

Water Stagnation Risks:

Guidance for Building Owners and Operators

Risks to the Building Water System

During the response to the COVID-19 pandemic, many buildings, such as office buildings, malls, educational institutions, hotels and motels, have been affected by low or zero occupancy and reduced water flow through the building. Under these conditions, water may stagnate, disinfection residuals decline and water temperatures change, creating environments which may support the growth and proliferation of disease-causing organisms including some types of *Legionella* and *Pseudomonas*.

Many components of the water system could be at risk of microbial growth including the water service delivery line, the building reservoirs, internal plumbing lines, as well as boilers and hot water lines with low water temperature. Disease-causing organisms, such as *Legionella*, can be transmitted through the aerosols generated at faucets, showers, toilets, humidifiers and spas as well as from ultrasonic mist machines, decorative fountains and cooling towers. (See the Reference section below for more information on *Legionella*).

Stagnation can also weaken and disrupt the protective scale on the piping and allow trace metals such as lead to leach into the water system. This may create sediment and discolouration in the water and further reduce the levels of chlorine.

Responding to the Risk

This document is intended to alert building owners and operators to the potential for microbial and chemical risks in water systems in buildings with limited or no occupancy, and to provide general steps on how to reduce those risks and prepare for building re-entry.

In Alberta, the municipal drinking water delivered from the water mains has sufficient treatment (filtration and disinfection), levels of disinfectant, low temperatures and flow rates to suppress the growth of disease-causing organisms, and the capacity to inactivate the virus that causes COVID-19 disease. Municipal drinking water is considered safe.

If you operate or own a building with significant and prolonged reduced occupancy or no occupancy, take the steps outlined below that apply to your building to ensure that the potential risks from stagnant water are minimized. Depending on the complexity of the system, it may be helpful to consult with a plumber or building system engineer to determine the flushing procedures.

A. Building Water Systems Operating under Low Occupancy

When buildings remain open over prolonged periods with low or intermittent occupancy, supplementary flushing is needed to reduce the risks from stagnant water. Flushing replaces potentially deteriorated water from stagnant sections of the plumbing with fresh water containing protective disinfectant residuals.

- Evaluate the building service line and water distribution systems and determine if sections need to be flushed independently at regular intervals to help ensure that the water entering the building is not stagnant.
- Identify all zones that have low or no occupancy.
- At a minimum, implement a weekly water-flushing program that completely flushes the endpoints of each floor's or zone's hot and cold water supply.
- The flushing time will depend on the size and length of piping, and the flow rate at the flush point.
- In general, flush cold and hot taps separately in each zone (cold first, hot second) at suitable endpoints for at least 5 minutes and until the water temperature is steady and water is clear, or in accordance with your site-specific maintenance procedures. Sediment and/or discolouring may be signs of potentially deteriorated water.
- Most municipal water systems provide a total chlorine residual of greater than 0.2 mg/L. If you are able to measure chlorine residuals, aim for a residual, after flushing, of at least 0.2 mg/L total chlorine. In municipal systems that use combined chlorine, like Edmonton, the total chlorine residual should be at least 0.5 mg/L.
- Check that the water supplies for HVAC systems, humidifiers, decorative water fountains/features, water storage units such as boilers, and other building systems are being supplied with water that is not stagnant. Review and follow any maintenance procedures related to these systems.
- Notify patrons if there are fixtures, plumbing components or areas that should not be used.
- Prior to tenants returning to any vacant zone of the building, all water lines and fixtures in those areas should be flushed for at least 5 minutes and until the water temperature is steady and water is clear, or in accordance with your site-specific maintenance procedures.

B. Building Water Systems Preparing for Re-Entry

Buildings that have been vacant or near vacant for prolonged periods likely have stagnant water throughout the entire water distribution system (from supply main to end faucet). All parts of the building's water distribution system including the service line, headers, hot water systems, water-using appliances and plumbing fixtures need to be sequentially flushed prior to occupancy in order to replace all the water inside the building plumbing with fresh water.

- Before flushing, sketch out the building water system or refer to the plumbing design diagram in order to identify the water system zones/branches, water fixtures, water features and water storage components.
- Consider the time required to complete flushing and maintenance, the amount of hot water needed, and steps to help stage the flushing process.
- If you have the ability to measure chlorine residual, testing at the service connection may be used to confirm the municipal baseline chlorine concentration. Each municipality sets distribution chlorine levels differently. Within the building, the residuals should be similar to the municipal baseline but they are expected to vary. Aim for a chlorine residual after flushing of at least 0.2 mg/L total chlorine. For municipal systems that apply combined chlorine like Edmonton, the total chlorine should be at least 0.5 mg/L.
 - Check information from your local utility regarding the normal concentrations of chlorine in the supply. If unable to detect 0.2 mg/L or 0.5 mg/L (for combined chlorine systems) at the point of entry (service line), please notify your utility.
- Ensure that the system components are working properly: inspect mechanical and plumbing components such as cooling towers, boilers, pumps and plumbing for leaks, depressurization, and proper function.
- Ensure that all backflow prevention devices are operating properly and check for a current inspection/approval.

