How codes and standards protect our society
AN AMERICAN NATIONAL STANDARD
IAPMO/ANSI UPC1 – 2021 & IAPMO/ANSI UMC1 – 2021

2021 UPC & UMC

Below are the 2021 UPC Most Important Changes:

- New Appendix N – Impact of Water Temperature on the Potential for Scalding and Legionella Growth
- New provisions for backflow prevention devices, assemblies, and methods
- New provision of temperature limiting devices
- New guard and rail requirements for appliances on roofs and platforms
- New requirements for the discharge of temperature and pressure relief valve piping
- New provision on leak detection devices
- Provisions for potable water pumps
- New standards for drain, waste, and vent pipe and fittings
- New provisions for drain waste and vent cleanouts
- Circuit vent provisions have been updated and expanded
- Updated to fuel gas provisions
- Updated medical gas provisions including reordering of categories for ease of use

Below are the 2021 UMC Most Important Changes:

- Guard and rail requirements for installation of equipment and appliances on roofs
- Transient and non-transient ventilation requirements
- Various provisions for air ducts, such as factory-made ducts and dampers
- Refrigeration systems, including pressure-limiting devices and hydrostatic expansion
- Sizing of natural gas and propane piping systems
- Fuel gas piping appliance shutoff valves, test pressure, and overpressure protection devices
- Tube fastener provisions for radiant heating and cooling
- Fire-extinguishing equipment for exhaust systems
- New Appendix F for open- and closed-loop geothermal energy systems

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Codes and standards provide the necessary solid foundation for consistent building practices. Without them, products manufactured by different companies may not fit together, and structures would likely struggle to survive the harsh environment.

IAPMO continues to be the go-to source for codes and standards development for jurisdictions globally. With a dedicated team, we advance the publication of documents that improve countless lives. The Uniform Codes have been revised with up-to-date provisions, and IAPMO standards have been updated for the safe use and application of products. Code development cycles were completed, state codes published, and well-respected IAPMO standards were published, all to protect the public’s health and welfare.

2021 UPC and UMC cycle completed

Completing the code change cycle for the 2021 UPC and UMC was a daunting task to say the least. With an accelerated schedule, the Code Development staff was resilient when faced with fast-approaching deadlines and multiple proposals coming from all aspects of the industry. The team answered all questions, and all comments were processed in a timely and efficient manner.

The UPC improved with the implementation of an appendix to address Legionella and scald risk potential. The Legionella Task Group produced the first code-enforceable language within a national code, providing for the implementation of key provisions from ASHRAE 188 and ASHRAE Guideline 12. Legionella bacteria can cause serious types of pneumonia and fevers, so it is crucial that a code like the UPC provides jurisdictions with enforceable language.

ANSI accredits about 250 Standards Developing Organizations (SDOs) that develop American National Standards. Of those, ANSI has approved six organizations (ASTM, ASHRAE, UL, NSF, NFPA and IAPMO) to be Audited Designators — the highest level of standards development — enabling each of these six organizations to self-designate their standards included in the audited designator program. IAPMO has been one such SDO for the past decade, and we are very proud to have achieved this designation.

Subject matter experts volunteer in the creation of IAPMO’s Uniform Codes. These SMEs are critical to our ability to advance innovative technology via inclusion in our various codes and standards. Our volunteer system in the United States is unique because in most countries, a national standards body, typically a government agency or department, is responsible for the ongoing development and maintenance of national or international codes and standards. I appreciate the ANSI process because it emphasizes the public-private relationship wherein government departments work collaboratively with the private sector. This includes, in IAPMO’s case, all major industry sectors, thus providing up-to-date codes and standards provisions. The U.S. voluntary consensus development process stands as a model of efficiency and a testament to the many qualified and skilled SMEs who give their expertise and experience in creating world-class codes and standards.

IAPMO Standards Development is the best in the plumbing industry for publishing American National Standards (ANS), National Standards of Canada (NSC) and Industry Standards. Every person from this team brings something unique to the table. Some review the technical contents for accuracy, some provide a secondary review, and others inspect grammar and layout. Our ANSI, NSC and Industry Standards help improve the lives of many.

When a new product comes to the market, the industry must not only have confidence it will function as intended, but more importantly, that is safe for public use. There are many standards that started out as an Industry Standard and now are a normal part of our lives.

IAPMO Codes and Standards Development prides itself as being the go-to-source for new and novel products. Many innovators and manufacturers have taken advantage of IAPMO’s services to ensure that their novel products find their way into the industry.

As technology rapidly improves, IAPMO Codes and Standards is ready to meet the industry’s needs.

GP Russ Chaney
CEO
IAPMO
In 2019, the World Health Organization started monitoring the outbreak of a new coronavirus, which ultimately was named COVID-19. The virus first was identified in Wuhan, China.

This article is intended to provide practical guidance for plumbing professionals who work on sanitary waste and sewer systems on how to protect themselves, their loved ones and their coworkers during the current pandemic.

