very young. For all others &gt; 5 sec. for 2nd degree burns.</td>
<td></td>
</tr>
<tr>
<td>Very Hot</td>
<td>=140 to &lt;160</td>
<td>Very High</td>
<td>No</td>
</tr>
<tr>
<td>Prevention Notes</td>
<td></td>
<td>Legionella dies in minutes.</td>
<td></td>
</tr>
<tr>
<td>Disinfecting Hot</td>
<td>&gt;160</td>
<td>Immediate</td>
<td>No</td>
</tr>
<tr>
<td>Prevention Notes</td>
<td></td>
<td>Legionella dies instantly.</td>
<td></td>
</tr>
</tbody>
</table>

*TABLE N103.1 - Black and White if color is not acceptable*
### Temperature Range, Name, and Risk

<table>
<thead>
<tr>
<th>Temp Range</th>
<th>Name</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥160°F</td>
<td>Disinfecting Hot</td>
<td>No</td>
</tr>
<tr>
<td>≥160°F</td>
<td>No</td>
<td>Immediate</td>
</tr>
<tr>
<td>140°F to 160°F</td>
<td>Very High</td>
<td>No</td>
</tr>
<tr>
<td>130°F to 140°F</td>
<td>Hot</td>
<td>No</td>
</tr>
<tr>
<td>120°F to 130°F</td>
<td>Warm</td>
<td>Moderate to Low</td>
</tr>
<tr>
<td>110°F to 120°F</td>
<td>Warm</td>
<td>Low to No</td>
</tr>
<tr>
<td>85°F to 110°F</td>
<td>Tepid</td>
<td>Very High</td>
</tr>
<tr>
<td>77°F to 85°F</td>
<td>Tepid Cold</td>
<td>No</td>
</tr>
<tr>
<td>&lt; 77°F</td>
<td>Cold</td>
<td>Low to No</td>
</tr>
<tr>
<td>10°F to 50°F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Substantiation:**

This is a proposal for a new appendix to the UPC. This appendix is intended to provide guidance on the relationships between water temperature and the risks of scalding and exposure to Legionella bacteria. The issue of Legionnaires’ disease from building water systems has become a real serious problem. A significant factor impacting this issue are efforts over the past two decades to save water and energy. One effort to save water includes adding flow restricting orifices to fixtures without reducing pipe diameters. This results in dramatically reduced water velocities and use rates that increase building water aging issues. An effort to save energy has been to reduce water temperatures to levels conducive to Legionella growth. These water temperature and flow changes have been made without any thought of the unintended consequences and without efforts to reduce pipe size and maintain water velocity. Having common and known temperature ranges and having those responsible for plumbing design, implementation and code enforcement understand the risks associated with these ranges is very important. The limited number of options for describing water temperature we have in the code limits our ability to discuss the complexities of the problems we face. The two biggest risks we currently face with regard to plumbing system water temperature are Legionnaires’ disease and scalding. Some say maintaining temperatures to control Legionella directly conflicts with scald concerns. This is absolutely not the case. The plumbing industry desperately needs to understand the temperatures where there is a risk for Legionella growth and a risk for scalding. Frequently those concerned with scalding will refer to published scald rates when in fact the number of scalds due to plumbing system water is a very small fraction of scalds reported. The 2009 CDC paper titled, “Nonfatal Scald-Related Burns Among Adults Aged =65 Years — United States, 2001—2006” does an excellent job of showing total scald rates and the relationship of those rates to scalds associated with plumbing fixtures. This paper is also very important because the elderly as a population group are the highest risk for Legionnaires’ disease and the second highest risk for scalding. This CDC paper showed an average of 8,620 hospital visits per year by elderly for scalding between 2001 and 2006. Table 2 in the paper lists the sources associated with reported scalds. Over 87% of scalds were related to food, water/steam, cookware and appliances. Only 3% of the 8,620 cases, only 220 cases per year were listed as related to Bathroom products (bathtub, shower and whirlpool). In comparison to the annual 220 cases of scalds related to plumbing fixtures impacting the elderly and resulting in hospital admissions the majority of the approximate 25,000 cases of Legionnaires’ disease per year are associated with the elderly and almost all Legionnaires’ disease cases result in hospitalizations. Unfortunately codes still today do not acknowledge this issue and in many cases codes are not the issue but those interpreting and enforcing the codes are the problem. Just yesterday an engineer called me regarding an issue with a UPC code where the code official was requiring local ASSE 1017 valve already delivering 120°F water even though there was a master mixing valve ASSE 1017 valve already delivering 120°F water to the system. This series installation of mixing valves resulting in 0°F temperature differential across the final mixing valve further increases Legionella risk and is recommended against by manufacturers. CDC published a paper in Morbidity and Mortality Weekly Report dated June 7, 2016 titled “Vital Signs: Deficiencies in Environmental Control Identified in Outbreaks of Legionnaires’ Disease — North America, 2000–2014” includes the following statements, • “During 2000–2014, the rate of reported legionellosis cases increased from 0.42 to 1.62 per 100,000 persons” • “The number of cases of Legionnaires’ disease in the United States increased again up to 2.00 cases per 100,000 persons1, that’s a 500% increase from 2000 and rates continues to rise. Recognizing the role building water system design plays in this issue ASHRAE 188 standard published in 2015 states: • In the Foreward: “This standard is intended for use by owners and managers of human-occupied buildings and those involved in the design, construction, installation, commissioning, operation, maintenance, and service of centralized building water systems and components.” • In the Scope: “This standard provides minimum Legionellosis risk management requirements for the design, construction, commissioning, operation, maintenance, repair, replacement, and expansion of new and existing buildings and their associated (potable and nonpotable) water systems and components.” • In the compliance section, the first paragraph is titled “Building designer requirements”. ASHRAE Guideline 12 DRAFT second public review has three full pages in the document related to plumbing system design and Legionella risk, with water temperature being a top issue addressed. In 2009 The Veterans Administration published VHA DIRECTIVE 2009-009 titled, “Domestic Hot Water Temperature Limits for Legionella Prevention and Scald Control”9. The largest hospital system in the world, with an elderly population higher than most healthcare facilities required sinks and showers to have a minimum of 120°F and a maximum of 130°F at every sink and shower. This Directive was in place until 2014. It was changed in 2014 largely due to the outbreak at the VA hospital in Pittsburgh, PA. This hospital had never followed the 2009 Directive. In early 2012 prior to the Pittsburgh outbreak I had contacted senior management with VA Healthcare in engineering and epidemiology and asked if there were any scalding concerns with the 2009 program now in place for over 2.5 years. I was told that no one knew of any issues.
Item #: 229
UPC 2021  Section: 1701.2

