

RECOMMENDATIONS for restoring service to water distribution systems in vacant buildings

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Writing

Michèle Prévost, full professor at the Polytechnique Montréal, senior researcher, NSERC Industrial Chair on Drinking Water

Marianne Grimard-Conea, Ph.D. candidate at the Polytechnique Montréal, member of the NSERC Industrial Chair on Drinking Water

Members of the Working Committee

Michèle Prévost, full professor and senior researcher, NSERC Industrial Chair on Drinking Water, Polytechnique Montréal

Marianne Grimard-Conea, Ph.D. candidate at the Polytechnique Montréal

Éric Gagnier, technical consultant, plumbing, General Directorate, Regulations and Consulting Expertise, Régie du bâtiment du Québec

Yves Duchesne, Eng. General Directorate, Regulations and Consulting Expertise, Régie du bâtiment du Québec

Henri Bouchard, director, Technical Department, Corporation of Master Pipe Mechanics of Québec

Manuel Giurgiu, Regulatory Interpretation and Support Directorate, Régie du bâtiment du Québec

Donald Ellis, Eng., Drinking Water and Groundwater Directorate, Ministry of the Environment and the Fight Against Climate Change

Émilie Bédard, Eng., assistant professor, Polytechnique Montréal

Élise Deshommes, Eng., Ph. D., research associate, Polytechnique Montréal
Fatemeh Hatam, Ph. D., research associate, Polytechnique Montréal

André Matte, Eng., Real Estate Project Directorate, Ministry of Health and Social Services

Luc Biron, Eng., Director, Equipment Department, Université du Québec à Trois-Rivières

Gabrielle Ebacher, Eng., Ph. D., City of Laval

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1. Recommendation development process

The following recommendations were developed by the Régie du bâtiment du Québec (RBQ) in collaboration with members of a working committee consisting of experts from the Polytechnique Montréal's NSERC Industrial Chair in Drinking Water, the RBQ, the Corporation of Master Pipe Mechanics of Québec, the Université du Québec à Trois-Rivières, the Ministry of the Environment and the Fight Against Climate Change, the Ministry of Health and Social Services, and the City of Laval.

The committee analyzed documents relating to post-stagnation service restoration published in Canada and abroad, as well as instructions and requirements for the commissioning and restoration of service in buildings or building sectors issued by standardization bodies, including specific instructions for the prevention of Legionnaires' disease.

In complying with these recommendations, you will ensure workers and occupants of these buildings have access to safe water.

2. Why issue recommendations for restoring service to water systems?

When fewer people are using a building's water system, the risk of stagnant water is higher, and the quality of the water deteriorates. Conditions leading to stagnant water increase the risk of bacterial growth, including the *Legionella pneumophila* bacteria, which causes Legionnaires' disease. Legionnaires' disease is a form of pneumonia that can make vulnerable persons seriously ill. Hot water systems are more likely to generate the proliferation of these bacteria. Closing buildings or parts of buildings where their use is limited can increase the risk of *Legionella pneumophila* in inadequately managed water systems. Maintaining high temperatures in the hot water system is the main way to minimize the risk of Legionnaires' disease.

The extended stagnation of water can also cause a reduction in the residual concentration of disinfectant in the drinking water system, leading to the corrosion of materials and increased concentrations of toxic metals such as lead and copper.

3. Who do these recommendations target?

These recommendations are for owners, managers and tenants:

- of a building that has been vacant for more than one month
- of part (section) of a building that has been vacant for more than one month, or
- of a building whose storey or storeys have been vacant for more than one month.

These recommendations involve actions that differ, based on **two major types of buildings**, with different equipment. They are defined as follows:

-  • **Small building:** any building with 3 storeys or less and 600 square metres or less.
-  • **Large building:** any building with more than 3 storeys and more than 600 square metres.

4. When do these recommendations apply?

These recommendations must be applied before all or some of a building's workers and/or occupants have moved back into the building or part thereof, which has been totally vacant for more than one month. A specific section covers the procedure applicable to buildings or building sections that have only been partially occupied.

