

FACT SHEET

WRF 5033

Demonstrating the Effectiveness of Flushing for Reducing the Levels of *Legionella* in Service Lines and Premise Plumbing



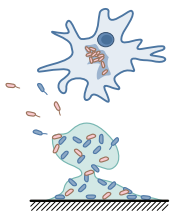
What are *Legionella*?

Legionella are a genus of environmental bacteria commonly found in drinking water at low levels. Various species, notably *Legionella pneumophila*, can cause illnesses like severe Legionnaires' disease or influenza-like Pontiac fever. Infections are more prevalent among certain populations, with risk factors including smoking, compromised immune system, chronic lung disease, and age 50 years or older.

Why are *Legionella* Important in Service Lines and Premise Plumbing?

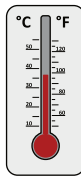
Legionella can persist or grow in drinking water at low levels but may flourish in building plumbing systems due to favorable factors. At higher levels, *Legionella* may become a significant public health risk. Exposure and subsequent infection may occur by inhaling contaminated aerosols from showers, faucets, or other water fixtures.

What Factors Contribute to *Legionella* Growth?



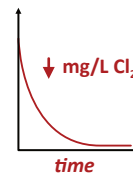
Bacterial Growth

Biofilms and amoebas that feed on biofilm play an important role in the *Legionella* life cycle.



Temperature

Legionella are active at 20 to 50°C (68 to 122°F) but grow best at 35 to 46°C (95 to 115°F). Inactivation starts at 55°C (130°F) and up.



No Disinfectant

The reduction or absence of disinfectant residual in drinking water may contribute to *Legionella* amplification.

Flushing Resets the Water Age

The factors contributing to *Legionella* growth are influenced by residence time, also known as water age. Flushing is the operation of water outlets to manage water age throughout some or all parts of a building water system, including the cold- and hot-water supplies. Flushing until the water returns to the baseline water temperature and residual disinfectant concentration (when applicable), and then an additional 5 minutes, can help manage bacterial levels and the amplification of *Legionella*. The flow rate or velocity may not be important, so long as new water replaces the old.

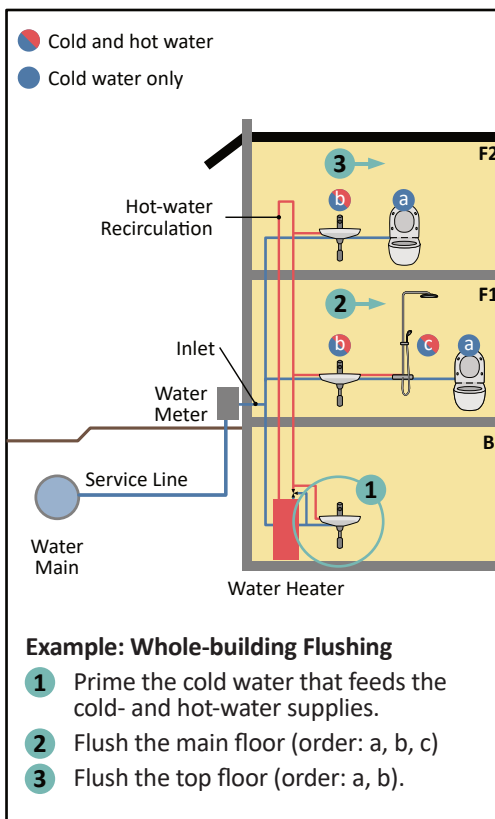
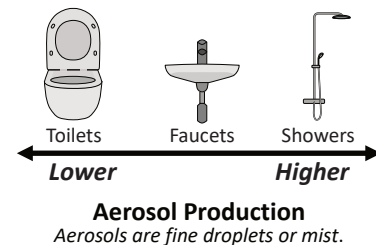


Before a Flush

1. Understand the design and operation of the water system, including problematic features like "dead legs."
2. Know the baseline water quality, especially **water temperature** and **residual disinfectant** (when applicable). The baseline quality is what is usual for water entering the building (cold water) or coming directly from the water heater or circulation system (hot water). Disinfectant may be absent in hot water even if present in cold water.
3. Identify the scope:
 - (a) Prolonged period of closure or low building occupancy (see **Whole-building Flushing**).
 - (b) Typical building occupancy, with some unused outlets (see **Targeted Flushing**).

General Flushing Recommendations

- Prioritize flushing the building inlet and cold water upstream of the hot-water system first.
- Flush regionally nearer the building inlet before flushing farther regions.
- Flush outlets until the water resembles **baseline temperature and residual disinfectant** for the specific supply (cold or hot) and then **another 5 minutes**.
- Flush as much as possible with low-aerosol fixtures before high-aerosol fixtures:
 - **Toilets:** Flush at least twice with the lid down to contain aerosols.
 - **Faucets:** Remove aerators or other flow-altering devices only if doing so will not increase aerosol or scalding hazards.
 - **Showers and bathtubs:** Remove shower hoses or heads only if doing so will not increase aerosol or scalding hazards. If possible, position the shower hose or head near the drain.
- Where applicable, leave an outlet filled with the water most hostile to bacterial growth (see FAQ).



