



Guidance for Premise Plumbing Water Service Restoration

When buildings and homes are vacated, the stagnation of potable water within the premise plumbing can lead to water quality deterioration that may be associated with public health risks.

Applicability

This guidance offers considerations for water service restoration to minimize risks associated with water quality degradation related to stagnant water. It is applicable to structures regardless of their status of a public water system as defined by Ohio Revised Code Section 6109.01 and Ohio Administrative Code Rule 3745-81-01 and is not meant to restrict any facility or water system's more comprehensive water management plan or guidance.

Water Quality Issues in Closed or Vacant Buildings

Buildings and homes are often closed or vacated for a variety of reasons including, but not limited to, housing demand, economics, tenant turnover. For example, schools close for summer vacation, office buildings go vacant based on patronage, hospital wings close for remodeling/expansion or lower patient census, and apartment buildings close for renovation. During such vacancies, water usage may decrease or cease leading to possible water quality degradation.

Even in buildings without a history of vacancy, premise plumbing faces several key challenges in the delivery of potable water throughout the building. These challenges include:

- High surface area to volume ratio
- High water age
- Multiple types of plumbing materials
- Multiple points for cross connections
- Temperature gradients

Building maintenance, regular water usage and flushing programs are essential for managing water quality and to decrease the health risks associated with water quality loss. In vacant buildings these challenges should be managed properly in order to prevent the accumulation of contaminants within the premise plumbing.

When buildings close or become vacant for extended periods of time, the stagnation of potable water within plumbing can lead to deterioration of the water quality, including loss of disinfectant residual, microbial growth, the accumulation of sediments and metals, and increased disinfection byproduct formation. Stagnant periods as short as a few hours can lead to reductions in water quality. Portions of a building that are allowed to remain vacant should also be considered for water quality management. For example, unused rooms allow for stagnation in the lines connecting the plumbing fixture to the main water riser.

Water quality degradation can impact drinking water safety within a building. When water service is returned to the building after an extended period of shut off, it is important to address the stagnant water in the building's plumbing before consumption and usage is permitted.

Potential Contaminants in Stagnant Waters in Premise Plumbing

- Metals (lead and copper)
- Opportunistic pathogens (Legionella, Pseudomonas, non-tuberculosis mycobacteria)
- Organics (disinfection byproducts: trihalomethanes and haloacetic acids)

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Addressing Contaminants to Protect Public Health

For buildings with long periods of closure, consideration should be given to ensuring the safety of water when the service is restored to the building. Factors to consider when restoring service include:

- The portion of the building that will be used – If vacant floors or sections will still exist, these areas are to be flushed and managed to prevent localized stagnation.
- Anticipated use of the building – Buildings with susceptible populations such as hospitals, nursing homes, schools, or daycares may consider additional efforts to address contaminants to which the population of the building is most susceptible.
- Regulatory requirements that must be met – Buildings comply with all state and local laws related to premise plumbing.
- Materials used in the plumbing system – Buildings with lead plumbing or solder should be aware of the potential for leaching or particle build up in aerators and stagnant waters. Materials may vary throughout the building due to maintenance, repairs, and renovations.
- Age of the plumbing system – The age of the plumbing system can be an indicator of the materials used, the integrity of the system, and maintenance that may be required once service is restored.
- Potable and non-potable distributions – Large buildings often have multiple types of water distribution networks. This can increase the potential for improper cross-connection and backflow to non-potable networks (fire protection, irrigation, etc.).
- Types of potable water distribution – Domestic cold water, hot (tempered) water distribution networks exist in buildings. Heated water is typically stored and produced in hot water storage tanks that can accumulate sediment, reduce disinfectant residual, and harbor opportunistic pathogens.

Consideration of these factors will help determine what kind of flushing or disinfection the building may require before serving potable water again, and what additional asset management or maintenance the building may require when in use.

Premise Plumbing is a Nexus of Regulations

In facilities not defined as a public water system by Ohio Revised and Administrative Codes, managing water quality is the responsibility of the building maintenance personnel, manager, or owner, commercial plumbers, or individual occupants. These groups are often not water quality professionals and the building water system is often not their primary responsibility. In facilities designated as a public water system, the water distribution system is the responsibility of the Professional Operator of Record (ORC) certified by Ohio EPA or owner. The traditional knowledgebase for an ORC is in-ground water distribution systems typical to municipal water utilities. Premise plumbing, which is regulated by the state building code, can present a knowledge gap for ORCs when buildings become designated as public water systems.

Ohio Agencies that may Regulate Premise Plumbing

- Ohio Department of Commerce - Building Code
- Ohio Environmental Protection Agency - Public Water Systems
- Ohio Department of Health - Healthcare Water Management Plans

Recommendations for Returning Buildings and Homes to Service

Despite the impact that building vacancies and closures can have on water quality, there is no federal guidance or consensus of best practices for returning water service to a building or premise plumbing. It is important to communicate with the local water utility and other state/local agencies prior to performing flushing or disinfection as they may provide guidance on any associated regulations. Local water utilities may also be able to assist with testing recommendations to ensure the safety of the water. In general, and prior to human consumption or use, Ohio EPA recommends a combination of the following methods to ensure the delivery of water throughout the premise is of the same quality that it was when it entered the building. Disinfection and testing are particularly important when the facility serves a sensitive population, such as immunocompromised individuals. Structures with lead service lines may consider using an NSF/ANSI Standard 53 filter for lead reduction. These filters are available in both faucet mounted and pitcher formats.

