

Guidance for Building Flushing After Low or No Use During COVID-19 Pandemic

The Rhode Island Department of Health's (RIDOH) Center for Drinking Water Quality offers this guidance for owners of large and small buildings who need to flush their distribution and plumbing effectively after low or no use during the COVID-19 pandemic.

In buildings that have been shut down or used less frequently, water quality may be negatively impacted because the water has been stagnant in the distribution and/or plumbing system. Bacteria and other harmful contaminants are more likely to be present in stagnant water. **Generally speaking, if the facility has been closed or not used for longer than three days, it is always a best practice to flush all water supply lines to ensure that fresh water is in the system.** This guidance details how to flush stagnant water from homes and other buildings and get the water quality back to pre-stagnation conditions.

To maintain high quality water in a building at all times, building owners and operators should implement a water management program (WMP) that follows industry recommendations, such as [ASHRAE 188 \(2018\)](#), or similar, to reduce the risk of infections due to water quality degradation. Each building is different, so flushing may need to be tailored accordingly.

Please note: Due to COVID-19, facility staff **must follow all current COVID-19 prevention measures, including physical distancing, wearing face coverings, and hand hygiene protocols** while flushing plumbing and distribution systems and when interacting with residents and other building occupants.

If your building or facility has been closed or unused due to COVID-19, the United States Environmental Protection Agency (EPA) has developed a [check list](#) that can be used to help reopening your building.

I. Flushing Overview

The purpose of building flushing is to replace all water inside building piping with fresh water. A single flush will most likely not bring water in the building back to normal operating water quality standards. The flushing process involves opening taps before the facility is reopened and letting the water run so that any stagnant water is removed from the interior pipes and the outlets (faucets, showers, hose bibs, etc.). It also helps any disinfectant in chlorinated water to work more effectively to kill bacteria and inactivate viruses. The longer a building is unused, and water sits stagnant in the lines, the greater the level of effort is needed to bring the system back into service.

In most cases, flushing buildings with water that has normal amounts of disinfectant (the chlorine already in the municipal or main water supply) is sufficient for cleaning the water system. Stagnant water should be flushed and replaced with fresh water from the main distribution line to the building or the source. It is not necessary to add disinfectant for flushing; however, if disinfectants are added, their use must follow all standards and requirements. Disinfectants, such as chlorine, are dangerous to handle and can cause serious damage to plumbing system components if used improperly.

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Why a building needs to be flushed

- When the building isn't used, any disinfectant that is present may have dissipated (breaks down), and therefore, can no longer effectively disinfect. Without proper disinfectant, microorganisms can grow in pipes, fixtures, and tanks.
- Potentially harmful substances such as disinfection by-products (DBPs) could form.
- The built-up protective scale on pipes, which supports corrosion control, could become destabilized. Without the protective scale, plumbing materials, like lead or copper, can dissolve or shear off as small particles and end up in the drinking water.
- Mechanical equipment such as cooling towers, boilers, and pumps may not have received routine maintenance.
- Backflow preventers may have missed regularly scheduled test cycles.

Special Considerations for Risk of *Legionella* and Other Biofilm-Associated Bacteria

- Stagnant or standing water can cause conditions that increase the risk for growth and spread of *Legionella* and other biofilm-associated bacteria.
- If there is concern that the building may be susceptible to contamination from pathogens like *Legionella*, the facility should follow the Centers for Disease Control and Prevention (CDC) Guidance for Building Water Systems to help minimize the risk of Legionnaire's disease and other diseases associated with water. The [guidance recommends an eight-step process before reopening a building](#), which includes flushing the water system and maintaining the water systems.
 - [According to the CDC](#), large complex plumbing systems like those used in hotels, hospitals, retirement communities, and public buildings are most often associated with *Legionella* growth.
 - CDC recommends that a [facility develop a comprehensive water management program \(WMP\)](#) for its water system and all devices that use water.
- If applicable, consult the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) that established [minimum legionellosis risk management requirements for building water systems](#).
- RIDOH's website also has [information on Legionnaire's disease and guidance relating to it](#).

II. General Flushing Guidance

1. Prepare for Flushing

It is helpful to know the volume of water associated with plumbing components (e.g., lengths and diameters of piping) and the rate of water flow from a tap to determine appropriate flushing times. Be aware that adequate flow is necessary to effectively flush lines; therefore, open all taps to obtain maximum flow rate.