SUBMITTER: April K. Trafton
Donald F. Dickerson Associates

RECOMMENDATION:
Add new text

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>IAPMO IGC 315-2016</td>
<td>Water Manifold Systems</td>
<td>Fittings</td>
</tr>
<tr>
<td>IAPMO IGC 327-2016</td>
<td>Flexible Metallic Expansion Joints for Pressure Systems</td>
<td>Joints</td>
</tr>
<tr>
<td>IAPMO IGC 332-2017a</td>
<td>Hydronic Radiators</td>
<td>Miscellaneous</td>
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</table>

(portion table not shown remains unchanged)

SUBSTANTIATION:
The standards proposed for inclusion in Table 1701.2 are used to test and list multiple products from several different manufacturers. Inclusion of these standards in Table 1701.2 will help the end users of the code to determining if a product has been evaluated or is appropriately listed.
**Item #: 230**  
**UPC 2021**  
**Section:** Table 1701.2  

**SUBMITTER:** April Trafton  
Donald F. Dickerson Associates  

**RECOMMENDATION:**  
Revise text  

### TABLE 1701.2  
**STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES**  

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
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<tr>
<td>IAPMO IGC 67-2014</td>
<td>Specialized ABS and PVC DWV Fittings</td>
<td>DWV Components</td>
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<tr>
<td>IAPMO IGC 183-2016</td>
<td>Oil/Water Separators and Coalescing Plate Separators</td>
<td>DWV Components</td>
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<tr>
<td>IGC 267-2015</td>
<td>Hydrants without Integral Backflow Preventers</td>
<td>Valves</td>
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<tr>
<td>IAPMO IGC 109-2015</td>
<td>Water Distribution Manifolds for SDR 9 PEX Tubing and PE-AL-PE and PEX-AL-PEX Composite Pipe</td>
<td>Valves</td>
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<tr>
<td>IAPMO PS 1-2007</td>
<td>Tank Risers</td>
<td>DWV Components</td>
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<tr>
<td>IAPMO PS 50-2010</td>
<td>Flush Valves with Dual Flush Device for Water Closets or Water Closet Tank with an Integral Flush Valves with a Dual Flush Device</td>
<td>Fixtures</td>
</tr>
<tr>
<td>IAPMO PS 90-2014</td>
<td>Elastomeric Test Caps, Cleanout Caps, and Combination Test Caps/Shielded Couplings</td>
<td>DWV Components</td>
</tr>
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</table>

(portion of table not shown remains unchanged)  

**SUBSTANTIATION:**  
The standards proposed for inclusion in Table 1701.2 are used to test and list multiple products that are being installed in the field from over 50 different manufacturers. Inclusion of these standards in Table 1701.2 will assist end users of the code to determining if a product has been evaluated or appropriately listed.
Item #: 231
UPC 2021  Section: 1701.2

SUBMITTER: Gary Klein
Gary Klein and Associates, Inc.
Rep: Self

RECOMMENDATION:
Revise text

### TABLE 1701.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
<thead>
<tr>
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<tr>
<td>IAPMO IGC 244-2015a</td>
<td><strong>Tub and Shower Flow-Reduction Systems</strong></td>
<td>Valves</td>
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(portions of table not shown remain unchanged)

