



Maryland

DEPARTMENT OF
GENERAL SERVICES

Water Management Program

for Water Monitoring, Treatment,
and Testing in DGS-Managed and
Leased Facilities



This Water Monitoring, Treatment, and Testing Risk Management Program is designed for facilities managed and leased by the Department of General Services (DGS). It establishes guidelines for managing potable and non-potable water systems to ensure safety, compliance with regulatory requirements, and the prevention of waterborne diseases. The program is based on standards and regulations from the Occupational Safety and Health Administration (OSHA), the Environmental Protection Agency (EPA), the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), and relevant Maryland laws.

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1

Purpose

The purpose of this program is to provide a comprehensive framework for monitoring, treating, and testing water systems in DGS-managed and leased facilities. Landlords are recommended to follow the most up-to-date DGS Office of Real Estate (ORE) requirements for water monitoring, testing, and treatment, which are incorporated into the General Performance Specifications and Standards (GPS&S) for new leases and lease renewals. The DGS Office of Real Estate (ORE) will collaborate with the Lessor and escalate any issues to ensure that the lease provisions are applied to address tenant concerns raised by state agency occupants in leased office space.

The Water Management Program objectives include:

- Managing water quality to control the growth and transmission of waterborne pathogens (including *Legionella pneumophila*, *E. coli*, total coliform, etc.), and monitoring for the presence of heavy metals such as lead and copper.
- Ensuring compliance with federal, state, and local water quality standards and regulations.
- Implementing effective risk management and remediation strategies for building potable and non-potable water systems.

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Applicable Standards and Regulations

This program is designed to comply with the following standards and regulations:

- 41 CFR § 102-80: Federal standards for ensuring safe and healthy workplaces.
- ASHRAE Standard 12-2023: Reducing the risk of Legionellosis associated with building water systems.
- ASHRAE Standard 188-2021: Risk management for building water systems to prevent *Legionella* growth.
- CDC Toolkit: Developing a *Legionella* Water Management Program
- CDC Toolkit: Controlling *Legionella* in Common Sources of Exposure
- EPA National Primary Drinking Water Regulations (40 CFR § 141): Includes the Lead and Copper Rule (40 CFR § 141 Subpart I).
- EPA National Primary Drinking Water Regulations Implementation (40 CFR § 142).
- EPA Other Safe Drinking Water Act Regulations (40 CFR § 143): Including use of lead-free materials for drinking water (40 CFR § 143 Subpart B).
- EPA Safe Drinking Water Act (SDWA): Federal water safety regulations.
- Md. Code Regs. 26.04.02.02: Maryland regulations on water supply and sanitation.
- OSHA General Duty Clause: Section 5(a)(1) of the Occupational Safety and Health Act (29 U.S.C. § 654).
- OSHA Standard 29 CFR § 1960: Safety and health regulations for federal employees.
- OSHA Standard 29 CFR 1910.141: Requirements for sanitation and potable water in workplaces.