Coronaviruses are so named because, when viewed under a microscope, they have protrusions that resemble a crown. They belong to a family of viruses common in both humans and many animal species. In rare occurrences, animal coronaviruses can mutate to the point where they are able to also infect humans, which is likely what occurred in China late last year. The potential for viruses that cross over from animals to humans to develop into an epidemic, happens when the virus can then be transmitted between humans. The COVID-19 virus is highly transmissible between humans and can cause respiratory illness and even death.

As of this writing in early March on World Plumbing Day, the WHO announced the outbreak qualifies as a pandemic, having spread on all inhabited continents. The worldwide number of humans diagnosed with COVID-19 has surpassed 120,000, with more than 4,300 deaths (see chart below). These numbers are predicted to grow.

Unfortunately, there’s much we still don’t know about the virus, including important details about its transmissibility, how long it can survive on various surfaces or in water, and the range of illness severity amongst various population groups. It is known that the elderly and those who are immuno-compromised with preexisting medical conditions are the most vulnerable for poor medical outcomes, which is consistent with other pathogen-based diseases, including influenza. However, contrary to some misinformation that’s currently available, the coronavirus is in fact considerably more dangerous than the current annual influenza virus.

**Understanding coronavirus exposure for plumbing professionals**

As long as the pandemic is still active, it should be assumed by anyone working on a sanitary drainage system that the virus is present.

Plumbing and the coronavirus

So, what are the implications for those who work in the plumbing industry and what steps can plumbers take to stay safe? It is likely that the COVID-19 coronavirus can, indeed, be spread through building sanitary drainage systems. This became apparent when the Chinese government identified an outbreak in a Hong Kong high-rise building a few weeks prior to this writing.

Therefore, for as long as the pandemic is still active, it should be assumed by anyone working on a sanitary drainage system that the virus is present. Considering the potential to come into contact with water and aerosols that contain the coronavirus when working on sanitary systems or sewers, it is highly recommended that plumbers wear proper personal protective equipment, including a full face shield, worn over safety glasses, and gloves.

Of course, plumbers work on sanitary drainage systems that contain fecal matter and a host of dangerous pathogens every day. Taking careful precautions to prevent contact with wastewater and proper hand and arm hygiene is a matter of good prac-
practice for plumbers. In the United States, the Occupational Safety and Health Administration provides standards for worker protection. OSHA Standard 29 CFR 1926, Safety and Health Regulations for Construction provides the requirements for construction worker safety, including plumbers who work on sanitary drains, vent systems and sewers. The standards are available free at www.osha.gov/laws-regs/regulations/standardnumber/1926.

The most important subsections for plumbers to review are: 1926.20 – General safety and health provisions; 1926.21 – Safety training and education; 1926.22 – Recording and reporting of injuries; 1926.23 – First aid and medical attention; 1926.28 – Personal protective equipment; 1926.50 – Medical services and first aid; 1926.95 – Criteria for personal protective equipment; 1926.102 – Eye and face protection and 1926.103 – Respiratory protection.

Additionally, ASSE International’s Series 12000 Standard, Professional Qualifications Standard for Infection Control Risk Assessment for All Building Systems, is a standard that sets minimum criteria for the training and certification of pipe trades craftpeople, and other construction and maintenance personnel, on how to safely work in an environment with the potentially deadly diseases that may be present within worksites.

While the pandemic remains ongoing, ASSE International is making the ASSE Series 12000 Standard available for free at https://asse-plumbing.org/12000-2018. The ASSE 12000 certification training addresses viruses, including the severe acute respiratory syndrome (SARS) virus, but does not specifically reference COVID-19. We welcome plumbers from across the globe to consider professional qualification for infection control risk assessment, especially when working on sanitary systems that have a high probability of being contaminated with COVID-19, such as healthcare facilities and hospitals.

Finally, common sense still reigns supreme. Plumbers are advised to increase the frequency of hand washing and wash for at least 20 seconds with soap and water (even longer hand washing time is good practice after contact with wastewater); avoid touching of the face; cover any open cuts or wounds and wear proper PPE. If you personally come into close proximity or into direct contact with an infected person, immediately report the incident to your supervisor and to your doctor or healthcare provider.

Good workplace and tool cleaning practices are also extremely important. Avoid sharing of tools with coworkers to the greatest extent possible. When choosing cleaning chemicals, look for cleaning agents with claims against viral pathogens. If such cleaning agents are not available, use soap and water, and dry tools thoroughly after use. Keep your PPE clean as well by following manufacturer instructions carefully.

With no vaccine or treatment regimen currently available, it is important for all workers to be able to recognize the symptoms associated with contracting the coronavirus, which include fever, shortness of breath and persistent cough. Symptoms can take between 2 to 14 days to become apparent after exposure to the virus. If you start to feel ill, stop work immediately in order to protect your coworkers and others around you, go home, contact your doctor and follow your doctor’s orders! This is critically important when working in a facility that houses immuno-compromised people.

The IAPMO Group sends its best wishes to plumbing professionals around the world. We hope that the information above is helpful. As usual, plumbers are on the front lines fighting the battles that keep people safe. By working carefully and thoughtfully, we can also keep ourselves and our loved ones safe as we deal with and defeat COVID-19!