Whole-building Flushing

1. **Prime the cold-water supply.**
Flush near the building inlet until temperature and residual disinfectant levels indicate the service line contains fresh municipal water, plus an extra 5 minutes. If inlet water quality does not improve or becomes worse (e.g., turbid or discolored), flush longer or contact the water supplier for assistance.
2. **Prime the cold water that feeds the hot-water system.**
Starting near the inlet, progressively flush cold water from each outlet between the inlet and water heater.
3. **Flush the rest of the building.**
Flush each designated area (room, area, or wing), beginning nearest the building inlet and moving outward. Flush multiple levels progressively in a similar manner.

Targeted Flushing

1. **Determine the necessity of priming the cold-water supply and the cold water that feeds the hot-water system.**
If there has been active water usage in the building, there may be no need to prime the water system with fresh water.
2. **Flush unused outlets and other dead legs progressively from nearest the building water outlet to farthest.**
Removal and cleaning of aerators, shower heads/hoses, and other devices should occur regularly. When flushing several outlets near one another, prioritize low-aerosol outlets first.

Flushing Safety

Flushing poses risks to both the person conducting the flushing and the occupants of the building. To mitigate these risks, consider implementing safety precautions, such as the following:

Hazard	Affected Person(s)	Safety Precaution
Contaminated aerosols	Flushing operator	<ul style="list-style-type: none"> Wear N95/FFP2 respirator
	Building occupants	<ul style="list-style-type: none"> Flush during off-peak hours or restrict room access
Hot water	Flushing operator	<ul style="list-style-type: none"> Minimize splatter from water outlets Wear safety glasses
	Building occupants	<ul style="list-style-type: none"> Flush during off-peak hours or restrict room access
Household bleach (chlorine)	Flushing operator	<ul style="list-style-type: none"> Wear safety glasses and rubber gloves Never mix bleach with other cleaners (especially ammonia)
Slippery floors	Building occupants	<ul style="list-style-type: none"> Remove excess water with a mop or squeegee Post signage indicating slipping hazard

Cleaning and Disinfection of Removable Aerators and Shower Heads

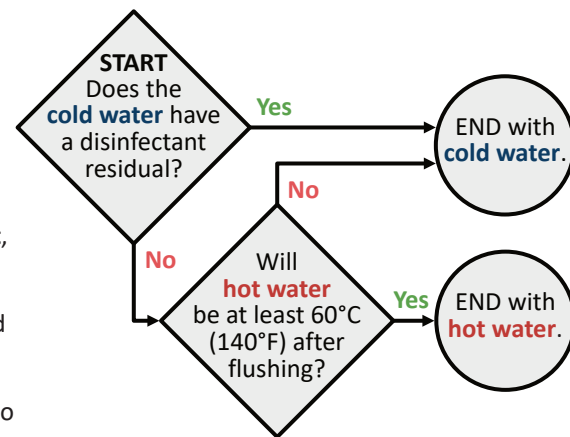
Aerators, shower heads and hoses, and any other removable devices should be periodically removed and cleaned of accumulated sediment, mineral deposits, and biofilm. To clean:

1. Uninstall the devices.
2. Scrub with dish soap and warm water.
3. Disinfect the removed devices by fully submerging in a chlorine bleach solution for ca. 30 minutes. Some components should not be exposed to bleach, such as certain metallic finishes or rubber gaskets.
4. Fully drain the bleach solution and then reinstall the devices.

To prepare a 50 ppm bleach solution, use 10 to 15 mL of 4 to 5% bleach per 10 L, or about 1 tsp per U.S. gallon.

Frequently Asked Questions (FAQ)

- **Does it matter if I flush with hot or cold water first?**
Leave outlets filled with the water most hostile to bacterial growth (see **flowchart**).
- **How often should I flush?**
When municipal tap water **contains a residual disinfectant**, flush outlets that have not been used for **7 or more days**.
When municipal tap water **contains no or insufficient residual disinfectant**, flush outlets that have not been used for **3 or more days**.
- **What time of day is best for flushing?**
Flushing during off-peak hours may help reduce exposure to hazardous conditions.



Disclaimers

- Flushing should be guided by clear goals as part of a comprehensive building water management plan.
- These recommendations are specifically for *Legionella* prevention and may not align with other types of flushing.
- The absence of *Legionella* can only be confirmed with regular testing.
- These recommendations are based on controlled pilot experiments and field studies, with inherent limitations.