SUBSTANTIATION:
Tub and shower flow-reduction systems are still relatively new to most plumbers and code officials. IAPMO first approved IGC 244 in 2005 and revised it 2015. This Standard covers temperature-actuated flow-reduction devices and systems intended to be installed in tub spouts or immediately upstream of shower heads and specifies requirements for materials, physical characteristics, performance testing, and markings. Showerhead flow-reduction devices consist of a thermostatic shower trickle valve intended to be installed directly upstream of the showerhead. Tub spout flow-reduction systems consist of a thermostatic tub spout shut-off valve and a normally-closed showerhead trickle valve. In addition to being required to pass lifecycle tests for shower and tub spout valves, there are requirements for showerhead flow rate and for automatic reset of either valve. Many people wait a relatively long time for hot water to reach their shower or combination tub/shower from their water heater. Once the cold water in the hot water pipe has been cleared out and the hot water has arrived, both of these devices shut the flow of water to a trickle. When the person is ready to get into the shower, they release the trickle valve and the shower works normally. The trickle valves reset automatically when the shower is turned off. These products have been in the market for more than a decade. More than 2 million have been installed, most under the auspices of energy utility incentive programs. They have been tested by IAPMO R&T and are listed with the full UPC shield. As these devices become more widely known by the general public, it is likely many more plumbers will install them as part of installation done under a building permit. It seems advisable to include the IGC in Table 1701.2.
Item #: 232
UPC 2021  Section: Table 1701.2

SUBMITTER: Matthew Williams
Association of Home Appliance Manufacturers (AHAM)

RECOMMENDATION:
Revise text

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<tr>
<td>AHAM FWD-1-2009</td>
<td>Food Waste Disposers</td>
<td>Appliances</td>
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(portion of table not shown remain unchanged)

SUBSTANTIATION:
The above revisions reflect the latest updates to the Association of Home Appliance Manufacturers (AHAM) standard that is referenced in Table 1701.2.
Item #: 233
UPC 2021  Section: Table 1701.2

SUBMITTER: Jonathan Esslinger
American Society of Civil Engineers (ASCE)

RECOMMENDATION:
Revise text

TABLE 1701.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

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<thead>
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<tr>
<td>ASCE 25-June 2016</td>
<td>Earthquake-Actuated Automatic Gas Shutoff Devices</td>
<td>Fuel Gas</td>
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SUBSTANTIATION:
The above revisions reflect the latest updates to the American Society of Civil Engineers (ASCE) standards that are referenced in Table 1701.2.
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<th>REFERENCED SECTION</th>
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<tbody>
<tr>
<td>ASME A112.1.2-2012 (R2017)</td>
<td>Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)</td>
<td>Fittings</td>
<td>Table 603.2</td>
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<tr>
<td>ASME A112.3.1-2007 (R2017)</td>
<td>Stainless Steel Drainage Systems for Sanitary DWV, Storm, and Vacuum Applications, Above- and Below-Ground</td>
<td>Piping</td>
<td>418.1, Table 701.2, 706.7.2, 1102.1</td>
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<tr>
<td>ASME A112.4.14-2004 (R2014)</td>
<td>Manually Operated Quarter-Turn Shutoff Valves for Use in Plumbing Systems</td>
<td>Valves</td>
<td>606.1</td>
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<td>ASME A112.6.1-1997 (R2017)</td>
<td>Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use</td>
<td>Fixtures</td>
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<td>ASME A112.6.3-2001 (R2012)</td>
<td>Floor and Trench Drains</td>
<td>Fixtures</td>
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<td>ASME A112.14.4-2001 (R2012)</td>
<td>Grease Removal Devices</td>
<td>Fixtures</td>
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<td>ASME A112.18.3-2002 (R2017)</td>
<td>Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings</td>
<td>Backflow Protection</td>
<td>417.3, 417.4</td>
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<td>ASME A112.18.9-2013 (R2012)</td>
<td>Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures</td>
<td>Miscellaneous</td>
<td>403.3</td>
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<td>ASME A112.19.3-2004/CSA B45.4-2004/CSA B45.10-2004 (R2012)</td>
<td>Stainless Steel Plumbing Fixtures</td>
<td>Fixtures</td>
<td>407.1, 408.1, 409.1, 410.1, 411.1, 415.1, 420.1</td>
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<td>ASME A112.19.7-2012/CSA B45.10-2012 (R2017)</td>
<td>Hydromassage Bathtub Systems</td>
<td>Fixtures</td>
<td>409.1, 409.6</td>
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<td>ASME A112.19.15-2012 (R2017)</td>
<td>Bathtubs/Whirlpool Bathtubs with Pressure Sealed Doors</td>
<td>Fixtures</td>
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</tr>
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<td>ASME B16.3-2011/2014</td>
<td>Malleable Iron Threaded Fittings: Classes 150 and 300</td>
<td>Fixtures</td>
<td>Table 604.1, Table 701.2</td>
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<td>ASME B16.4-2016</td>
<td>Gray Iron Threaded Fittings: Classes 125 and 250</td>
<td>Fixtures</td>
<td>Table 604.1</td>
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<td>ASME B16.5-2012/2017</td>
<td>Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch</td>
<td>Fixtures</td>
<td>1208.6.13.2(1)</td>
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<td>ASME B16.33-2012 (R2017)</td>
<td>Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 175 psi (Sizes NPS ½ through NPS 2)</td>
<td>Valves</td>
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SUBSTANTIATION:
The above revisions reflect the latest updates to the American Society of Mechanical Engineering (ASME) standards that are referenced in Table 1701.1 and Table 1701.2.
Item #: 235
UPC 2021  Section: Table 1701.1 and Table 1701.2