3

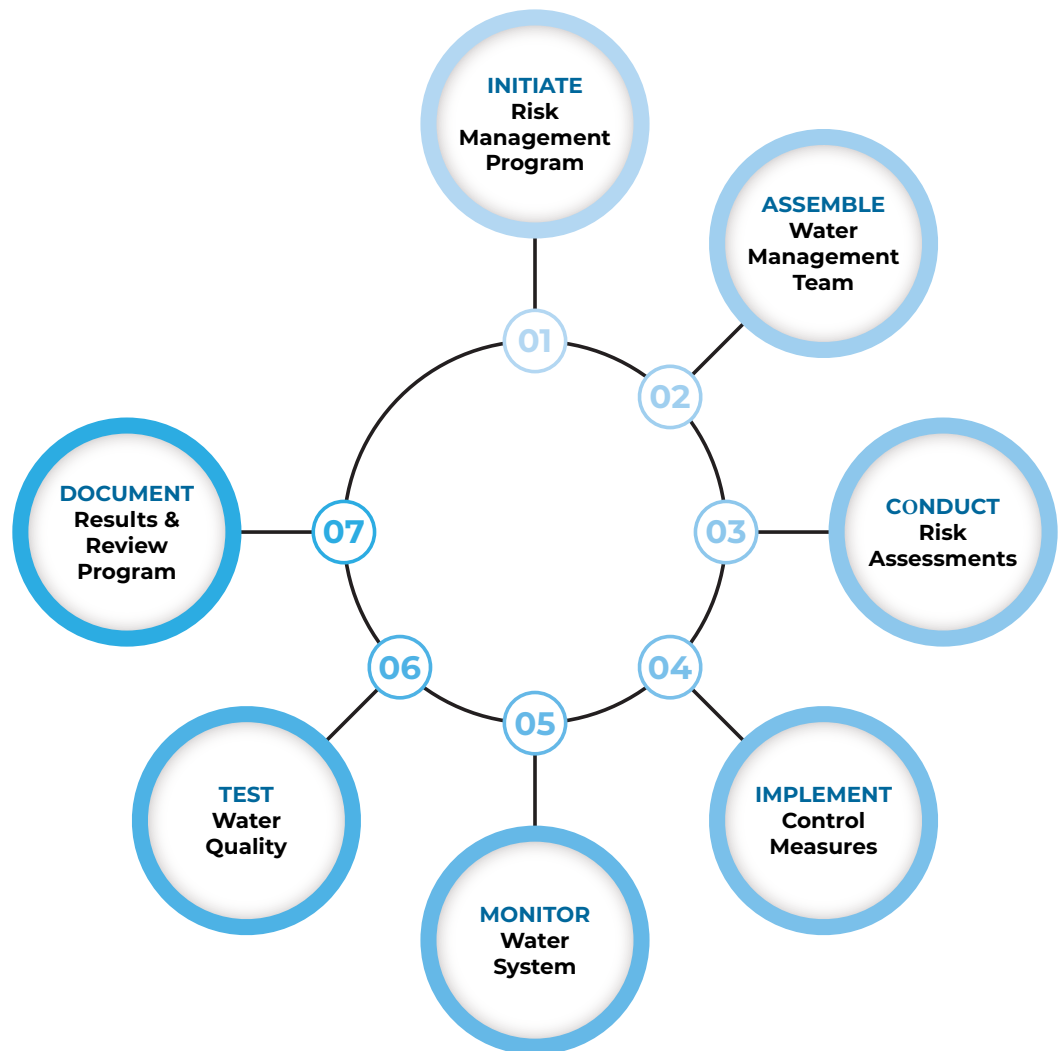
Scope

This program applies to the following water systems and components in DGS-managed facilities:

- **Potable Water Systems:** Hot and cold potable water for consumption, handwashing, and general use.
- **Non-Potable Water Systems:** Cooling towers, evaporative condensers, decorative fountains, and irrigation systems.
- **Equipment and Fixtures:** Drinking fountains, ice machines, showers, emergency eye-wash stations, and water-using equipment.
- **Building Plumbing Systems:** Water storage tanks, pipes, and valves.

4

Water Management Program Processes - Process Flow Chart



4a

Initiate Risk Management Program

Following the steps below, DGS can effectively manage and mitigate risks associated with water systems in DGS-managed facilities, ensuring compliance with health and safety regulations and preventing the growth and transmission of waterborne pathogens.

- **Establish a Water Management Team (WMT):** Form a team that includes representatives from various roles, such as the Director of Life Safety and Quality Improvement, Office of Facilities Management Leadership, Building Facilities Manager, Water Treatment Contractor, Industrial Hygienist (IH) Contractor, DGS Engineer, and Public Health Representative. This team will oversee the implementation and management of the water program.
- **Create Building Water System Descriptions:** Each building should incorporate a mapped water system into its building-specific Water Management Plan (WMP). The building-specific WMP should identify potential areas for *Legionella pneumophila* growth and outline regular maintenance procedures to prevent its growth.
- **Conduct Hazard and Risk Assessments:** The OFM building management team should conduct initial and ongoing assessments to identify potential risks related to waterborne pathogens, especially *Legionella pneumophila*, in the building's water systems. This includes evaluating water system components, water age, flow rates, temperature control, and identification of critical control points.
- **Implement Control Measures:** Based on the findings of the hazard and risk assessments, implement control measures to reduce the likelihood of waterborne pathogens. This includes maintaining appropriate water temperatures, preventing water stagnation, using appropriate water treatment chemicals, and managing cooling towers according to ASHRAE guidelines.
- **Set Monitoring Protocols:** Establish regular monitoring protocols for water systems to ensure compliance with control measures and maintain safe water quality. This involves monitoring temperature, disinfectant residual, water quality, and flow rate.
- **Testing Procedures:** Define and follow testing schedules for detecting potential contaminants or pathogens in the water systems.
- **Documentation and Program Review:** Maintain accurate monitoring, testing, and corrective action records.
- **Training and Education:** Ensure all personnel involved in water system management receive training on the principles and procedures of the water management program.

4b

Water Management Team (WMT)

A Water Management Team (WMT) will oversee the implementation and management of the water program. The WMT will be responsible for hazard and risk assessments, monitoring, testing, responding to notifications of water quality issues, and implementing control measures to mitigate risks associated with building water systems.

The team will include:

- **DGS Director of Life Safety and Quality Improvement:** This individual is responsible for creating and managing the Standard Operating Procedures (SOP) for water treatment, testing potable and non-potable water systems, and keeping them updated. They draft the Water Monitoring, Treatment, and Testing Risk Management Program document and provide guidance and

oversight over the program. They are responsive during emergencies when they receive notification of water quality issues.

- **DGS Office of Facilities Management Leadership:** These individuals ensure the proper implementation of the SOP for water treatment and testing of potable and non-potable water systems, compliance with the DGS Water Monitoring, Testing, and Treatment Risk Management Program, and responsiveness during emergencies when notifications of water quality issues are received.
- **DGS Building Facilities Manager:** This person oversees daily operations and water systems maintenance, monitors water quality during daily building rounds, and responds to emergencies or notifications of water quality issues. They are also the on-site point of contact for all building issues and concerns.
- **DGS Engineer:** Assists with the technical aspects of non-potable water system maintenance and monitors cooling towers and other non-potable water systems under their charge.
- **Water Treatment Contractor:** This contractor provides subject matter expertise on water treatment processes and ensures compliance with regulations.
- **Industrial Hygienist (IH) Contractor:** This contractor provides recommendations regarding testing, oversees any necessary remediation activities, and conducts testing of the various water systems as appropriate.
- **Maryland Department of Health Representative:** This person provides guidance on health risks related to waterborne pathogens, provides health department input on public communications, and ensures appropriate public health investigation of suspected cases and communication of infectious disease surveillance information to the rest of the DGS water management team.

4c

Building Water System Description

Each building will map its water system and incorporate this information into its building-specific Water Management Plan (WMP). The building-specific WMP will identify where *Legionella pneumophila* bacteria could grow (e.g., dead legs, low points, tie-ins, etc.).