Additional sources of useful information can be found at the links below:
- www.who.int/emergencies/diseases/novel-coronavirus-2019
- www.wef.org/resources/online-education/webcasts/ArchivedWebcasts/CoronavirusWebcastArchive/
Inside the 2021 Uniform Plumbing Code

Pay particular attention to code changes pertaining to water treatment systems and products.

The International Association of Plumbing and Mechanical Officials (IAPMO) published the 2021 Uniform Plumbing Code (UPC) in the first quarter of 2020.

As anticipated, the 2021 edition of the UPC has some significant modifications to the sections covering drinking water treatment products. As the 2021 revision of the UPC becomes adopted by states and local jurisdictions, it’s important for industry manufacturers and dealers to understand the code changes that affect drinking water treatment product installations.

This article outlines the 2021 code changes pertaining to water treatment systems and provides some insight on the new water treatment product standards that are referenced in the 2021 revision. Three new standards are referenced in the revised Section 611.1 of the 2021 UPC with regards to drinking water treatment units. Additionally, ASSE 1023 is now referenced in Chapter 4 for low-pressure water dispensers.

Outlined below, is the current 2018 UPC text, followed by the proposed 2021 UPC revisions to Section 611.1 covering water treatment equipment. In the 2021 revision, note the new Table 611.1 and new subsections 611.1.1 and 611.1.2.

2018 UPC Code excerpt

- 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.
- 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 in accordance with Table 603.2, NSF 58, or IAPMO PS 65.
- 611.3 Connection Tubing. The tubing to and from drinking water treatment units shall be of a size and material as recommended by the manufacturer.
- 611.4 Sizing of Residential Softeners. Residential-use water softeners shall be sized in accordance with Table 611.4.

2021 UPC Code excerpt

- 611.0 Drinking Water Treatment Units.
- 611.1 Application. Drinking water treatment units shall comply with the applicable referenced standards in Table 611.1.
- 611.1.1 Alkaline Water Treatment. Alkaline water treatment devices shall comply with IAPMO IGC 322.
- 611.1.2 Scale Reduction Devices. Scale reduction devices shall comply with IAPMO Z601.
- 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 in accordance with Table 603.2, NSF 58, or IAPMO PS 65.
- 611.3 Connection Tubing. The tubing to and from drinking water treatment units shall be of a size and material as recommended by the manufacturer.
- 611.4 Sizing of Residential Softeners. Residential-use water softeners shall be sized in accordance with Table 611.4.

The new Table 611.1 provides a list of water treatment technologies along with the corresponding performance and safety standards used to test and certify the product types. The table provides details for residential and commercial product standards required in the UPC. Adding this table helps clarify the scope of each product standard. The addition of the ASSE 1087-2018 standard provides clarity regarding the standard covering commercial and food service water treatment products. Along with the new...
table, two new subsections, 611.1.1 and 611.1.2, provide information on the performance and safety standards that cover alkaline water treatment devices, and products designed to reduce scale from drinking water.

ASSE 1087–2018 performance requirement for commercial and food service water treatment equipment utilizing drinking water

The application of this standard includes commercial water treatment equipment used in point-of-entry (POE) and point-of-use (POU) applications connected to the building plumbing to improve the water quality characteristics of potable water. This standard includes testing requirements for components and complete systems. This standard covers all water treatment products that are connected to the building’s potable water plumbing system. This standard is not intended to cover water treatment products used for process water or wastewater applications. Examples of water treatment equipment include deionizers, filters, softeners, reverse osmosis assemblies, ultraviolet systems, ozone systems and distillers.

Tests verifying claims regarding changes to water chemistry, microbiology and aesthetics [i.e. smell, taste, appearance, etc.] are not included in this standard. Devices may claim such performance via other standards or test protocols.

Similar to other ASSE standards, the ASSE 1087 standard includes minimum performance tests that focus on public health and product safety, such as:

### Service flow rate and pressure drop:
Testing to verify flow rate and pressure drop characteristics to assist with installation sizing requirements.

### Backsiphonage:
Products that operated via self-regeneration have integrated backflow protection to ensure the regenerant cannot enter the potable water.

### 24-hour pressure loss:
To ensure that the device’s seals, joints and connections continue to maintain the static working pressure.

### Pressure shock (water hammer):
To determine if the device, when subjected to a pressure of two times the manufacturer’s maximum rated working pressure, withstands the shock wave produced in downstream piping.

### Structural integrity – hydrostatic:
This test is performed to ensure the system or component will be able to withstand peak pressures found in a plumbing system when assembled into a complete water treatment system.

### Structural integrity – cycle test:
This test is performed to ensure the system or component will be able to withstand repeated pressure cycling.

### Material safety:
To ensure products connected to a potable water supply will not add contaminants to the drinking water above safe levels.

### TABLE 611.4
SIZING OF RESIDENTIAL WATER SOFTENERS

<table>
<thead>
<tr>
<th>REQUIRED SIZE OF SOFTENER CONNECTION (inches)</th>
<th>NUMBER OF BATHROOM GROUPS SERVED¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾</td>
<td>up to 2²</td>
</tr>
<tr>
<td>1</td>
<td>up to 4³</td>
</tr>
</tbody>
</table>

For SI units: 1 inch = 25 mm

**Notes:**
1. Installation of a kitchen sink and dishwasher, laundry tray, and automatic clothes washer permitted without additional size increase.
2. An additional water closet and lavatory permitted.
3. Over four bathroom groups, the softener size shall be engineered for the specific installation.
4. See also Appendix A, Recommended Rules for Sizing the Water Supply System, and Appendix C, Alternate Plumbing Systems, for alternate methods of sizing water supply systems.