The different steps in this process include preparing to put the hot water production system into operation followed by the complete flushing of both the cold and hot water systems (i.e., opening a faucet or other device for emptying the water in the pipes and replacing it with fresh water). The different steps in the restoration of service can take from 24 to more than 48 hours.



5. Recommended interventions for restoring service

Restoring service in hot and cold water systems involves the following three steps.

Step 1 – Locating the water systems' main components

At least 24 hours before undertaking the flushing, the following actions are recommended:

- Obtain information (plan) on the configuration of the hot and cold water systems, when possible.
- Locate the building's water intake as well as the unit furthest from the water intake (see figures 1 and 2).
- Locate the main components in the hot water system, i.e., the water heater and hot water tanks, and determine if there are one or more recirculation loops.

In a small building, hot and cold water systems are relatively simple (figure 1), but in large buildings, they are more complex (figure 2). Typically, a hot water recirculation loop is present in a large building.

Figure 1 – Example of cold (blue) and hot (red) water systems in a small building (3 storeys or less, and 600 square metres or less).

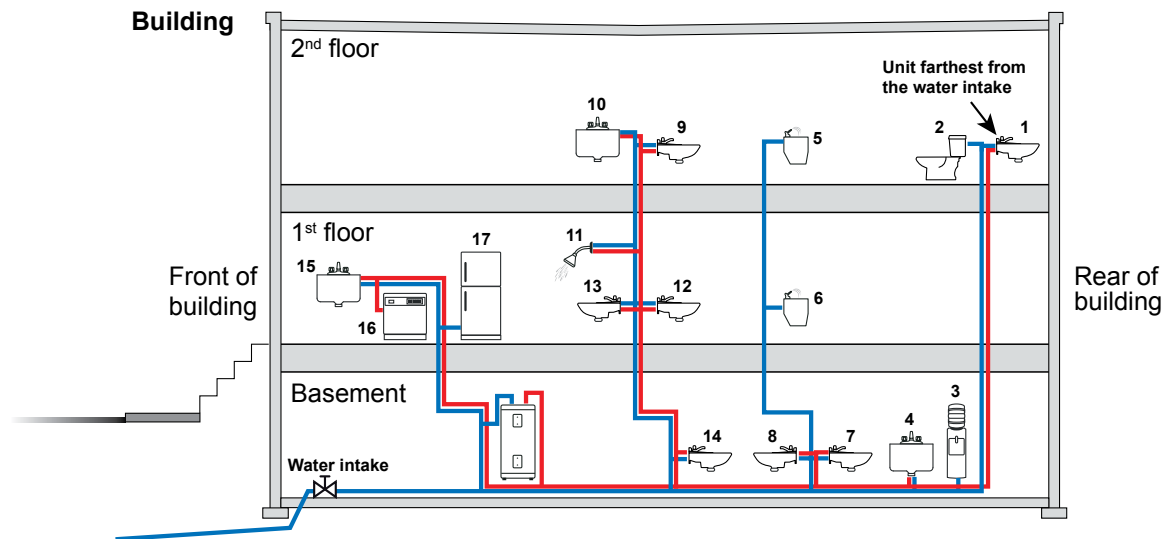
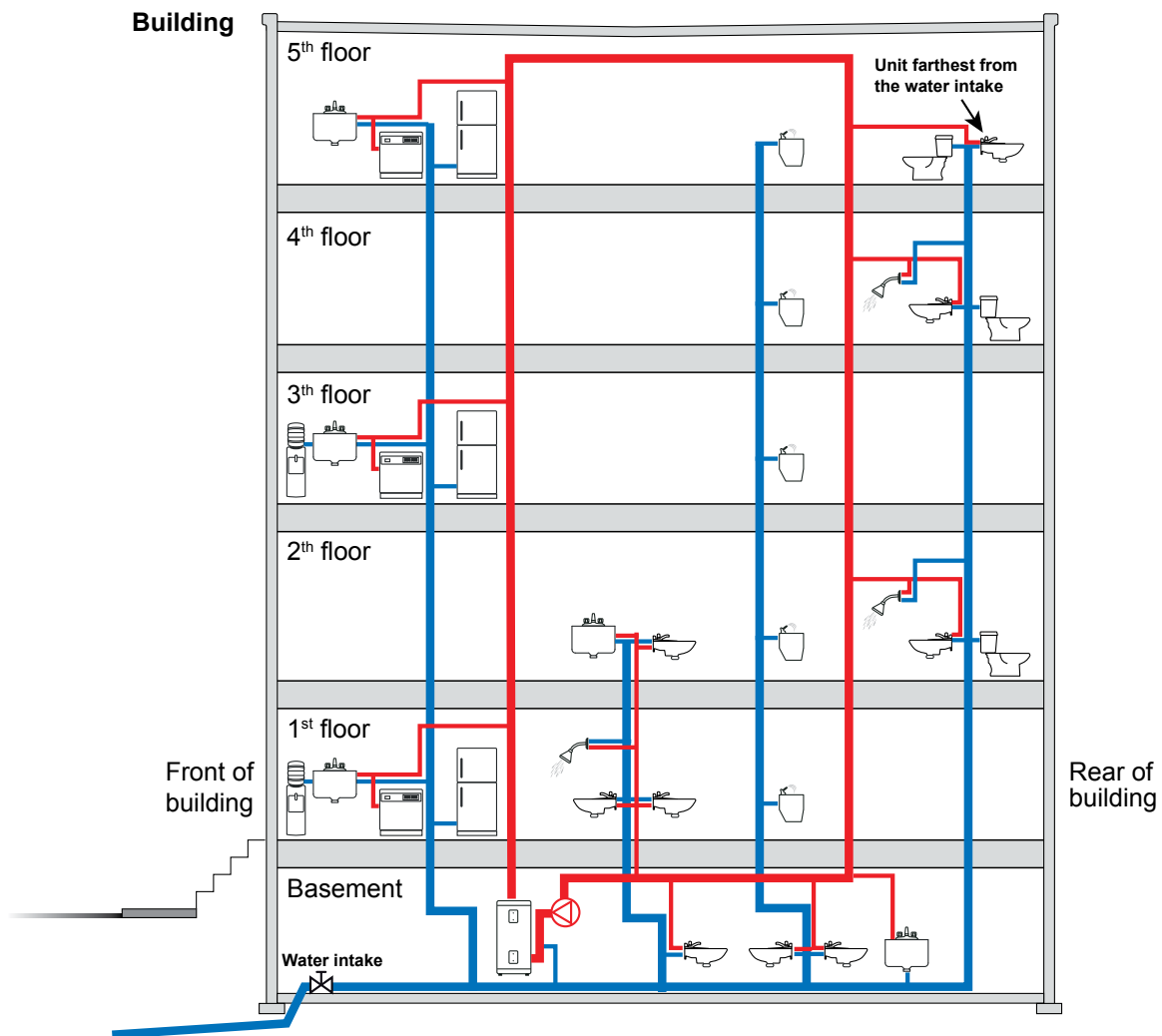