- Drain and flush the cold water system first, then drain and flush the hot water system. Finally, drain and flush the hot water tank and other peripheral equipment with fresh water. In some cases, filters and filter media may need to be changed.
- Flush zone by zone starting with the zone nearest to the building supply as described below or in accordance with site-specific maintenance procedures:
 - At least one complete flush of the water system's volume is needed to refresh the supply in all water supply pipes. Calculate the water system's volume to determine the time required for a complete water system flush.
 - Flushing time will be dependent on the size and length of piping, and the flow rate achieved at the flush point. Systems with large volume pipes and complex plumbing will likely require flushing with a higher volume of water than is present in the system and more than one turnover.
 - Flushing must proceed from one end of the zone to the other from the service entrance to the endpoints of the plumbing system.
 - Continue flushing until the water temperature is steady, (often the water will start to feel cooler) and the water is clear of sediment at each fixture.
 - Most municipal systems provide a total chlorine residual of greater than 0.2 mg/L. If you have the ability to measure chlorine residual, aim for a chlorine residual, after flushing, of at least 0.2 mg/L total chlorine. In municipal systems that use combined chlorine, like Edmonton, the total chlorine residual should be at least 0.5 mg/L. A total chlorine concentration of less than 0.1 mg/L anywhere in the building system means more flushing is likely needed to bring up the chlorine concentration.
 - Flush all fixtures (faucets, fridge, plumbed-in coffee machines, toilets etc.) and run equipment such as dishwashers and ice machines. (This will also ensure that drainage P-traps are full of fresh water.)
 - Remove and clean aerators on faucets, showers, mixing valves and other fixtures that trap particulates, biofilm and other contaminants. Disinfect, flush with hot water, or replace showerheads especially in facilities where vulnerable populations have access to the showers.
 - Flush the hot water system using fresh water and ensure that the temperature is at least 50° Celsius throughout the hot water distribution system. (Take measures to prevent scalding at point of use, where needed).
 - Record the procedures followed and measurements taken during the flushing process.
- Flushing should be conducted in a manner that minimizes aerosolization.
- and workers should take precautions to reduce aerosol exposure.
- Workers should take precautions to reduce exposure to aerosols. Appropriate personal protective equipment including gloves, eyewear, and masks should be worn when there is a high risk of aerosols (for example, when flushing showerheads).
- Buildings that have completed sequential flushing and are gradually increasing their occupancy will need to continue supplemental flushing (outlined in A) in those areas which remain vacant or partially occupied.

C. Heating, Ventilation and Air Conditioning (HVAC) Systems

Cooling systems should continue to be operated and maintained to minimize growth of biofilms which support disease-causing types of *Legionella*.

- Ensure that cooling towers are well-maintained, minimizing areas of water stagnation, eliminating sources of nutrients, maintaining overall cleanliness and using good biological control (with biocide), as per manufacturer's guidelines and industry best practices.

- The tower and basin should be clean and free of visible slime or biofilm before use. If the cooling tower is clean and has been well maintained, conduct disinfection while the cooling tower is operating (online disinfection). Guidance on disinfection procedures is available from the Cooling Technology Institute at: <http://www.cti.org/downloads/WTP-148.pdf>.
- If the cooling towers have not been well maintained, contact an industry professional to determine steps needed to physically clean and disinfect the system before returning to operation.

Other components of the HVAC system, such as humidifiers, which have not been in use, should be drained and cleaned prior to re-entry.

D. Decorative Water Fountains/Features

Decorative water fountains with water treatment systems may be shut-off and drained, or operated to meet treatment equipment and operational benchmarks, including a disinfection residual.

If the decorative water fountain does not have a treatment system, the fountain should be drained and closed. It is unlikely that the feed water from the plumbing system is able to provide disinfectant at levels that would maintain water quality.

Prior to start-up:

- Clean all decorative water features.
- Follow any recommended manufacturer guidelines for cleaning.
- Ensure that decorative water features are free of visible slime or biofilm.
- Refill the water feature and measure disinfectant levels to ensure that there is a minimum total chlorine residual of 0.2 mg/L.

E. Swimming Pools and Whirlpools

While closed to the public, swimming pools and whirlpools should have continuous flow but may be operated at no less than 75% of the design flow rate if able to maintain a minimum residual of 1.0 mg/L free chlorine and a pH of 6.8-7.6.

Reduced circulation may not be possible in pools with variable pumps or features that may become stagnant. Additional cleaning may be needed to control the build-up of algae on pool walls.

The pool water temperature may be reduced to reduce chemical costs however, the air temperature should be adjusted to prevent excessive evaporation and humidity. Some equipment, such as salt generators, may require a minimum water temperature.

Please refer to the manufacturers instructions for your pool regarding reduced operation or shutdown. Additional information on temporary closure is available from the United Kingdom Pool Water Treatment Advisory Group (PWTAG) *Guidance on temporary pool closure* at: <https://www.pwtag.org/guidance-on-temporary-pool-closure/>

Please contact your local public health inspector at Alberta Health Services prior to re-opening a pool at: <https://www.albertahealthservices.ca/eph/eph.aspx>

References

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