### TABLE 611.1
DRINKING WATER TREATMENT UNITS

<table>
<thead>
<tr>
<th>APPLICATION</th>
<th>RESIDENTIAL</th>
<th></th>
<th>COMMERCIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POINT OF USE</td>
<td>POINT OF ENTRY</td>
<td>ASSE 1087 and NSF 42*</td>
</tr>
<tr>
<td>Aesthetic Contaminant Reduction (filters)</td>
<td>NSF 42</td>
<td>NSF 42</td>
<td>ASSE 1087 and NSF 42*</td>
</tr>
<tr>
<td>Health Related Contaminant Reduction (filters)</td>
<td>NSF 53</td>
<td>NSF 53</td>
<td>ASSE 1087 and NSF 53*</td>
</tr>
<tr>
<td>Water Softener</td>
<td></td>
<td></td>
<td>ASSE 1087</td>
</tr>
<tr>
<td>Ultraviolet Water Treatment</td>
<td>NSF 55</td>
<td>NSF 44</td>
<td>ASSE 1087</td>
</tr>
<tr>
<td>Reverse Osmosis</td>
<td>NSF 58</td>
<td>NSF 61</td>
<td>ASSE 1087</td>
</tr>
<tr>
<td>Distillation</td>
<td>NSF 62</td>
<td>NSF 62</td>
<td>ASSE 1087</td>
</tr>
</tbody>
</table>

* Required for commercial modular systems only.
Inside the 2021 Uniform Plumbing Code

**Marking:** To provide guidance to uses on temperature and pressure limitations, and to distinguish between products approved for use on potable water vs process water.

**IAPMO IGC 322–2018 Alkaline Water – Drinking Water Treatment Units**

This standard covers alkaline water drinking water treatment devices intended for use in residential, commercial and food service applications and specifies requirements for materials, performance tests and markings.

**Alkaline water:** Drinking water treatment products covered by this standard increase alkalinity in potable water using a continuous flow-type electrolytic water generator, and can include the following types:

- Electrolytic water generators with internal power supply equipment for continuous flow;
- and
- Electrolytic water generators intended to increasing alkalinity in potable water.

Testing requirements include:

**Material safety:** Alkaline water treatment devices covered by this standard shall be made of materials safe to contact drinking water that complies with Section 4 of NSF/ANSI 42 or NSF/ANSI 53.

**Structural integrity:** The structural integrity test for alkaline water treatment units shall be conducted in accordance with NSF/ANSI 42, Section 5.4.

**Aesthetic and health effects reduction claims:** Aesthetic and health effects reduction claims marketed by the alkaline water treatment unit shall be conducted using the performance criteria in NSF/ANSI 42 and NSF/ANSI 53 or other applicable standards.

**Alkaline test:** The minimum flow rate of 2.2 L/min [0.58 gpm] shall be maintained during production. Samples of product water shall be collected at the manufacturers recommended pH ranges. The specific pH of the product shall be +/- 0.5 the pH measured. Product samples shall be analyzed for oxidation reduction potential (ORP) at each pH. The chart below indicates the required ORP at specified pH ranges.

- (a) 8.5 pH - 250~400 orp
- (b) 9.0 pH - 400~550 orp range
- (c) 9.5 pH - 500~650 orp
- (d) 5.5 pH > +500
- (e) 2.7 pH > +1100
- (f) 11.0 pH > -800 (for example -800 ~ -1100)

Alkaline water generators may have the potential to form total trihalomethane (TTHM) compounds when treating water supplies containing total organic carbon. To address this concern, the product shall have a post filter that conforms to NSF/ANSI 53 for VOC or TTHM reduction.

**IAPMO/ANSI Z601–2018 Scale Reduction Devices**

Although several alternatives to ion-exchange water treatment devices have the potential to offer solutions to consumers’ need for scale reduction, lack of an appropriate test protocol that can be used to certify their effectiveness did not exist until IAPMO/ANSI Z601 was published in 2019. This standard was developed to enable testing of devices that have the potential to reduce encrusted scale in residential water heaters and downstream associated plumbing. The standard includes the following test requirement categories: material safety, structural integrity, scale reduction performance testing for tank-type water heaters and tankless water heaters requiring a minimum of 70% reduction in scale formed in the water heater and downstream piping.

The scope of the standard covers scale reduction devices intended for residential and similar water heating applications. The intent of this standard is to rate or verify the effectiveness of the product’s ability to reduce or eliminating scale in hot water systems and downstream water piping systems.

The development of IAPMO/ANSI Z601 now allows companies to verify the scale reduction performance of their device. It also allows certification bodies the ability certify the scale reduction performance utilizing an ANSI standard.