Figure 2 – Example of cold (blue) and hot (red) water systems in a large building (more than 3 storeys or more than 600 square metres).



Step 2 – Preparation of the hot water production system: water heater and water recirculation loop

This step calls for supplying hot water at an adequate temperature for a period of at least 24 hours. The water temperature must be at 60°C at the water heater's outlet and reach a temperature of at least 55°C in a water recirculation loop.

A hot water system operating at below the aforementioned temperatures is deemed to be at greater risk of spreading the *Legionella pneumophila* bacteria, which can affect vulnerable populations.

If the water heater has remained in operation:



In a small building

- At least 24 hours before flushing the building's water system, ensure that the temperature at the water heater's outlet and in any hot water tank is maintained at a minimum of 60°C. Note that, when leaving the production plant, electric water heaters are set at 60°C.
 - If that is the case, go to step 3.
- If the water temperature at the water heater's outlet is below 60°C, increase and maintain the temperature at a minimum of 60°C for at least 24 hours before moving to step 3.

In a large building



- At least 24 hours before flushing the building's water system, ensure that the water temperature at the water heater's outlet and in any hot water tank is maintained at a minimum of 60°C.
- If the temperature at the water heater's outlet is below 60°C, increase and maintain the temperature at a minimum of 60°C.
- If the building does not have a recirculation loop, go to step 3.
- If the building has a recirculation loop and that it is functioning, go to step 3.
- If the recirculation loop is stopped, restart it and keep it working for 24 hours, then move to step 3.