Each building-specific plan should include a brief narrative description of the building's water systems and devices, as well as a flow diagram. Examples of narrative descriptions and flow diagrams are provided in Appendix C.

4d

Hazard and Risk Assessments

The Water Management Team will ensure that appropriate initial and ongoing hazard and risk assessments are conducted to identify potential hazards and the risks related to waterborne pathogens in the building's water systems. The hazard and risk assessments will include:

- **Identification of water system components** that could harbor pathogens (e.g., storage tanks, water heaters, dead legs, cooling towers).
- **Evaluation of water age, flow rates, and temperature control** to prevent stagnant water and conditions favorable to pathogen growth.
- **Ranking of risks** based on the likelihood of pathogen growth and the severity of potential exposure.
- **Identification of critical control points** for monitoring and implementing control measures.

The hazard and risk assessments will be updated annually or whenever significant changes occur to the building's water systems.

Each building-specific water management plan will include a diagram identifying areas where *Legionella pneumophila* could grow and spread. An example is in Appendix C.

4e

Control Measures

Control measures will be implemented based on the findings of the hazard and risk assessments to reduce the likelihood of waterborne pathogens.

These measures include:

- **Temperature Control:** To reduce the risk of *Legionella pneumophila* growth, maintain hot water temperatures at or above 120°F (49°C) and cold water temperatures below 68°F (20°C).
- **Stagnation Prevention:** Flush water systems as part of preventive maintenance to prevent stagnation and biofilm formation, particularly in areas with low water usage or dead legs due to low occupancy or no occupancy. This includes buildings that may be fully or partially occupied in some areas but not in others.
 - Non-occupied or low-occupancy buildings, flush potable water systems weekly.
- **Water Treatment:** Implement appropriate chemical treatments (e.g., chlorine, chloramine, or other biocides) to maintain safe water quality and prevent pathogen growth in potable and non-potable water systems.
- **Cooling Tower Management:** Follow ASHRAE guidelines for treating, cleaning, and disinfecting cooling towers and evaporative condensers. Monitor and treat these systems with biocides to prevent the growth of *Legionella pneumophila*.
- **Lead-Free Materials:** Ensure that pipes, fittings, and fixtures in contact with drinking water comply with EPA's regulations on using lead-free materials (40 CFR § 143 Subpart B).



4f

Monitoring and Testing Protocols

Water systems will be monitored regularly to ensure compliance with control measures and maintain safe water quality. Monitoring will include:

- **Temperature Monitoring: Daily**, the water temperature in hot and cold water systems should be checked by Facilities staff to ensure compliance with temperature control measures.
- **Disinfectant Residual Monitoring: Monthly** testing for disinfectant residuals should occur for potable and non-potable water systems with poorly controlled or uncontrolled levels. **Monthly** test, the chilled water supply, and return systems in the Power Plant for disinfectant residuals and pathogens. At a minimum, **quarterly**, Facilities staff will also test non-potable water systems

with well-controlled levels, including cooling towers in DGS-managed facilities other than the Power Plant.

- **Water Quality Monitoring:** Monitor water quality parameters (e.g., pH, hardness, turbidity, etc.) in potable water systems to assess the overall condition of the water system and the effectiveness of control measures. The frequency of monitoring is based on the building's size, type of water systems, and recommendations from water treatment and industrial hygienist contractors.
- **Flow Rate Monitoring:** Regular checks of flow rates to prevent stagnation in low-use areas of the building. Flow rates may vary by building and should be determined in consultation with a water treatment specialist, industrial hygienist, and/or plumbing contractors and based on industry standards for both potable and non-potable water systems.

Monitoring results should be documented in eMaint, the Computerized Maintenance Management System (CMMS), as part of the preventive maintenance plan outlined in each building's Water Management Plan. For buildings with well-controlled levels, the Water Management Team (WMT) should review the results annually to ensure ongoing compliance and identify potential issues. For buildings with uncontrolled or poorly controlled levels, the results will be reviewed as provided by the industrial hygienist and water treatment and testing contractors.

Appended to each building-specific plan will be a diagram showing monitoring activities at each control point. See Appendix C for an example.

4g

Testing Procedures

Testing is crucial for detecting potential contaminants or pathogens and ensuring that water systems meet regulatory standards. Note that *Legionella pneumophila* is the bacterium that causes Legionnaires' disease. It can be contracted when individuals inhale aerosolized water droplets containing the bacteria. Common sources of aerosolized water include showers, decorative fountains, hot tubs, and large HVAC systems with cooling towers.

It is essential to note that Legionnaires' disease is **not typically contracted** through drinking water or direct contact with water from standard bathroom sinks or drinking fountains, as these sources do not generate the fine mist necessary for inhalation of the bacteria. Therefore, the frequency of testing of some potable water systems may be less frequent than that of non-potable water systems.

Conduct testing according to the following schedule:

- **Legionella pneumophila Testing:** Conduct **quarterly** testing for *Legionella pneumophila* in high-risk systems, such as hot water systems and in any other areas identified in the hazard and risk assessments, as recommended in EPA regulations and guidance. Continuously monitor and test **annually** for *Legionella pneumophila* in non-high-risk systems.
- **Potable Water Testing: Weekly,** Facilities staff will test for disinfectant residuals (such as chlorine and pH).
- **Non-Potable Water Testing:** At least **quarterly**, test cooling towers in DGS-managed buildings and other non-potable water systems for microbial contamination (e.g., *Legionella pneumophila*, algae, and other pathogens), with additional tests as needed (e.g., if levels change or the system undergoes modification). **Monthly**, the chilled water supply and return to the Power Plant will be tested for disinfectant residuals, alkalinity, chlorine concentrations, chelant, sulfite, silica, total dissolved solids, iron, conductivity, and hardness. Chemicals will be added after testing and cleaning to stave off the growth of algae and other pathogens. A summary of testing frequency is found in the table below:

The water testing procedures must comply with the state and federal regulations, including EPA's National Primary Drinking Water Regulations (40 CFR § 141) and Maryland water quality standards (Md. Code Regs. 26.04.02.02).

