A SAFE RE-OPENING MEANS EVALUATING HOT WATER SYSTEMS

by Stirling Boston and Scott Alford

Colleges and universities are preparing to welcome students back on campus after three semesters of hybrid remote/in-person learning necessitated by COVID-19. As dormant dormitories, cafeterias, halls, gyms, and other campus facilities reopen, school administrators and managers must address a potential safety risk—stagnant water systems. Several weeks of zero flow and tempered water can result in an increased risk of Legionella, microbiological growth, leeching heavy metals, and increased corrosion within plumbing systems.

To ensure safety for students, professors, administrators, and other college employees, adequate processes should be implemented. Additionally, some funds available through the 2021 American Rescue Plan Act (ARP) should be allocated to upgrading and/or installing new water heating systems.

Five Steps for Water Safety

To help ensure water safety during the reopening process, facilities managers should take the following five steps:

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The ARP legislation allocates $122 billion as educational stimulus for facility improvements to create healthy learning environments and mitigate the risks of virus growth and transmission due to COVID-19. Some of those dollars can be used in upgrading hot water systems to help create a sanitized environment, while also lowering operating costs.

1. Map The Plumbing System: Identify low-use water outlets and institute a flushing regime. Go zone by zone, starting at the outlet nearest the water supply and proceed to the most distant outlets.

2. Flushing & Cleaning: Initial flushing and cleaning of the plumbing system must be completed before students return to campus. It consists of:

- initial flush
- sequenced flushing
- clean F&E
- test and monitor

If possible, have staff start flushing now, even if the building's reopening date is still unknown. The earlier a flushing regime is initiated, the sooner normal water quality returns.

3. Monitor & Test: Monitoring and testing for Legionella, other bacteria, and disinfectant concentration is the only way to know the health of the plumbing system.

4. Recommission, Inspect, Disinfect (RID): Before reopening, inspect all plumbing and mechanical equipment. Disinfect all equipment and fixtures. Follow manufacturer guidelines and, if necessary, contact proper authorities.

5. Maintain Your System: Create a water management plan now, if one is not already in place. Schedule monitoring and testing of disinfectants, bacteria levels, and water temperature. Make sure to document all activities, and, of course, address issues as quickly as possible. If necessary, notify authorities of a major issue.

The American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) has a standard aimed at preventing the growth and spread of *Legionella*. This standard (ASHRAE 188) provides a framework for proactively managing building water systems and reducing the potential for *Legionella* growth in these systems.

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This standard has broad support, including the Centers for Disease Control and Prevention (CDC), Centers for Medicare and Medicaid Services (CMS), Association of Water Technologies (AWT), Cooling Tower Institute (CTI), and many others. These organizations have stated that implementing a water management program per ASHRAE 188 is the industry standard for managing Legionella risk. Consider ASHRAE 188 when developing and implementing a water management program.

Importance of System Upgrades

The ARP legislation allocates $122 billion as educational stimulus for facility improvements to create healthy learning environments and mitigate the risks of virus growth and transmission due to COVID-19. Some of those dollars can be used in upgrading hot water systems to help create a sanitized environment, while also lowering operating costs.

The latter benefit stems from the fact that 41% of schools in America have underperforming HVAC systems in need of repair and replacement in at least half of their facilities.* Selecting the proper water heater for each building's needs and the area's water quality can increase the life of the units and improve efficiency, while also reducing maintenance costs.

Replacing outdated plumbing equipment with energy-efficient domestic hot water solutions makes water safer for students and faculty.

Mitigate Risks of Scalding and Legionella Infection

Everyone on campus will be washing their hands more frequently, making it imperative to maintain consistent water temperature. Upgrading water heating systems with an accurate digital water tempering solution can ensure this goal and prevent scalding.

The solution can be part of a hot water master blending system to intelligently control and monitor the water recirculation loop. It provides precisely controlled water temperature regulation within ±2°F to ASSE 1017, even during low and zero demand periods, in accordance with building codes. It also supports energy conservation through more efficient water temperature management—and in turn reduces energy costs for greater savings.

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As campuses open their doors and welcome back students, administrators and building managers have the responsibility of creating a clean and sanitary environment to keep everyone safe.

To further reduce Legionella concerns, several technologies have been developed. One that has proven highly effective is Template Assisted Crystallization (TAC). This technology has shown to control the formation of scale in plumbing systems by transforming dissolved hardness minerals into harmless, passive microscopic particles without using salt or harsh chemicals, such as water softeners and chemical additives.

TAC produces other benefits, as well: improved operating costs, lowered maintenance costs, reduced chances of premature equipment failure, and increased water heating system longevity.

Greater Reliability and Product Longevity

When water is heated, it undergoes a chemical reaction that causes the dissolved minerals to "precipitate" out as solids. The amount of precipitant, or scale, is directly proportional to the volume of water used and its temperature. As water temperature increases, so does the rate of corrosion. Heated water releases the dissolved corrosive gases, such as oxygen and carbon dioxide, which increases the electrical conductivity of water.

The amount of these dissolved minerals, such as calcium-carbonate (lime), magnesium, silica, iron, and phosphate, in water varies throughout the country. Eighty-five percent of the United States, however, is served with water containing concentrations of dissolved minerals that are prone to scale formation.

Scale formed by these dissolved minerals is a leading cause of water heater damage and ultimately because the more water is heated over time, the more scale precipitates out. Heating water through a layer of scale not only reduces heat transfer efficiency, it increases thermal stress on the metal. Eventually, thermal fatigue occurs, causing a fracturing of the tank material. Additionally, most water heaters utilize a glass lining that relies on anode rods to slow the effects of corrosion on the tank, which is also a leading failure point. On average, these units need to be replaced every three to five years.

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Technology advancements have helped to create a new generation of water heaters that withstand scale and corrosion much better than glass-lined units. A unique lining is engineered with specific materials utilized for corrosion: it is a 50-50 blend of austenitic-ferritic (Duplex) stainless steel with a ferritic and austenitic grain structure. This synergy makes the lining extremely strong and highly resistant to aqueous corrosion in potable water at any temperature. Chloride stress corrosion cracking, a known failure of 316L and 304L stainless steel, is also no longer a factor.

This type of material eliminates the need for glass linings or anode rods, which both require service over time. The high chromium content combines with oxygen in the air to form a "passive" layer of protection. This layer is permanent and prevents it from corroding when exposed to the dissolved oxygen and other aggressive elements found in all potable waters.

The ultra-durable duplex stainless steel increases reliability and reduces unscheduled maintenance, evident by their warranties of up to twenty-five years. The greater reliability also leads to a longer product lifespan. These advanced water heaters typically last three times longer than glass-lined alternatives, saving time and money.

The lean duplex steel alloy material is only one reason new water heaters have longer life. Advanced manufacturing also contributes to their durability. The process consists of specialized metal cutting technology in which waterjets with 3-axis (vertical) and 5-axis (beveled) cutting heads are used. They generate 50,000 psi water and garnet dust with no heat signature. State-of-the-art robotic TIG welding technology is part of the process, as well.

The final stage is immersion pickling and passivation processing. Full immersion pickling restores the chromium depleted layer from welding processes, while full immersion passivation restores the chromium oxide layer on all metal surfaces.

Welcoming Back Students

As campuses open their doors and welcome back students, administrators and building managers have the responsibility of creating a clean and sanitary environment to keep everyone safe. Part of that process should include a thorough evaluation of the water heating system, establishing a process to ensure it is operating cleanly, and upgrading systems to leverage the best available technologies for more efficient operation and greater ROI. ■

**Source: US Government Accountability Office*

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