Planning is important because it may be necessary to flush water to the ground surface outside to avoid overloading the wastewater disposal system. In addition, it is important to avoid creating a cross-connection when flushing. A cross-connection is any actual or potential connection between the public water supply and a source of contamination or pollution. Public water systems must review their existing *Cross Connection Control Plans* to be sure that everything is up to date and there are not any hazardous conditions.

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Tasks to complete during the preparation stage

- Contact the public water system that supplies water to your building for assistance. Building owners should not test on their own for water quality, and the public water supplier has awareness about any water quality issues that may be occurring in other parts of the system that could impact any given building.
- If staff are working in the facility, they should begin periodic flushing so there is less deterioration of water quality in the building and faster recovery to normal conditions.
- Uni-directional flushing (UDF) creates flow from the service entrance to the periphery of the plumbing system (distal points).
 - All multi-service Public Water Systems (PWS) may need to review existing UDF plans and increase the frequency and/or duration of flushing.
 - Smaller PWSs without UDF plans may need to perform additional flushing in combination with the steps outlined below. Smaller PWSs should document what they do and keep the record on site for future reference and use.

Special considerations for buildings used by at-risk populations

- At a minimum, water for at-risk facilities (childcare centers, schools, or vacant nursing homes) may also consider reviewing additional guidance prior to opening the buildings. Information about [Lead in Schools Flushing \(3Ts\)](#) and [Guidance on Restoring Water Quality No/Low Use](#) are available on EPA's website.

2. Initial Flushing

Depending on the building configuration and equipment, it may require an initial flush to remove low-quality water and any accumulated contaminants, followed by additional flushes that may bring the building's water back to pre-COVID-19 water quality. The longer service is interrupted, the more the required level of effort for restoration. This principle applies to both small and large buildings. The building's water system begins at the point it connects with the public water supply and water enters the building. It includes all plumbing, storage, fixtures, and appliances that use water (dishwashers, ice/beverage machines).

Tasks to complete during the initial flush

- Inspect mechanical equipment such as cooling towers, boilers, pumps, backflow preventers, etc., and determine if there are any issues regarding their function.
- Remove aerators prior to flushing faucets.
- Remove and clean fixtures, including showerheads, before flushing starts.
- In each zone, flush the cold water plumbing first and hot water second.
- Flush zone by zone. Zones are branches of the building's water system that have a common source or are served by a common riser.
 - The first zone to flush is the one nearest the building's water supply.
 - Flush zones progressively outward from the supply to the distal end.
 - Be sure to include every patient room, restroom, food-service area, etc.
- Flush continuously for at least 10 minutes, or based on water volume calculations, to flush pipes.
- Flush all drinking fountains by running water continuously for at least 10-minutes, or based on water volume calculations, to flush pipes.
- Flush all equipment/appliances that are connected to the water lines according to manufacturer's instructions.
- Inventory filters on equipment to determine if new filters are needed. Replace filters as needed.



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3. Preparing for Occupancy:

In addition to flushing, RIDOH recommends:

- Clean showerheads, faucets, and other fixtures that can aerosolize any contaminants from the stagnant water.
- Follow start-up inspection and maintenance guidance from manufacturers of any point-of-use or whole-building water-treatment systems.
- If required, collect water samples for analysis at a RIDOH-certified laboratory. PWSs that are required to follow start-up procedures must collect and analyze start-up bacteria samples. Information on seasonal start-up procedures are posted on RIDOH's website.
 - [Information for seasonal non-community public water suppliers when starting up their system \(February 13, 2020\)](#)
 - [Find a RIDOH-certified laboratory](#)
- Be sure to take additional measures for specific pieces of equipment, including:
 - **Water Softeners (if applicable):** Run water softeners through a regeneration (flush) cycle.
 - **Cold Water Faucets:** Run for a minimum of 10 minutes or more. If you have a single-lever faucet, set it to run the cold water first.
 - **Hot Water Faucets:** To clear hot-water pipes and water heaters of stagnant water, once all the cold water piping in the building has been flushed, turn on all hot water faucets and flush for at least 15 minutes for a typical household 40-gallon hot-water tank and 30 minutes for an 80-gallon hot water tank or larger. After this, hot water is safe to use for washing hands, dishes, pots and pans, etc. Never use water from the hot faucet for drinking, rinsing your mouth, or cooking.
 - **Dishwashers:** After flushing hot water pipes and water heaters, run the dishwasher empty one time before using it to wash dishes.
 - **Humidifiers:** Discard any water used in humidifiers; Continuous Positive Airway Pressure (CPAP) machines; and oral, medical, or healthcare devices. Rinse the device with clean water (or follow manufacturers' recommendations for flushing and cleaning).
 - **Refrigerator water-dispensing machine:** Flush water dispensing machine for at least 10 minutes before using it for household purposes. For more information, refer to manufacturer specifications.
 - **Ice cubes:** Empty automatic ice dispensers, and discard any ice made prior to shut down. Run the ice machine through a 24-hour cycle. Discard the ice from this first cycle to assure purging of the icemaker's water supply line. You can also follow manufacturers' recommendations for flushing/cleaning.
 - **Drinking Fountains:** Run drinking fountain continuously for 10 minutes. Replace filter if applicable.