**ASSE 1023–2019 Electrically Heated or Cooled Water Dispensers**

The ASSE 1023 standard has been referenced in the UPC and the International Plumbing Code (IPC) for many years. However, this standard has undergone a significant update for the 2019 edition. ASSE 1023–2019 now applies to filtered and nonfiltered water dispensers that cool or heat drinking water. The standard also now covers water dispensers, filtered or unfiltered, that include an integral electrically powered heater or cooler. Examples of products covered by this standard include, but are not limited to, undercounter-mounted water dispensing systems, freestanding plumbed systems, freestanding bottled systems, and countertop systems. These products are for both residential and commercial use. The following tests are required:

- Abnormal discharge and minimum water temperature.
- Instant capacity for heater water.
- Continuous capacity.
- Contamination reduction testing for products that incorporate water treatment.

As water treatment products become more common (the norm) in residential and commercial buildings, the 2021 UPC continues to set the bar for addressing new product consumer safety. The revisions to Section 611.1 of the UPC will help the building, plumbing and water treatment community understand the applicable product standards required to comply with the code.

The new standards that have been added to the code will allow companies a clear path for code compliance for residential and commercial buildings. Water quality issues continue to surface around the county and the aging water infrastructure in the U.S. continues to increase the demand for residential and commercial water treatment equipment. The IAPMO Group and ASSE International are committed to working with the water treatment industry to advocate solutions to the increasing list of water problems businesses and consumers are facing.
The Uniform Plumbing Code (UPC) governs the construction, location and installation of fuel-burning and other types of water heaters.

The UPC defines a water heater, or water heating boiler, as 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. The water heater thermostat is a device used to set the water temperature within the holding tank, and the UPC does not recommend or mandate a temperature setting for the thermostat, thus making it a "silent temperature" setting. The UPC does, however, contain regulations for minimum requirements that focus on the health, safety and welfare of the public by mandating specific requirements for the water heater and plumbing fixtures.

The UPC addresses comprehensive installation requirements for water heater safety devices and water heater appliances while referencing the appropriate nationally recognized standards, where applicable. There are three water heater safety devices required by the code: the first being a temperature-limiting device designed to prevent the heated water from exceeding 210° by automatically shutting down the energy source and preventing the water heater from becoming a steam-boiler.

The second water heater safety device is a vacuum relief valve designed to prevent siphonage within the tank that can result in emptying of the tank (possibly creating steam in the tank), and can even cause the tank to collapse.

The third safety device is a pressure relief valve designed to relieve excess pressure, usually at 150 psig for residential water heaters. Note that an expansion tank does not take the place of a pressure relief valve device, and that an expansion tank is required when a water system contains a check valve, backflow preventer or other normally closed device that prevents dissipation of building pressure back into the water main.

A water heater designed for residential or commercial purposes is typically set at 120° from the factory, but what temperature should the water heater be set to when installed? Again, the UPC is silent on the temperature setting for the water heater thermostat, and states that water heaters shall be installed in accordance with the manufacturer’s installation instructions. The water heater manufacturers typically recommend a thermostat temperature setting.

Unfortunately, there is no perfect temperature setting as an overlap of temperatures is required for the health, safety and welfare of the end users. When the water temperature is set too low, the water can create a perfect environment for Legionnaires’ disease. There are documented instances of health hazards associated with water-storing vessels set at temperatures known to “amplify” bacteria growth. According to the ASHRAE Guide 12, legionellae have been recovered from cold...
After joining the International Association of Plumbing and Mechanical Officials (IAPMO) in 2015 from the Water Quality Association (WQA), I began studying the U.S. and international plumbing codes in greater detail.

Having worked in the water treatment industry since 1997, I was familiar with the model plumbing codes and state plumbing codes, but since there were very few requirements for water treatment equipment, it was never a significant regulatory focus for the WQA or its members. The model plumbing codes are updated every three years and with each three-year cycle, water quality continues to become a bigger focus for consumer health and safety in homes and businesses.

Drinking water contamination is a global problem. People who travel quickly notice the varying water quality aspects throughout the United States and abroad. Most travelers would never consider drinking tap water in emerging countries or even in many developed countries.

Even in the United States, where tap water is considered safe, we continue to hear about tap water contaminated with lead, disinfection byproducts, perfluorocarbons, arsenic — this list is never ending. Drinking water contamination notices and related publicity have increased the need and demand for residential and commercial water treatment products. How do the plumbing codes ensure all the water treatment products being installed to improve tap water are safe or that they do not negatively affect the plumbing design?

Several existing standards are referenced in the Uniform Plumbing Code (UPC) and the International Residential Code (IRC). These standards include NSF/ANSI 44 for residential cation exchange water softeners, NSF/ANSI 58 for point of use ROs and NSF/ANSI 42 and 53 for residential water filtration equipment. One of the major gaps that exists in the plumbing codes today is a set of requirements for commercial water treatment equipment. The primary reason for this gap is that a standard to evaluate the health and safety of commercial water treatment equipment did not exist. The ASSE 1087 standard has been developed and published to fill this gap.

In October 2018, ASSE International published ASSE 1087, a comprehensive health and safety standard to cover commercial and food service water treatment equipment. The following is a list of the standard’s requirements and a brief description of the purpose of each test. 