4h

Documentation and Program Review

The Office of Facilities Management must maintain accurate records of all

Testing Frequency	Risk Level or Legionella Threshold	Testing Action
Weekly	Non-High Risk Systems	Disinfectant residuals (e.g. chlorine) anywhere the potable lines are located
Monthly	Uncontrolled/Poorly Controlled	Potable (until well-controlled); Legionella pneumophila only
Monthly	Uncontrolled/Poorly Controlled	Non-Potable (until well-controlled)
Monthly	High-Risk System	Non-Potable; Power Plant
Quarterly	Well Controlled	Non-Potable (including Cooling Towers in non-Power Plant buildings)
Quarterly	High-Risk Systems	Legionella pneumophila testing
Annually	Well-Controlled & Non-High Risk	Potable

monitoring, testing, and corrective actions to demonstrate compliance with regulatory requirements and track the performance of water management strategies. The following records should be maintained in accordance with industry-standard record retention schedules.

- **Hazard and Risk Assessments:** Document the hazard and risk assessment process, including identified hazards, the related risks, and the control measures implemented to mitigate them.
- **Monitoring Logs:** Water temperature records, disinfectant residuals, and other monitoring data.
- **Test Results:** All laboratory test results for *Legionella pneumophila*, microbial contamination, and water quality parameters.
- **Maintenance Records:** The dates of maintenance, description of work performed, technician/contractor's name, parts used and costs, invoices, photos of repairs or issues, and work orders.
- **Corrective Actions:** Detailed records of corrective actions taken in response to system failures or contamination.

5

Test Results Thresholds for *Legionella pneumophila* and other Pathogens

Legionella pneumophila Test Results

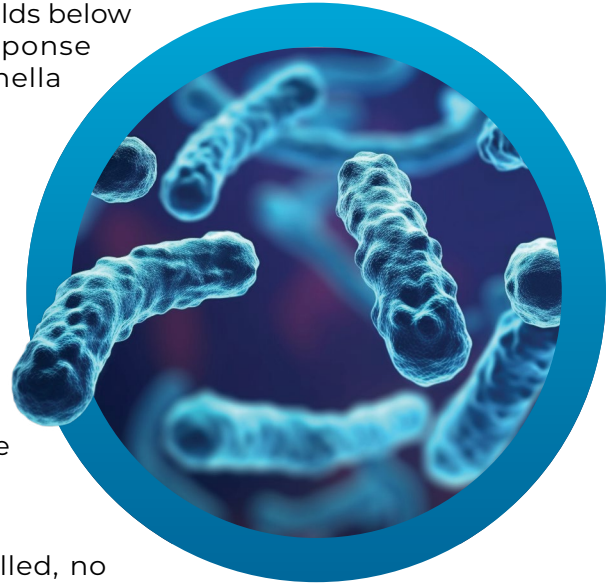
The CDC established the thresholds below to determine the level of response in the event of positive *Legionella pneumophila* test results.

For Potable Water:

- 0 to 0.9 CFU/mL- Well controlled, no treatment. Continue to monitor
- 1.0-9.9 CFU/mL- Poorly controlled, sanitize and flush the system
- Greater than or equal to 10 CFU/mL- Uncontrolled, sanitize and flush the system

For Non-Potable Water:

- 0 to 9 CFU/mL- Well controlled, no treatment. Continue to monitor
- 10-99 CFU/mL- Poorly controlled, sanitize and flush the system
- Greater than or equal to 100 CFU/mL - Uncontrolled, sanitize and flush the system



Other Waterborne Pathogen Test Results

There is no universal agreement on the acceptable levels of waterborne pathogens in drinking water. However, the EPA has set Maximum Contaminant Levels (MCLs) for certain contaminants in potable water, as shown below.

- Total Coliforms: Zero (note that the CDC allows for up to 100 CFUs/mL)
- Enteric Viruses: Zero

Other Water Test Results

The EPA has established acceptable levels of other pathogens, as indicated below.

- Chlorine residuals: optimally 0.02 parts per million (PPM) per MDE guidelines, can't exceed 4.0 PPM per MDE guidelines
- Lead: Zero parts per million (PPM)
- Copper: 1.3 parts per million (PPM) Note: this is a non-enforceable health goal
- Arsenic: 3 parts per million (PPM)
- Mercury: 1 part per million (PPM)
- Manganese: 50 parts per billion (PPB) or less
- Nickel: None established. Per EPA, it should be monitored.
- Turbidity should also be monitored. It is a measure of the cloudiness of water, which indicates water quality and filtration effectiveness.
 - Higher turbidity levels are often associated with higher disease-causing microorganisms such as viruses, parasites, and some bacteria.

6

Notification of Water Quality Issues

In the event of a positive result that indicates that the potable and/or non-potable water systems are poorly controlled or uncontrolled, reporting will occur as follows:

Internal

- The OFM Building Manager will notify the OFM Regional Manager & OFM Superintendent.
- The OFM Regional Manager will complete an Incident Report.
- The OFM Superintendent will notify the OFM Assistant Secretary and the OFM Director of Operations.
- If necessary, the Assistant Secretary will notify the DGS Secretary, Deputy Secretary, Director of Life Safety & Quality Improvement, Director of Communications, and the DGS Water Management Team.