SUBMITTER: Conrad Jahrling
ASSE International

RECOMMENDATION:
Revise text

TABLE 1701.1
REFERENCED STANDARDS

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<thead>
<tr>
<th>STANDARD NUMBER</th>
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<th>APPLICATION</th>
<th>REFERENCED SECTION</th>
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<tr>
<td>ASSE 1001-2017</td>
<td>2017 Atmospheric Type Vacuum Breakers</td>
<td>Backflow Protection</td>
<td>Table 603.2</td>
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<td>ASSE 1004-2008</td>
<td>Performance Requirements for Commercial Dishwashing Machines</td>
<td>Backflow Protection</td>
<td>414.2</td>
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<tr>
<td>ASSE 1022-2003</td>
<td>Performance Requirements for Backflow Preventer for Beverage Dispensing Equipment</td>
<td>Backflow Protection</td>
<td>Table 603.2, 603.5.12</td>
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Note: The ASSE standards meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

TABLE 1701.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
<thead>
<tr>
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<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
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<tr>
<td>ASSE 1062-2017</td>
<td>Performance Requirements for Temperature Actuated, Flow Reduction (TAFR) Valves for Individual Supply Fittings</td>
<td>Valves</td>
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SUBSTANTIATION:
The above revisions reflect the latest updates to the ASSE standards that are referenced in Table 1701.1 and Table 1701.2.
Item #: 236
UPC 2021 Section: Table 1701.1 Table 1701.2

SUBMITTER: Steve Mawn  
American Society of Testing and Materials (ASTM)

RECOMMENDATION:
Revise text

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTION</th>
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<tr>
<td>ASTM A312/A312M-2016</td>
<td>Seamless, Welded, and Heavy Cold Worked Austenitic Stainless Steel Pipes</td>
<td>Piping</td>
<td>Table 604.1, 1308.5(2)(b)</td>
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<td>ASTM A403/A403M-2016</td>
<td>Wrought Austenitic Stainless Steel Pipe Fittings</td>
<td>Fittings</td>
<td>1308.5(2)(c)</td>
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<td>ASTM A861-2004</td>
<td>High-Purity Iron Pipe and Fittings</td>
<td>Piping</td>
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<td>ASTM A888-2016</td>
<td>Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications</td>
<td>Piping</td>
<td>301.2, Table 701.2</td>
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<tr>
<td>ASTM A1056-2012</td>
<td>Cast Iron Couplings Used for Joining Hubless Cast Iron Soil Pipe and Fittings</td>
<td>Fittings</td>
<td>705.2.2</td>
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<td>ASTM B135/B135M-2017</td>
<td>Seamless Brass Tube</td>
<td>Piping</td>
<td>Table 604.1</td>
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<td>ASTM B251/B251M-2016</td>
<td>General Requirements for Wrought Seamless Copper and Copper-Alloy Tube</td>
<td>Piping</td>
<td>Table 604.1, Table 701.2</td>
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<td>ASTM B302-2013</td>
<td>Threaded Copper Pipe, Standard Sizes</td>
<td>Piping</td>
<td>Table 604.1, Table 701.2</td>
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<tr>
<td>ASTM C1460-2013</td>
<td>Shielded Transition Couplings for Use With Dissimilar DWV Pipe and Fittings Above Ground</td>
<td>Joints</td>
<td>705.10</td>
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<tr>
<td>ASTM C1461-2008</td>
<td>Mechanical Couplings Using Thermoplastic Elastomeric (TPE) Gaskets for Joining Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems for Above and Below Ground Use</td>
<td>Joints</td>
<td>705.10</td>
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<tr>
<td>ASTM D2466-2016</td>
<td>Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40</td>
<td>Fittings</td>
<td>Table 604.1, 1308.6(2)(b)</td>
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<tr>
<td>ASTM D2513-2014</td>
<td>Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings</td>
<td>Piping</td>
<td>1208.6.5, 1208.6.7(2), 1208.6.12.2, 1210.1.7.1(1)</td>
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<td>ASTM D2729-2014</td>
<td>Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings</td>
<td>Piping</td>
<td>Table 701.2, Table 1101.4.6</td>
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<tr>
<td>ASTM D2846/D2846M-2014</td>
<td>Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Standard Sizes</td>
<td>Piping, Plastic</td>
<td>Table 701.2</td>
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<td>ASTM D3034-2014</td>
<td>Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings</td>
<td>Piping, Plastic</td>
<td>Table 701.2</td>
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<tr>
<td>ASTM D4068-2016</td>
<td>Chorinated Polyethylene (CPE) Sheet for Concealed Water-Containment Membrane</td>
<td>Miscellaneous</td>
<td>408.7.2</td>
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<tr>
<td>ASTM D4551-2013</td>
<td>Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane</td>
<td>Miscellaneous</td>
<td>408.7.1</td>
</tr>
<tr>
<td>ASTM E84-2016</td>
<td>Surface Burning Characteristics of Building Materials</td>
<td>Miscellaneous</td>
<td>701.5(2), 903.1(2), 1101.4</td>
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<tr>
<td>ASTM E851-2013a</td>
<td>Fire Tests of Penetration Firestop Systems</td>
<td>Miscellaneous</td>
<td>208.0, 222.0, 1404.3, 1405.3</td>
</tr>
<tr>
<td>ASTM F409-2014</td>
<td>Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings</td>
<td>Piping, Plastic</td>
<td>404.1</td>
</tr>
<tr>
<td>ASTM F438-2014</td>
<td>Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40</td>
<td>Fittings</td>
<td>Table 604.1, 1308.6(2)(e)</td>
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<td>ASTM F628-2012</td>
<td>Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core</td>
<td>Piping</td>
<td>Table 701.2</td>
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<td>ASTM F876-2014</td>
<td>Crosslinked Polyethylene (PEX) Tubing</td>
<td>Piping</td>
<td>Table 604.1, 605.2.2, 605.3.1, 1308.6(2)</td>
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<td>ASTM F891-2016</td>
<td>Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core</td>
<td>Piping, Plastic</td>
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<td>ASTM F1281-2014</td>
<td>Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PE-AL-PE) Composite Pressure Pipe</td>
<td>Piping</td>
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<td>ASTM F1282-2010</td>
<td>Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe</td>
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<td>ASTM F1380-2016</td>
<td>Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PE-AL-PE) Composite Pressure Pipe</td>
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<td>ASTM F1760-2014</td>
<td>Coextruded Poly(Vinyl Chloride) PVC Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content</td>
<td>Piping</td>
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<td>ASTM F1907-2014</td>
<td>Metal Insert Fittings Utilizing a Copper Crimp Ring</td>
<td>Fittings</td>
<td>Table 604.1</td>
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for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing

ASTM F1866-2013 (R2017) Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings Fittings Table 701.2

ASTM F2389-2015 2017a Pressure-Rated Polypropylene (PP) Piping Systems Piping Table 604.1, 605.11.1, 606.1

ASTM F2831-2012 (R2017) Internal Non Structural Epoxy Barrier Coating Material Used in Rehabilitation of Metallic Pressurized Piping Systems Miscellaneous 320.1

(portion of table not shown remain unchanged)

Note: The ASTM standards meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

### TABLE 1701.2

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
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<tr>
<td>ASTM A479/A479M-2016a</td>
<td>Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels</td>
<td>Piping, Ferrous</td>
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<tr>
<td>ASTM A733-2015</td>
<td>Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples</td>
<td>Piping, Ferrous</td>
</tr>
<tr>
<td>ASTM A1045-2010 (R2017)</td>
<td>Flexible Poly (Vinyl Chloride) (PVC) Gaskets used in Connection of Vitreous China Plumbing Fixtures to Sanitary Drainage Systems</td>
<td>Piping, Plastic</td>
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<td>ASTM C444-2012</td>
<td>Perforated Concrete Pipe</td>
<td>Piping, Non-Metallic</td>
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<td>ASTM C478-2018</td>
<td>Circular Precast Reinforced Concrete Manhole Sections</td>
<td>Miscellaneous</td>
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<tr>
<td>ASTM C1440-2016</td>
<td>Thermoplastic Elastomeric (TPE) Gasket Materials for Drain, Waste, and Vent (DWV), Sewer, Sanitary and Storm Plumbing Systems</td>
<td>Joints</td>
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<td>ASTM D2517-2016</td>
<td>Reinforced Epoxy Resin Gas Pressure Pipe and Fittings</td>
<td>Piping, Plastic</td>
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<tr>
<td>ASTM D3311-2016</td>
<td>Drain, Waste, and Vent (DWV) Plastic Fittings Patterns</td>
<td>Joints</td>
</tr>
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<td>ASTM F1499-2012</td>
<td>Coextruded Composite Drain, Waste, and Vent Pipe (DWV)</td>
<td>Piping, Plastic</td>
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<tr>
<td>ASTM F1743-2012</td>
<td>Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)</td>
<td>Piping, Plastic</td>
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(portion of table not shown remain unchanged)

**SUBSTANTIATION:**
The above revisions reflect the latest updates to the American Society of Testing and Materials (ASTM) standards that are referenced in Table 1701.1 and Table 1701.2.
Item #: 237
UPC 2021  Section: Table 1701.1

SUBMITTER: Annette Alonso  
American Welding Society (AWS)