Performance requirements and compliance testing

The following is a list of the standard’s requirements and a brief description of the purpose of each test.

Service flow and pressure drop testing is required on complete systems: Service flow rate and pressure drop information is critical when sizing the plumbing system of
The 1087 standard includes plumbed-in water treatment devices and components, point of entry (POE) and point of use (POU), that are used in buildings (such as restaurants) to improve the quality of the water.

New buildings or for determining the proper size of treatment equipment in existing buildings. This testing includes requirements for specified service flow rates and maximum flow rates (peak flow) with corresponding pressure drop data. This data can be used by plumbing engineers for proper sizing of systems to comply with the plumbing code.

**Backsiphonage during system regeneration** testing is required on products such as cation exchange water softeners that use brine to regenerate the system. Areas of the United States are beginning to require regenerating water treatment equipment to be installed with an additional backflow prevention device. This test has been designed to confirm the system will not allow fluid in the brine tank to enter the potable water system. Systems meeting this design will not need an additional backflow prevention device because this safety mechanism is designed into the water treatment system. It is important to note this test is designed to evaluate backflow of the brine tank. Proper air gaps are also required on systems that include a drain connection.

**Bypass flow capacity during system regeneration** testing is required on products such as cation exchange water softeners. Flow rate and pressure drop testing will be conducted on the water treatment equipment while the automatic bypass is engaged. This test is designed to ensure the building will not be restricted of water if there is a demand when the system is regenerating.

The 1087 standard includes four structural integrity tests to verify the integrity of the system or component. **A 24-hour pressure loss test** is required on complete systems and pressure bearing components. This test has been designed to demonstrate the system or component will not leak under pressure over a 24-hour period. The **pressure shock (water hammer) test** checks the system’s ability to withstand water hammer up to twice the maximum rated working pressure of the device. The **hydrostatic test** is performed to ensure the system or component will be able to withstand peak pressures experienced in a plumbing system. Finally, **cycle testing** is performed to ensure the system or component will be able to withstand repeated pressure cycling for a simulated 20 years of life.

**Material safety testing** refers to the existing NSF/ANSI 61 standard that has been used for decades to ensure products are safe to contract drinking water. Point-of-use products would reference the corresponding NSF/ANSI standard covering filters, ROs and distillers. The 1087 standard also requires systems and components to comply with the requirements of NSF/ANSI 372 to verify compliance with the U.S. EPA’s lead-free requirements under the safe drinking water act.

**Contaminant reduction testing** to verify marketed claims is not currently required in the standard because most commercial products are specifically designed and constructed for the commercial building’s water treatment needs. Creating contaminant reduction test protocols for uniquely designed products of varying sizes can be challenging. However, industry manufacturers have already initiated proposed revisions to the standard to include voluntary contaminant reduction testing to verify the system’s marketed claims. As these protocols are finalized and validated through laboratory testing, the standard will be opened for revision.

The ASSE 1087 standard will provide regulators, inspectors and code developers an opportunity to improve health and safety requirements for commercial water treatment products that connect to the building drinking water supply. It seems that the news media publishes new articles daily that highlight major concerns about poor drinking water quality around the globe.

Water treatment in commercial buildings continues to expand because of the water quality issues. Creating the ASSE 1087 standard to cover all commercial drinking water treatment equipment is an important step to improve the safety of drinking water. The new 1087 standard follows ASSE’s motto, “Prevention Rather than Cure,” by allowing companies, inspectors and regulators to verify the safety and performance of commercial water treatment equipment before it is installed in a building.

Plumbing codes are quickly recognizing the need for high-quality water treatment equipment.

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**Contaminant reduction testing** to verify marketed claims is not currently required in the standard because most commercial products are specifically designed and constructed for the commercial building’s water treatment needs. Creating contaminant reduction test protocols for uniquely designed products of varying sizes can be challenging. However, industry manufacturers have already initiated proposed revisions to the standard to include voluntary contaminant reduction testing to verify the system’s marketed claims. As these protocols are finalized and validated through laboratory testing, the standard will be opened for revision.

The ASSE 1087 standard will provide regulators, inspectors and code developers an opportunity to improve health and safety requirements for commercial water treatment products that connect to the building drinking water supply. It seems that the news media publishes new articles daily that highlight major concerns about poor drinking water quality around the globe.

Water treatment in commercial buildings continues to expand because of the water quality issues. Creating the ASSE 1087 standard to cover all commercial drinking water treatment equipment is an important step to improve the safety of drinking water. The new 1087 standard follows ASSE’s motto, “Prevention Rather than Cure,” by allowing companies, inspectors and regulators to verify the safety and performance of commercial water treatment equipment before it is installed in a building.

Plumbing codes are quickly recognizing the need for high-quality water treatment equipment. As new products are engineered, ASSE is committed to helping the industry create new product standards that can ultimately be referenced in the plumbing codes to protect public health and safety.
It’s alarming that a modern city can run out of water, a reality that was on the brink of occurring in the city of Cape Town, South Africa.

Located at the southernmost tip of the African continent, Cape Town reached a critical state after two years of severe drought conditions. Some residents are even digging boreholes to find a source of water, which may be unfit for drinking.

