

Alert: Preparing Water Systems Prior to Reopening Buildings

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TO:	Health Alert Network
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SUBJECT:	Preparing Water Systems Prior to Reopening Buildings
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This transmission is a “Health Alert”, conveys the highest level of importance; warrants immediate action or attention.

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- As buildings have been shut down or used less frequently, building water quality degradation becomes an issue.
- The best immediate action is to flush the entire building, including all water-using appliances like ice machines and dishwashers.
- Ensure cooling towers are clean and well-maintained.
- It may be necessary to consult with a qualified water consultant.

As buildings have been shut down or used less frequently, building water quality degradation becomes a silent but serious issue. *Legionella* and other pathogens, lead, disinfection byproducts, and other health issues can result when water sits for an extended period of time. In the days leading up to reopening, the following steps and considerations should be made, and a team of facilities staff or a water management consultant will be needed to prepare the water system. Each building is different, and flushing will need to be tailored accordingly.

How do I prepare the building for re-occupancy?

- The best immediate action is to flush the entire building, including all water-using appliances like ice machines and dishwashers.
- Ensure your water heater is properly maintained and temperature is correctly set. Make sure you follow the manufacturer recommendations.
- Make sure your water heater is set to at least 120°F.
- Inspect mechanical equipment such as cooling towers, boilers, pumps, backflow preventers, etc., and determine if there are any issues regarding their function.

- Other actions you could take are:
 - Clean showerheads, faucets and other fixtures that can produce aerosols that people could inhale.
 - Develop a water safety plan, a long-term plan for keeping water quality high and protecting building occupants and visitors,
 - Collect water samples for analysis at a qualified laboratory (only recommended for buildings with specific at-risk populations like children in childcare, immunocompromised, and elderly people).
- Disinfecting building's water systems with concentrated chlorine should only be considered when there is a strong reason to believe the building is contaminated with pathogens like *Legionella pneumophila*.
 - In most cases, flushing buildings with water that has normal amounts of chlorine in the building water supply is sufficient for cleaning the water system.
- Ensure cooling towers are clean and well-maintained.
 - Ensure that cooling towers are maintained (including start-up and shut-down procedures) per manufacturer's guidelines and industry best practices.
 - Ensure that the tower and basin are free of visible slime or biofilm before use.
 - If the tower appears well-maintained, perform an online disinfection procedure.
 - Guidance on disinfection procedures from the Cooling Technology Institute: <http://www.cti.org/downloads/WTP-148.pdf>

How do I flush a small building?

- When buildings are returned to service after an extended period of discontinued service (e.g., weeks or months), ensure that the meter works, leaks are minimized, wastewater piping is intact, and the building's plumbing is flushed. A thorough flushing process is appropriate in such situations. Flushing instructions provided to occupants will vary depending on the structure. Flush until the hot water reaches its maximum temperature.

Key elements of existing protocols include:

1. Remove or bypass devices like point-of-entry treatment units prior to flushing.
2. Take steps to prevent backflow or the siphoning of contaminants back into plumbing (e.g., close valves separating irrigation systems from home plumbing, disconnect hoses attached to faucets, etc.).
3. Organize flushing to maximize the flow of water (e.g. opening all outlets simultaneously to flush the service line and then flushing outlets individually starting near where the water enters the structure).
4. Run enough water through all outlets (e.g., hose bibs, faucets, showerheads, toilets, etc.), removing aerators when possible. Typical durations in existing protocols range from 10 to 30 minutes for each outlet (duration varies based on outlet velocity).
5. Flush the cold water lines first, and then the hot water lines. Note: the hot water tank can be drained directly; it can require roughly 45 minutes to fully flush a typical 40-gallon hot water tank.
6. Replace all point-of-use filters, including the filter in refrigerators.
7. Additional precautions may be warranted if there is excessive disruption of pipe scale or if there are concerns about biofilm development.

How do I flush a larger building?

For larger buildings, a single flush cannot bring the building water system back to normal operation and re-establish good water quality. Ongoing flushing draws particles through and out of the system and brings in disinfectant from the municipal system that can help control biological growth. The longer service is interrupted, the more the required level of effort for restoration. Experience in flushing and maintaining buildings has shown that there are some general principles for an effective flushing strategy. Flush until the hot water reaches its maximum temperature. In general,

- Flushing should proceed uni-directionally, that is from the service entrance to the periphery of the plumbing system (distal points).
- Some buildings have water treatment systems like filters and water softeners at the building water supply. Those treatment systems were installed for a reason and should not be bypassed. Those treatment systems need to be cleaned, flushed and maintained as part of bringing the building back into use.
- Building water systems have a variety of places where water is stored. At a minimum, they should all be identified, drained, and flushed with clean cold water, after the building cold water service is properly restored. These include, but are not limited to:
 - Hot water storage,
 - Hot water recirculating loop(s),
 - Humidifiers,
 - Ice machines,
 - Dishwashers,
 - Cooling towers, and
 - Ultrapure water storage (membrane filtration).

Before flushing, sketch out the building water system to the best of your ability and identify:

- the water supply,
- zones or branches with a common water supply (e.g., a branch to a wing of a building or a set of branches served by the same riser),
- the faucet nearest the starting point of the zone and the most distant faucet or use for each zone,
- water heaters and recirculating heated water loops, and
- appliances and water-using features (e.g., hot tubs).

Parts of the water system that are most important to flush because they have the greatest opportunity to make people sick include:

- faucets used for drinking water or food preparation,
- drinking fountains,
- ice machines and refrigerators with ice makers,
- showers,
- kitchen sink sprayers,
- water features that generate aerosols (fountains, spas, etc.),
- parts of the water system that are used by children, and
- components of the water system used by elderly people and susceptible people.

However, it is also important to identify and flush as many other water outlets as possible - utility sinks, decorative water features, hose taps, piping in place to serve any future installations, removed water taps - to remove contamination in the piping. Complete the initial flushing and cleaning steps before resuming normal building operation:

- Clean fixtures, including showerheads, utility sinks, decorative water features, hose taps, piping in place to serve any future installations, and removed water taps.
- Replace/maintain point of use filters.
- Flush zone-by-zone. Zones are branches of the building water system with a common source or parts of the building water system served by a common riser.
 - The first zone to flush is the one nearest the building supply. Flush zones progressively outward from the supply.
 - In each zone, flush the cold water plumbing first and hot water second.

- Begin flushing at the point of use (POU) nearest to the origin of the zone. Aerators and other flow restrictors are removed at the POU nearest the beginning of the zone and the tap is opened wide.
- Open other taps on the same branch, moving from the faucet nearest the origin to the most distant POU tap.
- Continue flushing until the final POU tap is flushed for at least 5 minutes AND the cold water temperature at the final POU tap is steady.
- Drain hot water tanks on the first flush after resumption of flow. If draining is not possible, hot water flushing time depends upon the size of water heater tank. Maintain the water heater temperature.
- DO NOT turn the heater off as water temperature is critical to prevent microorganisms from growing in the heater and being disseminated in aerosols.

Even when the building water system has recovered from a lengthy stagnation, flushing is a best practice.

Additional guidance is available here: <https://www.cdc.gov/coronavirus/2019-ncov/php/building-water-system.html>

Categories of Health Alert messages:

Health Alert: conveys the highest level of importance; warrants immediate action or attention.

Health Advisory: provides important information for a specific incident or situation; may not require immediate action.

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This information is current as of May 11, 2020 but may be modified in the future. We will continue to post updated information regarding the most common questions about this subject.