Staff Safety Precautions

- Personnel that are flushing the water system may be exposed to aerosolized bacteria and virus. All staff who are directly involved in the flushing should wear personal protection equipment (PPE), including safety goggles, rubber gloves, and NIOSH approved N-95 facemasks (if available). If N-95 facemasks are not available, use face masks.
- Deferred maintenance in buildings that have been closed or unoccupied for an extended period of time may present other hazards to workers. These hazards include, but are not limited to electrical systems, HVAC systems, water intrusion, structural components, and other physical hazards during the period of reopening and reoccupation. Workers and building owners/operators should proceed with caution and carry a heightened awareness of all risks.



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III. Flushing Small Buildings/Homes

This section details the considerations and the process for small buildings/homes that are returned to service after an extended period of discontinued service, such as seasonal homes that are part of a year-round PWS. An adult should be present in the building/home to ensure that the meter works, leaks are identified and repaired, wastewater piping is intact, and the building's plumbing is properly flushed. Flushing instructions provided to occupants may vary depending on the individual structure.

Please note: Many homes have maintained service or even increased water use as residents stay and work from home. These homes do not need to be flushed. This guidance applies to small buildings that have had reduced or no use for a prolonged period of time, due either to COVID-19 or seasonal closures.

1. Prepare for flushing

- Remove aerators (screens) from all faucets and showerheads, where possible, so that the water flows faster and the amount of sediment that gets trapped during flushing is reduced.
- Remove point-of-use (POU) filters to limit the amount of sediment that gets trapped in the filter during flushing. Afterward, replace the old filter with a new filter. Some types of water treatment devices may need to be disinfected or replaced before being used. Check with the manufacturer for details.

2. Initial flushing and cleaning

The initial flush clears out any contaminants that accumulated during stagnation and draws in fresh, high-quality water to the building plumbing. ***Always follow manufacturer guidance when cleaning/flushing individual components connected to building plumbing. This helps ensure proper flushing and limits the chance of damaging components.***

- Flush the faucets in your home or building one floor at a time. Start with the lowest level and move up to the top floor.
- Turn on (open) all water faucets (inside and outside) and showerheads and let the water run for at least 10 minutes.
- In addition to faucets, flush water/ice dispensers, water heaters, and any other appliance that uses water.
- Clean all fixtures, including faucets, showerheads, point-of-use filters, and/or point-of-entry water softeners. (Follow manufacturer's instructions for flushing and cleaning.) Cleaning removes contaminants from the complex internal structures of the fixtures.
- Refer to the [April 3, 2020, recommendations from the American Water Works Association \(AWWA\)](#) that are posted online.
- Replace any aerators and/or filters that were removed before flushing and cleaning.

IV. Flushing Large Buildings and Facilities

This section details the considerations and the process for large buildings that are returned to service after an extended period of discontinued service, including hotels, malls, and office buildings. An adult should be present in the building to ensure that the meter works, leaks are identified and repaired, wastewater piping is intact, and the building's plumbing is properly flushed. Flushing instructions may vary depending on the structure and design of premise plumbing. Experience in flushing and maintaining buildings has shown that there are some general principles for an effective flushing strategy.

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[According to the CDC](#), large complex plumbing systems like those used in hotels, hospitals, retirement communities, and public buildings are most often associated with growth of *Legionella* bacteria. Parts of a building with insufficient air circulation or lukewarm temperature can provide the ideal environment for *Legionella* and biofilm-associated bacteria to grow. Any disinfectant, such as chlorine, already in the water breaks down and can no longer effectively disinfect the system.