How is this possible in an established city such as Cape Town? What can be done to help cities in a similar predicament?

One solution implemented in several coastal cities is saltwater desalination, a filtering process where salt is removed from water so that it is safe to drink. Whether the technology employed is reverse osmosis (RO desalination) or thermal distillation (stills), coming up with the technology to tackle the water shortage problem is only part of the solution. Like any other innovative design or improvement on existing technology, it is crucial that the finished product be evaluated to ensure public safety.

Cape Town’s coastline runs along 620 miles (1,000 km) of the Atlantic Ocean. Its location and access to saltwater makes this city a perfect candidate for saltwater desalination. Two temporary RO desalination plants are under construction. At an estimated cost of around $40 million U.S. (1/2 billion Rand), the plants are expected to supply up to 7 million gallons (26.5 million liters) a day for two years, after which they will be removed, and the area rehabilitated.

A close-to-ideal solution would be low-cost, highly efficient, compact stills or RO desalination units. However, low-cost solutions are traditionally cumbersome and require significant maintenance. Highly efficient systems are typically prohibitively expensive to construct and need a substantial energy investment per gallon of water produced.

Fortunately, we may be at the crossroads of low cost and high efficiency in our desalination technology. The increasing applications of these technologies, as well as the heightened interest driven by a need for solutions to the water shortage problem around the world, is moving the development and production of available products closer to the ideal solution.

**How IAPMO can help**

It is important in this burgeoning area that as products move into use they are tested to a standard to prevent failures and safeguard the health of the public. This is where IAPMO can become a factor. The IAPMO standards development procedures provide a means to rapidly develop new industry standards, to keep pace with evolving technology, and IAPMO R&T can provide testing and certification of a safe and reliable RO desalination unit or thermal still.

A municipal size desalination plant capable of generating 50 million gallons (190 million liters) of water a day is planned for construction in Huntington Beach, California. The cost is estimated at $1 billion U.S.; such a solution is financially unfeasible for most cities and individuals. However, a small still intended for use in individual households is not only financially feasible, but highly advisable when considered as one part of a plan to address an emergency water shortage. The Institute of Medicine recommends women drink around 0.5 gallons (2 liters) and men drink around 0.8 gallons (3 liters) of water a day. A still that produces 1 gallon (3.7 liters) of water per day per person would provide enough clean water for hydration, cooking and sparse bathing. A typical passive solar still can produce between 0.8 and 1.6 gallons (3 and 6 liters) of drinking water per day, per square meter of irradiation.

Water distillation, at its most basic, is how the natural water cycles work. Water evaporates and, when enough water vapor collects in the atmosphere, clouds are formed. When the clouds are saturated with moisture, water is released as rain. The concept of a still is similar. Saltwater is heated to accelerate evaporation in a chamber, and the distilled water vapor condenses on a surface and is then channeled to a collecting point such as a plate, channel or bottle. Although the concept of building a still is simple, there are many ways for it to be accomplished.

It is possible that the materials used for construction could contaminate the finished product. This is one issue that can occur with the purchase and use of uncertified products.
products or products not certified for the intended use. There are several other potential issues that can be avoided through product certification, including poor workmanship or design leading to an unsafe product; improper function of a system out of the box due to a lack of quality control; and unclear directions or vague descriptions of the intended application of the product. Standards development and third-party product certification are a solution to these and other potential issues with this technology, as well as products in general.

IAPMO specializes in developing standards for new and innovative technologies. For example, IAPMO Codes and Standards just completed development of an industry standard for certification of alkaline water dispensers, and has developed standards for other innovative products, such as recirculating shower systems, and a test method for measuring

The silent temperature
continued from page 9

water, and the temperature range favorable for amplification of bacterial growth is 77° to 108°. Furthermore, ASSE indicates that the temperature of the water within a water heater is recommended to be set between 135° to 140° in order to minimize the growth of harmful bacteria found in water. However, these high temperatures put the public at risk for scalding, thermal shock or both. According to the Engineering and Science Division of the United States Product Safety Commission, it takes one minute to receive a first-degree burn at 122°, and it takes two seconds to receive a first-degree burn at 140°.

It would seem logical to keep the water heater thermostat at its factory setting of 120° to prevent scalding or thermal shock, but the water heater thermostat is not a reliable or accurate temperature control for regulating the water temperature leaving the water heater. In fact, the UPC prohibits the water heater thermostat from being utilized as a suitable control for meeting the water temperature limit provisions. The UPC addresses the need to prevent scalding and thermal shock for the end user by requiring water temperature limits for common fixtures.

The UPC is a breathing and living standard that continuously improves with the changing world by means of input and knowledge from the public and consensus bodies that incorporate necessary standards and code text. For example, in 1988 the UPC added code text for

The UPC allows local jurisdictions to mandate appropriate regulations as deemed necessary.

is limited to 110°. Multiple or gang showers may be controlled by a master thermostatic blender in lieu of individually controlled pressure balance or thermostatic mixing valves."

In 1991, the water temperature for showers was limited to 120°. From 1991 through present day, the UPC has included the following text in all sections requiring temperature regulating valves: “The water heater thermostat shall not be considered a suitable control for meeting this provision.”