RECOMMENDATION:
Revise text

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<tr>
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<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTION</th>
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<tr>
<td>AWS A5.8-2011-AMD 1</td>
<td>Filler Metals for Brazing and Brazing Welding</td>
<td>Joints</td>
<td>605.1.1, 705.3.1, 1309.4.2</td>
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<tr>
<td>AWS B2.2/B2.2M-2016</td>
<td>Brazing Procedure and Performance Qualification</td>
<td>Certification</td>
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Note: AWS A5.8, AWS A5.9, and AWS B2.2 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
The above revisions reflect the latest updates to the American Welding Society (AWS) standards that are referenced in Table 1701.1.
**Item #: 238**
UPC 2021  Section: Table 1701.1

**SUBMITTER:** Paul Olson  
American Water Works Association (AWWA)

**RECOMMENDATION:**
Revise text

**TABLE 1701.1**  
**REFERENCED STANDARDS**

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<thead>
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<tr>
<td>AWWA C111-2012</td>
<td>Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings</td>
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<td>AWWA C151-2009</td>
<td>Ductile-Iron Pipe, Centrifugally Cast</td>
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<td>AWWA C510-2009</td>
<td>Double Check-Valve Backflow Prevention Assembly</td>
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<td>AWWA C511-2007</td>
<td>Reduced-Pressure Principle Backflow Prevention Assembly</td>
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<tr>
<td>AWWA C901-2008</td>
<td>Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. (13 mm) through 3 in. (76 mm), for Water Service</td>
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(portion of table not shown remain unchanged)

**Note:** The AWWA standards meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

**SUBSTANTIATION:**
The above revisions reflect the latest updates to the American Water Works Association (AWWA) standards that are referenced in Table 1701.1 and Table 1701.2.
Item #: 239
UPC 2021 Section: Table 1701.1

SUBMITTER: David Parney
Cast Iron Soil Pipe Institute (CISPI)

RECOMMENDATION: Revise text

TABLE 1701.1 REFERENCED STANDARDS

<table>
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<tr>
<td>CISPI 301-2012</td>
<td>Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications</td>
<td>Piping, Ferrous</td>
<td>301.2.4, Table 701.2</td>
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<td>CISPI 310-2012</td>
<td>Couplings for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications</td>
<td>Joints</td>
<td>301.2.4, 705.2.2</td>
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(portion of table not shown remain unchanged)

Note: CISPI 301 and CISPI 310 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
The above revisions reflect the latest updates to the Cast Iron Soil Pipe Institute (CISPI) standards that are referenced in Table 1701.1.
**TABLE 1701.1**

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<td>ASME A112.18.6-</td>
<td>Flexible Water Connectors</td>
<td>Piping</td>
<td>604.5, 604.13</td>
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<td>2017/CSA B125.6-2007 (R2014)</td>
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<td>ASME A112.19.3-</td>
<td>Stainless Steel Plumbing Fixtures</td>
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<td>407.1, 408.1, 409.1, 410.1, 411.1, 412.1, 415.1, 420.1</td>
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<td>ASME A112.19.5-</td>
<td>Flush Valves and Spads for Water Closets, Urinals, and Tanks</td>
<td>Fixtures</td>
<td>413.3</td>
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<td>CSA B45.5-</td>
<td>Plastic Plumbing Fixtures</td>
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<td>407.1, 408.1, 409.1, 411.1, 412.1, 420.1</td>
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<td>CSA B45.11-</td>
<td>Glass Plumbing Fixtures</td>
<td>Fixtures</td>
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<td>Flexible Water Connectors with Excess Flow Shut-off Device</td>
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<td>CSA B137.1-</td>
<td>Polylethylene (PE) Pipe, Tubing, and Fittings for Cold-Water Pressure Services</td>
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<td>Table 604.1</td>
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<td>CSA B137.5-</td>
<td>Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications</td>
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<td>CSA B137.6-</td>
<td>Chlorinated Polyvinylchloride (CPVC) Pipe, Tubing, and Fittings for Hot- and Cold-Water Distribution Systems</td>
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<td>CSA B137.9-</td>
<td>Polylethylene/Aluminum/Polylethylene (PE-AL-PE) Composite Pressure-Pipe Systems</td>
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<td>Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-P EX) Composite Pressure-Pipe Systems</td>
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<td>CSA B137.11-</td>
<td>Polypropylene (PP-R) Pipe and Fittings for Pressure Applications</td>
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<td>Polyethylene of Raised Temperature Resistance (PE-RT) Tubing Systems for Pressure Applications</td>
<td>Piping, Fittings</td>
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<td>CSA Z21.10.1-</td>
<td>Gas Water Heaters, Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu Per Hour or Less (same as CSA 4.1)</td>
<td>Fuel Gas, Appliances</td>
<td>Table 501.1(1)</td>
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<td>CSA Z21.10.3-</td>
<td>Gas-Fired Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous (same as CSA 4.3)</td>
<td>Fuel Gas, Appliances</td>
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<td>CSA Z21.93-</td>
<td>Excess Flow Valves for Natural Gas and LP Gas with Pressures up to 5 psig (same as CSA E.30)</td>
<td>Fuel Gas</td>
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*Note: The CSA standards meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.*