If the water heater has been turned off:

- Before restarting the water heater, replace the water in the tank by turning on the hot water faucet* near the outlet of the water heater or tank until it fills with fresh water. Depending on the tank's capacity, refilling can take from 30 to 60 minutes.
- Turn on the water heater and restart the recirculation loop if there is one. If needed, set the temperature to at least 60°C.
- Let the hot water system run for at least 24 hours.
- Go to step 3.

* It is important to open faucets slowly to avoid splashes and the generation of aerosols. Appropriate personal protective equipment (PPE) must be worn during flushing operations (see section 1.6).

Step 3 – Flushing hot and cold water systems

This step seeks to improve the quality of the water by bringing fresh water into all pipes and removing possible contaminants from stagnant water.

 In the case of a **small building with 3 storeys or less and less than 600 square metres**, conduct the flushing operation in six steps:

1. If possible, remove aerators and showerheads, etc. and deactivate the faucets' electronic function. Be careful of water splashes when flushing water systems.
2. Flush the cold-water system for at least 30 minutes by turning on a faucet, manually if possible, in a sanitary fixture (washbasin, sink, tub, etc.) located at the farthest and highest point from the water intake. Select a sanitary fixture located on the top storey of the building and as far as possible from the front of the building. Ensure the presence of "fresh water" (cold water) at the end of the flushing process (see figure 1).
3. Flush the hot water system from the same sanitary fixture, until the water is hot.
4. Next, flush the system from the second farthest sanitary fixture, and so on, from each fixture, for two minutes for cold water and two minutes for hot water. In this step, you flush all sanitary fixtures and other equipment directly connected to the building's water system, such as faucets, showers, coffeemakers, water coolers and ice machines, safety showers, etc. Flush toilets and urinals at least once (see figure 1).
5. If there are filters, replace them according to manufacturer's instructions after the flushing.
6. Clean, rinse and reinstall aerators and showerheads and reactivate electronic controls after flushing.



In the case of a **large building with more than 3 storeys or more than 600 square metres** or part of a building, it is necessary to conduct the complete preventive flushing of all pipes.

Two procedures are proposed:

Procedure 1 – Flushing main pipes followed by the flushing of all points of use

This procedure applies when the configuration of the system is known. It allows for more effective flushing.

1. If possible, remove aerators and showerheads, etc. and deactivate the faucets' electronic function. Be careful of water splashes when flushing water systems.
2. Flush the cold water system for at least 15 minutes by opening the sanitary fixture's cold water faucet (washbasin, tub, sink, etc.) located the farthest from the water intake, i.e., at the end of riser pipes and main pipes.
3. Flush the hot water system from the same sanitary fixture, until the water is hot.
4. Next, flush the system from the second farthest sanitary fixture, and so on, from each fixture, for two minutes for cold water and two minutes for hot water. In this step, you rinse all sanitary fixtures and other equipment directly connected to the building's water system, such as faucets, showers, coffeemakers, water coolers and ice machines, safety showers, etc. Flush toilets and urinals at least once.
5. If there are filters, replace them according to manufacturer's instructions after the flushing.
6. Clean, rinse and reinstall aerators and showerheads and reactivate electronic controls after flushing.

Procedure 2 – Flushing the water intake followed by the flushing of all points of use

This procedure applies when the system's configuration is unknown or uncertain.

1. If possible, remove aerators and showerheads, etc. and deactivate the faucets' electronic function. Be careful of water splashes when flushing water systems.
2. Flush each water intake for at least 30 minutes by turning on the sanitary fixture's cold water faucet (washbasin, tub, sink, etc.) located closest to each water intake.
3. Next, for cold water, flush each fixture for five minutes, starting with the fixture closest to the water intake and working towards the fixture farthest from the water intake. However, after a restroom's first fixture has been flushed, cold water in all neighbouring fixtures must be flushed for one minute only. This step requires that all sanitary fixtures and equipment directly connected to a building's water system be rinsed, including faucets, showerheads, coffeemakers, water coolers and ice machines, safety showers, etc. Flush toilets and urinals at least once.
4. For each fixture, turn on the hot water faucet, wait for the arrival of hot water and keep running the water for two minutes.
5. If there are filters, replace them according to manufacturer's instructions after the flushing.
6. Clean, rinse and reinstall aerators and showerheads and reactivate electronic controls after flushing.