External

- The Director of Communications will draft correspondence on behalf of the Secretary for the Agency heads. The communications team will manage all sensitive ongoing communication.
 - Communication with building occupants will be either:
 - Directly from DGS or
 - Via messaging sent to Agency leaders for dissemination
- Any other stakeholders (Governor's Office, Maryland Department of Health, etc.) will be advised as deemed necessary.
- The Director of Life Safety & Quality Improvement will notify the MOSH Enforcement Activities Program Coordinator.

7

Corrective Actions

If test results indicate contamination or non-compliance with water quality standards, the Water Management Team will implement the following corrective actions:

- **Immediate Notification:** Notify relevant authorities, building occupants, and stakeholders of the issue.
- **Remediation:** Depending on the severity of the issue, OFM will implement corrective actions such as system sanitation, flushing, other chemical treatment, or system shutdown.
- **Post-Remediation Testing:** Conduct follow-up testing to verify that corrective actions have resolved the issue and that the system is safe for use.



8

Training and Education

All personnel responsible for operating and maintaining water systems must receive regular training on the following topics:

- The principles and goals of the water management program
- Hazard and Risk Assessments
- Procedures for water monitoring, treatment, and testing
- How to respond to test failures or contamination incidents

Training will be conducted at least annually whenever new employees join the Water Management Team (WMT) or when significant changes are made to the water system.



9

Program Review and Audits

The Water Management Team will review the Program annually to evaluate its effectiveness and ensure continued compliance with applicable regulations. This review will include:

- **Evaluation of monitoring and testing results** to assess system performance.
- **Review hazard and risk assessments and control measures** to ensure they remain appropriate and effective.
- **Audits of documentation and recordkeeping** verify that all required records are being maintained.

Corrective actions will be taken to address any deficiencies identified during the review process, and the program will be updated as necessary.

10

Leased Facilities

The General Performance Specifications and Standards also require landlords to perform water testing, as outlined in Section 4g. *Legionella pneumophila* Testing shall follow the same allowable threshold levels outlined in Section 5.

Landlords are required to provide copies of the test reports to DGS Lease Compliance regularly, in compliance with these standards, and are expected to remediate any unsatisfactory testing results immediately. Landlords must communicate their plan, including building shutdowns, to their tenants and the DGS Lease Compliance Office. Following remediation, landlords must re-test and ensure levels are within the normal range before allowing building occupancy. Although not required by the lease, landlords are encouraged to use these guidelines to conduct Hazard and Risk Assessments and establish a Water Management Program for their buildings. At a minimum, the landlord must perform regular testing, remediate any unsatisfactory results, and communicate with tenants and the DGS Office of Real Estate Lease Compliance Unit.

Test reports shall be emailed every quarter within 10 business days of the test to DGS.LeaseCompliance@maryland.gov.

Standing Operating Procedure (SOP) for Water Monitoring, Testing, and Treatment Plan for DGS-Managed Facilities & Leased Spaces

Based on OSHA Standard 29 CFR 1910.141

1. Purpose

This SOP outlines the water treatment and testing plan for maintaining safe water systems in DGS-managed state facilities in compliance with OSHA Standard 29 CFR 1910.141. A section is included for leased spaces. The objective is to ensure that potable water is safe for human consumption and that non-potable water is appropriately managed to prevent potential health risks.

2. Scope

This procedure applies to all DGS-managed state facilities, including office complexes, warehouses, and facilities with potable and non-potable water systems. It addresses the treatment and testing of drinking water, cooling systems, and any water systems that could pose a health hazard.

3. Responsibilities

- **DGS Director of Life Safety and Quality Improvement:** This individual is responsible for creating and managing the Standard Operating Procedures (SOP) for water treatment, testing potable and non-potable water systems, and keeping them updated. They draft the Water Monitoring, Treatment, and Testing Risk Management Program document and provide guidance and oversight over the program. They are responsive during emergencies when they receive notification of water quality issues.
- **DGS Office of Facilities Management Leadership:** These individuals ensure the proper implementation of the SOP for water treatment and testing of potable and non-potable water systems, compliance with the DGS Water Monitoring, Testing, and Treatment Risk Management Program, and responsiveness during emergencies when notifications of water quality issues are received.
- **DGS Building Facilities Manager:** This person oversees daily operations and water systems maintenance, monitors water quality during daily building rounds, and responds to emergencies or notifications of water quality issues. They are also the on-site point of contact for all building issues and concerns.
- **DGS Engineer:** Assists with the technical aspects of non-potable water system maintenance and monitors cooling towers and other non-potable water systems under their charge.
- **DGS Office of External Affairs:** This office ensures timely and effective communications to relevant parties, responds to and guides press inquiries, is the point of contact with other agency communications entities, reviews and brand communications regarding notifications, and ensures timely agency response. It also assists in developing a communications template for incident notification.
- **Water Treatment Contractor:** This contractor provides subject matter expertise on water treatment processes and ensures compliance with regulations.

- **Industrial Hygienist (IH) Contractor:** This contractor provides recommendations regarding testing, oversees any necessary remediation activities, and conducts testing of the various water systems as appropriate.
- **Maryland Department of Health Representative:** This person provides guidance on health risks related to waterborne pathogens, makes recommendations when DGS notifies them of water quality issues, provides health department input on public communications, and ensures appropriate public health investigation of suspected cases and communication of infectious disease surveillance information to the rest of the overarching DGS water management team.