**(portion of table not shown remain unchanged)**

**TABLE 1701.2**

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<th>DOCUMENT NUMBER</th>
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<td>CSA Z21.13-2014</td>
<td>Gas-Fired Low-Pressure Steam and Hot Water Boilers (same as CSA 4.9)</td>
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*Note: The CSA standards meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.*

**(portion of table not shown remain unchanged)**
The above revisions reflect the latest updates to the American Society of Mechanical Engineering (ASME) standards that are referenced in Table 1701.1.
SUBMITTER: Kyle Thompson
IAPMO

RECOMMENDATION:
Revise text

TABLE 1701.1
REFERENCED STANDARDS

<table>
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<tr>
<th>STANDARD NUMBER</th>
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<th>REFERENCED SECTION</th>
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<tr>
<td>CSA B45.5-2011/IAPMO Z124-2011</td>
<td>Plastic Plumbing Fixtures</td>
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<td>CSA B45.11-2011/IAPMO Z401-2011</td>
<td>Glass Plumbing Fixtures</td>
<td>Fixtures</td>
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(paragraph of table not shown remain unchanged)

Note: CSA B45.5/IAPMO Z124 and CSA B45.11/IAPMO Z401 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

TABLE 1701.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
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<tbody>
<tr>
<td>IAPMO PS 52-2009</td>
<td>Pump/Dose, Sumps and Sewage Ejector Tanks with or without a Pump</td>
<td>DWV Components</td>
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<tr>
<td>IAPMO PS 53-2016</td>
<td>Grooved Mechanical Pipe Couplings and Grooved Fittings</td>
<td>Joints</td>
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<td>IAPMO PS 54-2015</td>
<td>Metallic and Plastic Utility Boxes</td>
<td>Miscellaneous</td>
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<td>IAPMO PS 59-2016</td>
<td>Wastewater Diverter Valves and Diversion Systems</td>
<td>DWV Components</td>
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<td>IAPMO PS 92-2013</td>
<td>Heat Exchangers and Indirect Water Heaters</td>
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<tr>
<td>IAPMO PS 94-2012</td>
<td>Insulated Protectors for P-Traps, Supply Stops and Risers</td>
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<td>IAPMO PS 95-2004</td>
<td>Drain, Waste, and Vent Hangers and Plastic Pipe Support Hooks</td>
<td>DWV Components</td>
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<tr>
<td>IAPMO PS 117-2017</td>
<td>Press and Nail Connections</td>
<td>Miscellaneous</td>
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(paragraph of table not shown remain unchanged)

SUBSTANTIATION:
The above revisions reflect the latest updates to the IAPMO and CSA standards that are referenced in Table 1701.1 and Table 1701.2.
SUBMITTER: Jonah Schein
   U.S. Environmental Protection Agency

RECOMMENDATION:
Revise text

TABLE 1701.2

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<th>DOCUMENT NUMBER</th>
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<td>EPA/625/R-04/108-2004</td>
<td>Guidelines for Water Reuse</td>
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(portion of table not shown remain unchanged)

SUBSTANTIATION:
The above revisions reflect the latest updates to the United States Environmental Protections Agency (EPA) standards that are referenced in Table 1701.2.
Item #: 243
UPC 2021 Section: Table 1701.1

SUBMITTER: Ed Wirtschoreck
International Code Council

RECOMMENDATION:
Revise text

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(portion of table not shown remain unchanged)

Note: ICC A117.1 meets the requirements for mandatory referenced standard in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
The above revisions reflect the latest updates to the ICC standards that are referenced in Table 1701.1.
Item #: 244
UPC 2021  Section: Table 1701.1 and Table 1701.2

SUBMITTER: David Thompson
Manufacturers Standardization Society (MSS)

RECOMMENDATION:
Revise text

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<th>APPLICATION</th>
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<td>Butterfly Valves</td>
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<td>MSS SP-122-2017</td>
<td>Plastic Industrial Ball Valves</td>
<td>Valves</td>
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Note: MSS SP-67 and MSS SP-122 meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

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<td>MSS SP-44-2016</td>
<td>Steel Pipeline Flanges</td>
<td>Fittings</td>
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SUBSTANTIATION:
The above revisions reflect the latest updates to the MSS standards that are referenced in Table 1701.1 and Table 1701.2.
SUBMITTER: Laura Moreno
National Fire Protection Association (NFPA)

RECOMMENDATION:
Revise text

Note: The NFPA standards meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

SUBSTANTIATION:
The above revisions reflect the latest updates to the National Fire Protection Association (NFPA) standards that are referenced in Table 1701.1 and Table 1701.2.
Item #: 246
UPC 2021 Section: Table 1701.1 and Table 1701.2