Partial occupancy of buildings

Certain buildings or building sections may possibly have been partially occupied. Based on the rate of occupancy, the following recommendations are proposed.

In the case of partial occupancy (fewer than 25% of users) of a building or part of a building (wing, storey, etc.) for more than one month:

- Depending on the size of the building, carry out the previously described preventive flushing after each month of partial occupancy in the parts of the building involved.
- Depending on the size of the building, carry out a preventive 5-minute flushing of both hot and cold water systems once a week, at the systems' farthest points in the building involved. An automated flushing device can be used. This measure will reduce the risk of spreading the *Legionella pneumophila* bacteria and of deteriorating water quality, especially as it relates to water being consumed by occupants.
- Post the following notices at every point of consumption in parts of the building involved (by each water fountain and each kitchen faucet):
 - “Let the water run for one to two minutes before consuming.”
 - “When you wash your hands (a minimum of 20 seconds), let the water run to help purge the system.”

In the case of partial occupancy (more than 25% of users) of a building or part of a building (wing, storey, etc.):

- No specific measure required.
- However, consider carrying out a preventive 5-minute flushing of both hot and cold water systems once a week, at the systems' farthest points in the building involved. An automated flushing device can be used. This measure will reduce the risk of deteriorating water quality, especially as it relates to water being consumed by occupants.

If any one of the elements in these directions seems complex, contact a licensed plumbing contractor. To locate one, go to the website of the Corporation of Master Pipe Mechanics of Québec at www.cmmtq.org.

6. Occupational health and safety considerations

When flushing water systems by turning on faucets, showers and other fixtures for a few minutes, aerosols will form. These could potentially be contaminated with the *Legionella pneumophila* bacteria. The person responsible for pipe flushing operations could be exposed to these bacteria, due to the number of systems that need to be flushed, the intensity of this work, and its duration.

Here are a few tips for limiting exposure to aerosols during the flushing of water systems:

- Flush toilets (with the lid down, if there is one).
- Take care when flushing the hot water system, as the water could become quite hot and cause burns.
- During the flushing of water systems, restrict access to rooms where aerosolization could occur (do not make these premises accessible in order to avoid the risk of burns as well).
- Avoid splashes and aerosols when turning on faucets and showers.
- Ventilate premises as much as possible, by opening windows and/or turning on the ventilation system.
- Where exposure could be more extensive (ex.: total exposure to aerosols for a cumulative period of more than 30 minutes), wearing adequate respiratory protective equipment (N95 or equivalent) is recommended.
- Persons at risk of Legionnaires' disease (persons over the age of 50, smokers, are immunocompromised, diabetic, suffering from kidney disease, cancer, have recently had surgery or have a chronic heart or lung condition) should avoid exposure to aerosols potentially contaminated by bacteria.

7. Additional considerations for other systems

- Discharge water into floor drains and flush every sanitary fixture (toilets, urinals) to keep water in the siphons (P-trap).
- Go to the RBQ's website for the [obligations of the owner of water cooling towers](#) (available in French only).
- Be vigilant to avoid overflows and remain on the premises when flushing fixtures.

8. Communication activities

Relevant authorities should forward instructions to parties who are responsible for buildings and who must, in turn, advise occupants of:

1. Flushing operations carried out.
2. Special actions relating to the water's use.

9. References

The following supporting documents were consulted and analyzed for the drafting of these instructions:

- Instructions for the post-stagnation restoration of service published in Canada, the US and abroad.
- Instructions and obligations for the commissioning and restoration of service in buildings or building sections, including specific instructions for the prevention of Legionnaires' disease.
- Relevant publications on deterioration resulting from stagnation in large buildings, recommended measures, the regulatory framework and communication challenges.

Questions?

Should you have any questions relating to this document, contact the RBQ at 1 800 361-0761.