4. Procedure for Water Treatment

4.1 Potable Water Systems

- **Treatment:**
 - a. Facilities staff must monitor the municipal water supplied to the DGS-managed the building's system to ensure local water quality compliance. Monitoring the municipal water system includes, but is not limited to, remaining in contact with municipal water providers to receive updates and information regarding water issues, system repairs, shut-downs, outages, etc.
 - b. Facilities staff ensure water tanks are cleaned and disinfected at least annually.
 - c. If required, use corrosion inhibitors to prevent rust in pipes and maintain pH within safe limits (6.5 - 8.5 pH).
 - A corrosion inhibitor is typically required in commercial building pipes when the water quality is considered aggressive toward the pipe material. This includes high levels of dissolved minerals, low pH, or high temperature, which can accelerate corrosion. Additionally, the building may utilize older metal pipes that are more prone to rusting. In such cases, adding a corrosion inhibitor to the water system can significantly extend the lifespan of the pipes. The water treatment contractor can make the recommendation.
- **Preventive Measures:**
 - a. Create a recurring work order in the CMMS system per the Preventative Maintenance schedule
 - b. Ensure backflow prevention devices are correctly installed and functioning to avoid contamination of the potable water supply. They must also be monitored and maintained on a preventive maintenance schedule.
 - c. Maintain records in the CMMS of water treatment, chemical usage, dosage rates, and the type of chemicals used. Keep these records for at least five (5) years.
- **Recommendations:**

Store hot water at a temperature above 140°F (60°C). Maintain circulating hot water at a temperature above 120°F (49°C). Store and maintain circulating cold water at a temperature below the growth range most favorable to *Legionella pneumophila* 77–113°F (25–45°C). Note that *Legionella pneumophila* may grow at temperatures as low as 68°F (20°C).
- **Record Keeping:**

Keep a record of cleaning these systems for at least five years.

4.2 Non-Potable Water Systems

- **Treatment:**

- a. Create a recurring work order in the CMMS system in adherence with the treatment schedule B3.
- b. Treat non-potable water systems (e.g., cooling towers) with biocides at least monthly to prevent the growth of *Legionella pneumophila* and other pathogens.
- c. To remove sediment and biofilm from non-potable systems, conduct monthly routine flushing. In unoccupied buildings or building spaces, flushing should occur weekly.

- **Preventive Measures:**

- a. Ensure non-potable systems do not have any cross-connections with potable systems.
- b. Non-potable water used for industrial purposes, cooling towers, or irrigation should be clearly marked and separated from potable water.
 - MDE Standard Chapter 13: Nonpotable Water Systems, Section 1301.3 Signage Required advises that Facilities staff must put signs at the point of use for each outlet that read: "CAUTION: NON-POTABLE WATER-DO NOT DRINK!" We must also include a pictograph of a person drinking a glass of water with a slash through it on the signage. The signage must be in a contrasting color from the background to which it will be adhered.
- c. Ensure condensate pans are on a monthly preventive maintenance schedule, including dropping a chlorine tablet in them.

- **Record Keeping:**

Keep a record of cleaning these systems for at least five (5) years.

5. Procedure for Water Testing

5.1 Potable Water Testing

- **Frequency**

- a. Create a recurring work order in the CMMS system in adherence with the testing schedule B3.
- b. OFM staff will conduct baseline testing and then test potable water quarterly to semi-annually (for chlorine levels).
- c. Engage a contractor to test more frequently if water quality changes or an issue is detected in municipal water supplies.

- **Parameters to Test**

- a. **Chemical Testing:** Test for pH, chlorine residual, hardness, and other chemicals quarterly to semi-annually.
- b. **Physical Properties:** During daily rounds, Facilities staff must check turbidity, color, and odor to identify potential issues.

- **Notification:**

Immediately report any failures to meet safety standards to the Director of Life Safety and Quality Improvement, the OFM Region Superintendent, the OFM Director of Operations, the OFM Assistant Secretary, and building occupants. The OFM Assistant Secretary notifies the Office of the Secretary. The OFM Assistant Secretary notifies the Maryland Department of Health.

- **Corrective Action:**

Initiate corrective action plans if water quality falls below standard (e.g., flushing, retesting, increasing treatment, and other practical recommendations from the Contractor). The IH contractor, water treatment contractor, plumber, etc., will recommend the concrete steps based on the issue(s) found or reported.

- **Documentation**

- a. Maintain records of test results for a minimum of five (5) years.

5.2 Non-Potable Water Testing (Cooling Towers and Other Systems)

- **Frequency:**

- a. Engage a Contractor to test monthly for biological contaminants, such as *Legionella pneumophila* bacteria, and chemical stability.
- b. Check pH and biocide levels weekly to ensure the system is properly balanced.

- **Parameters Contractor to Test:**

- a. **Biological Contamination:** Test for *Legionella pneumophila* and other waterborne pathogens.
- b. **Chemical Stability:** To prevent scaling and corrosion, test the pH, total dissolved solids, alkalinity, hardness, and conductivity.

- **Corrective Action:**

Initiate corrective action plans if water quality falls below standard (e.g., flushing, retesting, increasing treatment, and other practical recommendations from the Contractor). The IH contractor, water treatment contractor, plumber, etc., will recommend the concrete steps based on the issue(s) found or reported.