SUBMITTER: Jeremy Brown
NSF International

RECOMMENDATION:
Revise text

### TABLE 1701.1

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<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTION</th>
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<tr>
<td>NSF 3-2012</td>
<td>Commercial Warewashing Equipment</td>
<td>Appliances</td>
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<td>NSF 14-2016</td>
<td>Plastics Piping System Components and Related Materials</td>
<td>Miscellaneous</td>
<td>301.2.3, 604.1</td>
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<td>NSF 42-2012</td>
<td>Drinking Water Treatment Units – Aesthetic Effects</td>
<td>Appliances</td>
<td>611.1</td>
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<td>NSF 44-2012</td>
<td>Residential Cation Exchange Water Softeners</td>
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<td>NSF 53-2016</td>
<td>Drinking Water Treatment Units–Health Effects</td>
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<td>NSF 55-2012</td>
<td>Ultraviolet Microbiological Water Treatment Systems</td>
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<td>Reverse Osmosis Drinking Water Treatment Systems</td>
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<td>NSF 61-2012</td>
<td>Drinking Water System Components – Health Effects</td>
<td>Miscellaneous</td>
<td>415.1, 417.1, 604.1, 604.9, 606.1, 607.2, 608.2</td>
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<td>Drinking Water Distillation Systems</td>
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<td>NSF 350-2014</td>
<td>Onsite Residential and Commercial Water Reuse Treatment Systems</td>
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**Note:** The NSF standards meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

### TABLE 1701.2

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<td>Commercial Cooking, Rethermalization, and Powered Hot Food Holding and Transportation Equipment</td>
<td>Appliances</td>
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<td>NSF 12-2012</td>
<td>Automatic Ice Making Equipment</td>
<td>Appliances</td>
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<tr>
<td>NSF 46-2012</td>
<td>Evaluation of Components and Devices Used in Wastewater Treatment Systems</td>
<td>DWV Components</td>
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<tr>
<td>NSF 169-2012</td>
<td>Special Purpose Food Equipment and Devices</td>
<td>Appliances</td>
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**SUBSTANTIATION:**
The above revisions reflect the latest updates to the NSF International standards that are referenced in Table 1701.1 and Table 1701.2.
**Item #:** 247  
**UPC 2021**  
Section: Table 1701.1 and Table 1701.2

**SUBMITTER:** John Taecker/Maggie Carroll  
UL LLC

**RECOMMENDATION:**  
Revise text

### Table 1701.1  
**REFERENCED STANDARDS**

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<td>UL 103-2010</td>
<td>Factory-Built Chimneys for Residential Type and Building Heating Appliances</td>
<td>Fuel Gas, Appliances</td>
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<td>UL 174-2004</td>
<td>Household Electric Storage Tank Water Heaters</td>
<td>Appliances</td>
<td>Table 501.1(1)</td>
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<td>UL 399-2015</td>
<td>Drinking Water Coolers</td>
<td>Fixtures</td>
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<td>UL 641-2010</td>
<td>Type L Low-Temperature Venting Systems</td>
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<td>UL 723-2008</td>
<td>Test for Surface Burning Characteristics of Building Materials</td>
<td>Miscellaneous</td>
<td>701.2(2), 903.1(2), 1101.4</td>
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<td>Household Dishwashers</td>
<td>Appliances</td>
<td>414.1</td>
</tr>
<tr>
<td>UL 778-2016</td>
<td>Motor-Operated Water Pumps</td>
<td>Appliances</td>
<td>1101.14</td>
</tr>
<tr>
<td>UL 921-2016</td>
<td>Commercial Dishwashers</td>
<td>Appliances</td>
<td>414.1</td>
</tr>
<tr>
<td>UL 1453-2016</td>
<td>Electric Booster and Commercial Storage Tank Water Heaters</td>
<td>Appliances</td>
<td>Table 501.1(1)</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

**Note:** The UL standards meet the requirements for mandatory referenced standards in accordance with Section 3-3.7.1 of IAPMO’s Regulations Governing Committee Projects.

### Table 1701.2  
**STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES**

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 252-2010</td>
<td>Compressed Gas Regulators</td>
<td>Fuel Gas</td>
</tr>
<tr>
<td>UL 290-2013</td>
<td>Oil Burners</td>
<td>Fuel Gas, Appliances</td>
</tr>
<tr>
<td>UL 563-2009</td>
<td>Ice Makers</td>
<td>Appliances</td>
</tr>
<tr>
<td>UL 569-2013</td>
<td>Pigtails and Flexible Hose Connectors for L.P-Gas</td>
<td>Fuel Gas</td>
</tr>
<tr>
<td>UL 1206-2003</td>
<td>Electric Commercial Clothes-Washing Equipment</td>
<td>Appliances</td>
</tr>
<tr>
<td>UL 1331-2005</td>
<td>Station Inlets and Outlets</td>
<td>Medical Gas</td>
</tr>
<tr>
<td>UL 1795-2016</td>
<td>Hydromassage Bathubs</td>
<td>Fixtures</td>
</tr>
<tr>
<td>UL 1951-2011</td>
<td>Electric Plumbing Accessories</td>
<td>Miscellaneous</td>
</tr>
</tbody>
</table>

(portion of table not shown remain unchanged)

**SUBSTANTIATION:**  
The above revisions reflect the latest updates to the UL LLC standards that are referenced in Table 1701.1 and Table 1701.2.