1. Prepare for Flushing

- Before flushing, sketch or draw the building water system, to the best of your ability, and identify:
 - Where the water enters the building (source);
 - Zones or branches with the same water supply (a branch to a wing of a building or a set of branches served by the same riser);
 - Faucet that is closest to the starting point of the zone and the faucet/appliance/fixture that is the farthest from the starting point of the zone;
 - Water heaters, recirculating heated water loops, and water-using features (hot tubs); and
 - Any on-site water-treatment systems.
- Parts of the water system that are most important to flush, because they are most commonly used to provide water for drinking, cooking, or preparing food and/or bathing, include:
 - Faucets used for drinking water and/or food preparation;
 - Drinking fountains;
 - Ice machines and refrigerators with ice makers;
 - Showers;
 - Kitchen sink sprayers;
 - Water features that generate aerosols (ornamental fountains, spas); and
 - Parts of the system used by children, older adults, and other vulnerable people.
- Before flushing, remove faucet aerators (screens) from all water taps and clean any sediment that has built up on the aerator. For deposits that are difficult to remove, soak the aerator in white vinegar for a few minutes and then scrub it with a brush. Replace the aerator if it is in poor condition.
- Remove point-of-use (POU) filters to limit the amount of sediment that gets trapped in the filter during flushing. Afterward, replace the old filter with a new filter. Some types of water treatment devices may need to be disinfected or replaced before being used. Check with the manufacturer for details.

2. Initial flushing and cleaning

The initial flush clears out any contaminants that accumulated during stagnation and draws in fresh, high-quality water to the building plumbing. ***Always follow manufacturer guidance when cleaning/flushing individual components connected to building plumbing. This helps ensure proper flushing and limits the chance of damaging components.***

- Clean fixtures, including any showerheads, to remove any contaminants from the complex internal structures of the faucet.
- Clean water treatment systems like point-of-use filters and water softeners according to manufacturer's specifications.
- Clean all decorative water features according to manufacturer's specifications. Be sure to clean any visible slime or biofilm from water features.
- Flushing should be done in segments (e.g., floors, wings, or individual rooms) due to facility size and water pressure.
- Flushing should proceed unidirectionally, from the service entrance to the periphery of the plumbing system (distal points).



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- Flush water lines through all points of use (showers, sink faucets). Flush cold-water lines first and repeat the flushing process for hot-water lines.
 - Begin flushing at the tap in the basement or the lowest floor, moving up to each floor by opening the tap wide.
 - Do not shut off any faucets as you proceed through the building opening more faucets. Be sure to include any laundry tubs and utility sinks.
 - Let the water run for at least 15 minutes or until the tap that is farthest away from where the water comes into the building consistently produces cold water at a stable temperature, whichever is longer.
 - Turn off all the faucets in the order that you opened them (beginning in the basement and moving up to the top floor).
- Building plumbing systems have a variety of places where water is stored. At a minimum, they should be drained and flushed with clean, cold water after the building's cold-water service is properly restored. These include, but are not limited to:
 - Hot water storage (some buildings have more than one type of heating system and hot water storage)
 - Hot water recirculating loop(s), humidifiers, ice machines, dishwashers
 - Ultrapure water storage (membrane filtration)
- Clean any visible slime or biofilm from hot tubs/spas before refilling them with water. Perform a [hot tub/spa disinfection procedure](#) before use.
- Clean any visible slime or biofilm from all cooling towers and basins before use and are maintained per manufacturer's guidelines and industry best practices. If the tower appears well-maintained, perform an online disinfection procedure. [Guidance on cooling towers disinfection procedures](#) is available online from the Cooling Technology Institute.
- Refill the water in any decorative water fountain, and measure disinfectant levels to ensure that the water is safe to use.
- Complete any necessary maintenance of water heaters according to the manufacturer's instructions or hire a professional.
- Complete any necessary maintenance of onsite water treatment systems according to the manufacturer's instructions.
- Replace any aerators and/or filters that were removed before flushing and cleaning.



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Additional Resources

Water Research Foundation

- [Flushing Guidance for Premise Plumbing and Service Lines to Avoid or Address a Drinking Water Advisory](#)

Journal of Water & Health

- [Analysis of building plumbing system flushing practices and communication](#)

CDC

- [Federal Requirements to Reduce Legionella Risk](#)
- [Reduce Risk from Water: From Plumbing to Patience](#)
- [Healthcare Water System Repair and Recovery Following a Boil Water Alert or Disruption of Water Supply](#)
- [Emergency Water Supply Planning Guide for Hospital and Healthcare Facilities](#)

American Water Works Association (AWWA)

- [AWWA Replacement and Flushing of Lead Service Lines](#)

Environmental Protection Agency

- [Coronavirus \(COVID-19\)](#)
- [Coronavirus and Drinking Water and Wastewater\]](#)
- [Restoring Water Quality in Buildings for Reopening](#)

Rhode Island Water Works Association

- <https://www.riwwa.net/>