- **Documentation:**

- a. Keep test results for at least five (5) years.
- b. If *Legionella pneumophila* is detected above the threshold, engage the Contractor to initiate corrective actions, such as hyper-chlorination, system shock treatments, or system shutdown for cleaning.

6. Leased Spaces by State Agencies

- The DGS Office of Real Estate (ORE) will ensure that the most updated DGS recommendations for water monitoring, testing, and treatment are included in new, replacing, succeeding, and superseding leases.
- If necessary, ORE will collaborate with the Lessor and escalate any issues to ensure that the lease provisions are applied to address tenant concerns raised by state agency occupants in leased office space.

7. Emergency Procedures

- **Contamination Events:**

- a. In the event of confirmed contamination (e.g., microbial or chemical), immediately stop using affected water systems.
- b. Notify the Director of Life Safety & Quality Improvement, the OFM Region Superintendent, the OFM Director of Operations, the OFM Assistant Secretary, and building occupants. The OFM Assistant Secretary notifies the Office of the Secretary. The OFM Assistant Secretary notifies the Maryland Department of Health.

- c. The DGS team, with the assistance of a licensed Industrial Hygienist, will investigate to determine the source of contamination and implement corrective measures.
- d. The IH Contractor will retest the water after remediation and confirm the system meets safety standards before returning it to use.
- **Water Main Breaks or System Failures:**
 - a. If a water main breaks or fails, conduct thorough system flushing and testing once repairs are completed before restoring water for consumption or use.

8. Training Requirements

- Any DGS personnel responsible for water treatment must undergo annual training on water safety, OSHA regulations, and emergency response procedures. Training may occur more frequently should standards or regulations change or are amended.
- OFM building personnel must be trained in the installed water treatment systems and be familiar with monitoring equipment, chemical handling, and safety protocols.

9. Records and Documentation

- Maintain detailed logs of all water treatment procedures, chemical usage, and water test results.
- Ensure records are available for audits and inspections, both internally and by regulatory bodies, for five (5) years.

10. Review and Update

- This SOP should be reviewed annually by the Director of Life Safety and Quality Improvement and OFM staff involved with the maintenance and monitoring of the systems when significant changes to the water systems occur.
- Update procedures to reflect new regulations or best practices in water treatment and testing.

Building-Specific Water Management Plan Template

Water management planning is essential because:

Health and Safety: Proper water management helps prevent the growth and spread of waterborne pathogens, such as *Legionella pneumophila* and other bacteria, that can cause serious health issues. Regular monitoring and testing ensure that the water supply is free from harmful microorganisms and chemical contaminants, thereby protecting the health of building occupants.

Regulatory Compliance: Commercial buildings are subject to various federal, state, and local regulations that dictate standards for water quality. Effective water management ensures compliance with these regulations, such as the Environmental Protection Agency's (EPA) Safe Drinking Water Act and standards set by the Occupational Safety and Health Administration (OSHA).

Operational Efficiency: Systematic water treatment and monitoring can enhance the efficiency of water systems by ensuring that they operate optimally. This includes maintaining appropriate water flow and temperature, which can help prevent problems such as scaling, corrosion, and biofilm formation in the plumbing systems.

Public Confidence and Building Reputation: Ensuring the building has a reliable and safe water system can enhance the building's reputation. It reassures tenants and visitors that DGS is committed to high health, safety, and environmental stewardship standards.

1. Introduction

Briefly describe the building (location, year built, square footage, floors, etc.) and its primary uses/tenants.

2. Building Water System Description

- **Overview:** Describe the building's water system, including potable and non-potable systems.
- **System Map:** Insert a detailed diagram of the water system, highlighting areas prone to water stagnation or potential growth of pathogens. (see Appendix C of the DGS Water Management Program for Water Monitoring, Treatment, and Testing)

3. Hazard and Risk Assessment

- **Identify Hazards and Risks:** List potential hazards and the associated risks related to the water system, focusing on areas where pathogens are likely to thrive.
- **Evaluation:** Discuss the assessment of water age, flow rates, and temperature controls to minimize risks.
- **Risk Ranking:** Prioritize the risks based on the likelihood of occurrence and potential impact.

Use the Risk Assessment checklist in Appendix B2.

4. Control Measures

- **Temperature Controls:** Specify the temperature settings in specific equipment required to inhibit the growth of pathogens.
- **Stagnation Prevention:** Outline procedures to prevent water stagnation.
 - Include flushing sinks, faucets, and toilets in daily rounds for low occupancy areas and weekly for higher-occupancy areas.
 - Create preventive maintenance work orders to track and monitor maintenance.
- **Water Treatment:** Describe the chemical treatments and other strategies to maintain water quality.
 - Include schedules.
 - Create work orders for scheduled treatments.
- **Cooling Tower Management:** Provide guidelines for the regular treatment and maintenance of cooling towers to ensure optimal performance.
 - Include schedules for treatments
 - Create work orders for scheduled treatments

Use the Control Measures Checklist in Appendix B2

5. Monitoring Protocols

- **Temperature Monitoring:** Detail how and when Facilities staff will check temperatures.
- **Disinfectant Levels:** Outline the schedule and methods for testing disinfectant levels in the water.
- **Water Quality Monitoring:** Define the parameters for regular water quality assessments based on the DGS Water Management Program for Water Monitoring, Treatment, and Testing.
- **Flow Rate Monitoring:** Describe how Facilities staff will monitor flow rates to prevent stagnation.