The 2003 UPC added language to this section stating that such valves shall be in accordance with ASSE 1016. Furthermore, the 2009 UPC gave an option for the valves and stated that the individual control valves of the pressure balance, thermostatic or combination pressure balance/thermostatic mixing valve type that provide scald and thermal shock protection be in accordance with ASSE 1016 or ASME A112.18.1/CSA B125.1.

The 2009 UPC added text for gang showers, where supplied with a single temperature-controlled water supply pipe, shall be controlled by a mixing valve that is in accordance with ASSE 1069. Furthermore, the 2009 UPC set water temperature limits to bathtubs and whirlpool bathtubs (120°), for bidets (110°) and for public lavatories (120°). These temperatures were to be limited by devices that were in accordance with ASSE 1070 or CSA B125.3.

The UPC has evolved since its release in 1946 and will continue to be positively influenced by the public. Plumbing systems are regulated by the UPC year that was adopted by the local jurisdiction at the time of installation, and there will be many plumbing systems predating the newly adopted codes as the code is updated every three years.

The key to protecting the public’s health, safety and welfare is through continuous improvement and knowledge. The UPC may be silent on certain provisions, but it cannot be overly restrictive and allows the local jurisdictions to mandate appropriate regulations as deemed necessary.
Sustainability takes a big step forward at 45th WorldSkills competition

Recycle/reuse and children from Derbyshkinskiy Orphanage in Russia were both winners at conclusion of event.

Champions and experts from more than 30 countries and regions joined efforts to deliver three new toilets and washrooms to the Derbyshkinskiy Orphanage in Russia. Reusing some of the materials from the Plumbing and Heating Test Projects, including the steel frames, pipes and ceramics, they assembled the toilet and washrooms at Kazan Expo in a special team project on the final day of competition, and readied them for transportation to the orphanage where they were installed in the days following WorldSkills Kazan 2019.

The new sanitary facilities were officially handed over to the Ministry of Building, Architecture and Housing Municipal Services of the Republic of Tatarstan, which was responsible for the selection of the orphanage following completion of the installation project on Aug. 29, 2019. Derbyshkinskiy Orphanage, which opened in 1976, today cares for 176 special needs children and teenagers between the ages of 4–23. There are 171 staff members who work at the orphanage, providing rehabilitation to residents including social adaptation, education, medical care and work experience.

The Plumbing and Heating Champions project was a collaborative effort between several organizations, including IAPMO — a nonprofit standards and certification industry body — WorldSkills, TECE, the Russian HVAC Expert association, and the Ministry of Building, Architecture and Housing Municipal Services.

International Program Director with IAPMO — and its charitable arm IWSH Foundation — Seán Kearney, who together with colleague Grant Stewart helped to spearhead this initiative, explained the structure of the project and its focus on sustainability. Both Kearney and Stewart have personal connections with whom it collaborated to achieve the Plumbing and Heating Champions Project; in particular, fellow WorldSkills Global Partners 3M, Autodesk and DHL. As a Global Partner of WorldSkills, the project was very important to IAPMO, which sees water, sanitation and hygiene advocacy as central to its mandate, which the developing relationship with WorldSkills facilitates.

“WorldSkills, having started out as competitors in 2005 and 1997 respectively. “The plumbing and heating skill competition this year was three days, and then that was the end of the assessment,” Kearney said. “On day four, we ran a team project where all competitors and experts worked together to assemble these new toilet and wash facilities for the children of Derbyshkinskiy Orphanage. “Everything was ready by end of the final day of WorldSkills Kazan 2019, and then shipped across town to Derbyshkinskiy where a team — including a group of local students and a teacher from the Kazan Construction College — spent two days installing them in renovation of the existing toilet and washrooms. In all, there were around 20 people working on site at the orphanage over the two days.”

Kearney stressed that IAPMO was thankful to many different people and companies with which it collaborated to achieve the Plumbing and Heating Champions Project; in particular, fellow WorldSkills Global Partners 3M, Autodesk and DHL. As a Global Partner of WorldSkills, the project was very important to IAPMO, which sees water, sanitation and hygiene advocacy as central to its mandate, which the developing relationship with WorldSkills facilitates.

“We see plumbing and the plumbing profession as being crucial to protecting and sustaining public health and safety,” he said. “Wherever you may be in the world, quality plumbing skills and professional practices help ensure safe water supply and sanitation which, today, must be considered a fundamental human right.

“IAPMO looks at the big picture, and we see the plumber as akin to a healthcare professional. When these skills and services are present in the community, then in turn this can help protect and provide reliable water supply for drinking, cooking and cleaning, provide toilets, provide the ability to wash and encourage better hygiene, provide safe drainage and wastewater disposal, and safeguard all the things connected to good sanitation, and health and safety.”

The International Water, Sanitation and Hygiene Foundation (IWSH) is the charitable arm of The IAPMO Group and the platform through which the organization’s philanthropic and community-based programs are delivered (including the Community Plumbing Challenge, which was originally developed during IAPMO’s Trusteeship of WorldSkills Foundation, 2013–2015). These projects have provided ongoing opportunities for WorldSkills Champions to further their personal and professional skills development pathways ever since.
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