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I. Disinfection

Vacant buildings that are not in service should consider disinfection prior to occupancy. Buildings that are not public water systems may consider following Ohio Department of Commerce's disinfection rules for new buildings cited in OAC 4101:3-6-01 Section 610 which requires new potable water systems to be purged of deleterious matter and disinfected to remove bacteriological contamination prior to utilization. Disinfection of the buildings plumbing must be administered by a licensed plumber in accordance with all state and local regulations.

Buildings that are designated as public water system should contact their Ohio EPA district office for guidance.

II. Testing

Testing should be performed to ensure that water quality parameters and health risks are minimized and to evaluate the effectiveness of flushing or disinfection. Water pressure, temperature, and disinfection residual should be measured at varying locations in the building to check for consistency. Lead and copper testing should be performed at taps to ensure flushing has removed any accumulated metals. Bacteriological testing should be performed at various locations throughout the building to ensure the elimination of coliform bacteria and other opportunistic pathogens.

III. Flushing

When buildings and homes are returned to service after an extended period of discontinued service (e.g., weeks or months), someone should be present to ensure that the meter works, leaks are minimized, wastewater piping is functional, and the building's plumbing is flushed. Flushing instructions will vary depending on the size and configuration of the structures internal plumbing. Flushing procedures may also vary depending on the specific contaminant being mitigated. Flushing can be used as a preventative measure during the periods of closure to prevent water stagnation. Flushing can also be used to address the potential effect of stagnation on premise plumbing.

Flushing does not require installation of special equipment, can be implemented by anyone, and can address multiple contaminants. The procedure included in this guidance document is also provided at the end of this document as a standalone procedure that can be distributed to the general public as a guide to improve water quality, particularly after water service is restored to vacant structures.

In general, flushing involves opening taps and other fixtures (including showerheads) and letting the water run to remove any stagnant water within the plumbing and fixtures. It does not require the installation and maintenance of additional water treatment equipment and is not complex to implement. The length of flushing required to remove all the stagnant water in the buildings plumbing will depend on the number and type of fixtures that are opened for flushing, and the length and diameter of pipe that needs to be flushed. Flushing may help remove particle build up that contributes to poor water aesthetics and to high lead or copper levels. Replacing stagnant water with fresh water may increase the disinfectant residual within the building plumbing, in turn, help destroy microbial growth and prevent re-growth.

Flushing should continue long enough to ensure that accumulated material is removed, which can be verified by testing. Additionally, faucet aerators should be removed prior to flushing to allow for complete removal of material and avoid clogging or accumulating materials in the aerator. It is also recommended to clean faucet aerators prior to reinstallation.

Flushing should be conducted in a way that ensures water stagnation is reduced throughout the entire premise plumbing system, including hot water distribution lines. A systematic flushing procedure is necessary to remove potential contaminants from the premise plumbing and restore adequate disinfectant residuals before returning the building to service and using water for drinking, cooking, and washing. While there is no one standard to flush a system for all contaminants, the attached directions are for flushing a single-family structure with lead service lines.

Cold water plumbing should always be thoroughly flushed before hot water taps are used or flushed.

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Additional Resources

There are many resources available online with more information.

- <http://www.clevelandwater.com/actions#top>
- <https://www.awwa.org/Store/Product-Details/productId/65628258>
- <https://epa.ohio.gov/Portals/28/documents/pws/PWS-06-001.pdf>
- https://www.epa.gov/sites/production/files/2018-09/documents/flushing_best_practices_factsheet_508.pdf
- https://www.michigan.gov/documents/egle/egle-tou-dweh-WaterReconnectionActions_683801_7.pdf
- https://www.michigan.gov/documents/egle/egle-tou-dweh-FlushingAppliancesForWaterConsumption_684205_7.pdf
- <https://www.waterrf.org/resource/evaluation-flushing-reduce-lead-levels-0>
- <https://engineering.purdue.edu/PlumbingSafety/project/covid19-response>
- <https://epa.ohio.gov/Portals/28/documents/rules/rtrcr/SeasonalStart-UpProcedureTraining.pdf>
- https://www.health.ny.gov/environmental/water/drinking/docs/water_startup.pdf
- <https://epa.ohio.gov/Portals/28/documents/rules/rtrcr/SeasonalStartupChecklist.pdf>
- <https://www.health.state.mn.us/communities/environment/water/docs/ncom/startup.pdf>
- <https://www.maine.gov/dhhs/mecdc/environmental-health/dwp/sitemap/seasonal.shtml>
- <https://dec.vermont.gov/water/drinking-water/public-drinking-water-systems/tncws/seasonal-systems>

Contact

For more information contact the Emerging Contaminants Section at (614) 644-2752 or your district office inspector.