Maintaining Drinking Water Safety During Long-Term Closures of Schools, Offices and Public and Private Spaces

Who is this relevant to:
- Managers of properties vacated for long periods such as during the COVID-19 pandemic. This includes office buildings, schools, medical offices, hotels, and other public and private spaces.
- Drinking water utilities with such properties in their service area.
- At risk population (elderly, young children, pregnant women, and those with pre-existing health conditions).

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The properties that sat vacant or underutilized for weeks or months during COVID-19 shelter in place orders may experience water and air stagnation, uncontrolled humidity, and dry sanitary systems that could lead to health risks when occupants return. This brochure focuses on water and is one in a series focusing on identifying and addressing these risks in building systems (water, air, and sewer).

Our drinking water supply is comprised of four key components: the water source, the water treatment plant (WTP), the distribution system that carries water from the WTP to consumer property lines, and the network of pipes within our properties (houses, schools, public or private spaces, offices, or businesses) known as either premise plumbing or building water systems. Water utilities continue to safeguard the water quality delivered to consumers via the distribution system by maintaining water flows, disinfectant residuals (chlorine or chloramines) and providing water quality that mitigates corrosion and release of metals in premise plumbing (lead and copper for example).

However, safeguarding water quality within the premise plumbing or building water systems of properties siting nearly empty presents additional challenges. These properties are experiencing significantly reduced water flows and prolonged stagnation (weeks or months) that has the potential to deteriorate water quality and create health risks. These issues can impact a number of building water systems including hot and cold potable water used for drinking and washing as well as water used in utility systems such as humidity control for HVAC or cooling towers.

Primary Issues with Prolonged Stagnation in Premise Plumbing
- Loss of disinfectant effectiveness within days or weeks.
- Loss of corrosion control effectiveness.
- Changes in water temperature in building services (cold water increase and hot water decrease).

Health-related Risks
- Growth of opportunistic pathogens (Legionella pneumophila, non-tuberculous mycobacteria, Pseudomonas aeruginosa, free-living amoeba), and microbial community shifts.
- Nitrification which further feeds microbial growth.
- Regulated disinfection byproduct concentrations increase.
- Metals (lead, iron, copper) and/or arsenic leaching from plumbing materials into drinking water.
- Water discoloration, taste and odor.

These are all public health issues that if not addressed could lead to illness in occupants re-entering the properties; and furthermore, lead to loss of confidence or public outcry. For example, Legionella can cause pneumonia and/or flu-like symptoms that could be confused with COVID-19. As such it is imperative that building owners and operators consult with experts, water industry organizations, public health officials and onsite personnel, in developing an action plan for buildings that have sat near empty. Corrective actions can be taken by property managers during the shutdown (water management practices) or before the scheduled re-entry of building tenants and workers (recommissioning).

In addition, municipalities or water utilities may need to evaluate the need to flush certain water mains before buildings can be occupied in service areas where flows have diminished significantly. Subsequently, flushing of many of these properties in a short amount of time may require taking certain measures to ensure adequate water flow availability to that service area.
Building Water Management Practices to Reduce Impact During Shut Down

1. Building Water Management Plan (CDC Toolkit). If a Building Water Management Plan is in place, this should include information on management of the water system and should be followed to reduce risk. The plan will commonly include an overview of the building water system, regular flushing and draining protocols, thermal regulation, and water quality testing.

2. Periodic flushing. Replacing stagnant water in the building water system with water from the main will help to prevent water quality deterioration. Flushing locations, frequency and duration should be determined based on piping configuration with considerations for the most remote use point the building and building water system size, and length of the service line to the building.

Recommissioning Considerations Before Building Re-entry

Each building water system must be recommissioned to ensure safe operational performance. For potable water systems, this could include disinfection in accordance with local building codes and water quality regulations. In addition the following may provide some guidance for the current situation as detailed below:

Additional Resources: AWWA, WaterRF, CDC, ASHRAE, Purdue University Center of Plumbing Safety

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<th>Communicate</th>
<th>Execute</th>
<th>Ready for Re-entry</th>
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<td>• Is there a Building Water Management Plan in place?</td>
<td>• How and when are building tenants informed about ongoing water quality issues or mitigation strategies?</td>
<td>• Corrective actions may include flushing with fresh water and/or disinfection (typically shock chlorination).</td>
<td>• Confirm complaint operation of systems and water quality.</td>
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<td>• Are there schematics of the building water system available to understand the number of systems and complexity of the piping network?</td>
<td>• Do stakeholders include “at risk populations” (elderly, sick, or children)?</td>
<td>• Allocate at least enough time to complete procedure depending on the size and complexity of the building water system (in the order of days or weeks).</td>
<td>• Water quality testing before and after corrective actions (metals, disinfection residual, bacteriological).</td>
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<td>• Is there an understanding of which building water systems are potentially at risk such as domestic hot and cold water (potable water), service water (non-potable water), tepid water systems (safety showers) evaporative cooling water systems, cooling tower systems, water fountains? Is a subcontractor required for this?</td>
<td>• Do regulatory agencies require notification, or can they provide guidance?</td>
<td>• Strategy development may require support from regulators, engineers and subcontractors.</td>
<td>• Anticipate 1 week for each round of samples to be processed and reported by lab.</td>
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<td>• Are the building hot potable water systems recirculating systems? Older buildings may have been designed without hot water recirculation and are more vulnerable with lack of use.</td>
<td>• Are there legal or financial implications?</td>
<td>• A plan may be required to ensure that corrective actions have been completed for each pipe and fixture.</td>
<td>• Notifications to health department, tenants, and stakeholders.</td>
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<td>• When was the last time the system ran at higher capacities? If it has been more than 3-4 weeks, flushing is likely necessary.</td>
<td>• Are there special health and safety considerations for staff or subcontractors implementing corrective actions?</td>
<td>• Understand your building occupancy levels during recommissioning, and any required notifications.</td>
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<td>• Has water quality testing been conducted during the shutdown (metals, bacteriological, disinfectant residuals)?</td>
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<td>– The system complexity including fixtures and equipment, dead ends, bottlenecks, and ways to maximize flows (pipe velocities).</td>
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