6. Testing Procedures

- **Legionella pneumophila Testing:** Insert schedules for Legionella pneumophila testing.
 - Create a work order for scheduled testing.
- **Potable Water Testing:** Identify specific equipment and systems and insert protocols for testing potable water for microbial contamination and chemical levels, based on the DGS Water Management Program for Water Monitoring, Treatment, and Testing.
 - Create a work order for scheduled testing.
- **Non-Potable Water Testing:** Identify specific equipment and systems and insert procedures for testing non-potable systems based on the DGS Water Management Program for Water Monitoring, Treatment, and Testing.
 - Create a work order for scheduled testing.

7. Documentation and Program Review

- **Record Keeping:** Explain how and where records of tests, monitoring data, and corrective actions will be maintained.
- **Review Schedule:** Review the water management plan and make necessary adjustments whenever changes to the building's water system occur or equipment is replaced.

8. Communications Plan

- Outline the strategy for communicating water management issues to building management, tenants, and relevant authorities based on the DGS Water Management Program for Water Monitoring, Treatment, and Testing .

9. Training and Education

Describe the training program for building staff responsible for implementing the water management plan.

APPENDIX B2

Hazard and Risk Assessment Checklist for Building-Specific Water Management

This checklist is designed to help identify, evaluate, and control risks related to waterborne pathogens in water systems, including *Legionella pneumophila*, *Pseudomonas*, and other pathogens that thrive in stagnant or poorly controlled water conditions. It is a practical tool for assessing and minimizing the risk of pathogen growth in water systems, helping ensure safe water for all building occupants.

1. Identifying Water System Components

Identify water system components that could harbor pathogens and create a flow chart marking the areas where waterborne pathogens may grow or exist. This includes evaluating the following:

Storage Tanks

Are storage tanks cleaned and inspected regularly?

Frequency of cleaning _____ Date Cleaned:

Frequency of inspection _____ Date Inspected:

Are they kept at appropriate temperatures to prevent pathogen growth (cold water below 68°F [20°C], hot water above 140° [60°C])?

Water Heaters

Are hot water temperatures maintained at 140°F (60°F) or above to kill potential pathogens?

Is there evidence of sediment buildup that could foster bacterial growth?

Dead Legs (unused pipe sections)

Are there any dead legs or outlets in the water system that are infrequently used?

Can dead legs be removed or minimized?

Cooling Towers

Are cooling towers cleaned and disinfected regularly?

Frequency of cleaning _____ Date Cleaned:

Frequency of inspection _____ Date Inspected:

Are they appropriately treated with biocides to prevent bacterial growth?

Showerheads, Faucets, and Water Outlets

Are outlets cleaned and disinfected on a regular schedule?

Frequency of cleaning _____ Date Cleaned:

Frequency of disinfection _____ Date Disinfected:

Is water flushed from outlets after periods of stagnation?

2. Evaluation of Water Age, Flow Rates, and Temperature Control

Assess conditions that could lead to water stagnation or poor water quality:

Water Age

Is there any potential for water to stagnate for extended periods in the system?

Are water turnover rates sufficient to prevent stagnant conditions?

Flow Rates

Are flow rates sufficient to prevent stagnation in all parts of the system?

Are there areas of low or no flow that need to be addressed?

Note those areas:

Temperature Control

Are hot water systems maintained at a temperature of at least 140°F (60°C) throughout the system?

Are cold water systems kept below 68°F (20°C)?

Is there an effective mixing of hot and cold water to avoid lukewarm temperatures where pathogens could grow?

3. Risk Ranking

Rank risks based on the likelihood of pathogen growth and the severity of potential exposure:

Likelihood of Pathogen Growth

What is the risk level for each component based on the likelihood of stagnation, poor temperature control, or inadequate disinfection?

Low Risk: Components with controlled temperature, regular maintenance, and good flow.

Medium Risk: Components with occasional stagnation or temperature fluctuations.

High Risk: Components prone to stagnation or poor temperature control (e.g., dead legs, cooling towers, infrequently used outlets).

Severity of Potential Exposure

How severe is the exposure if pathogens were to grow in the system?

Low: Limited human exposure or low-risk environments.

Medium: Environments where vulnerable populations may be exposed (e.g., hospitals, nursing homes).

High: High-risk areas with susceptible populations or frequent water aerosolization (e.g., public showers).

4. Identification of Critical Control Points

Identify critical points in the system where monitoring and intervention are essential:

Temperature Monitoring

Are temperature sensors installed at critical points (e.g., storage tanks, distribution systems)?

Are temperature readings recorded and monitored for fluctuations?

Water Flow Monitoring

Are flow meters installed to detect low-flow or stagnant areas?

Are automated flushing systems in place for infrequently used outlets?

Disinfection Control

Are disinfection measures (e.g., chlorine, UV, biocides) applied consistently at critical points?

Is the effectiveness of disinfection monitored regularly (e.g., residual chlorine levels)?

Regular Maintenance and Inspections

Are there routine maintenance schedules for cleaning storage tanks, cooling towers, and other system components?

What is the plan for flushing the system and testing water quality?

5. Control Measures and Actions

Define corrective actions for risk mitigation:

- Establish action thresholds for each building's water temperature, flow rate, and biocide levels.
- Implement a maintenance plan for removing dead legs and addressing poorly maintained areas.
- If pathogen growth is detected, refer to the Water Monitoring, Treatment, and Testing SOP for immediate action (e.g., thermal disinfection, chemical treatment, and increased flushing).

APPENDIX B3

Control Measures Checklist for Building-Specific Water Management

This checklist should be used as a regular audit tool to ensure that all control measures are being effectively implemented and maintained following the DGS Water Management Program. Adjustments should be made based on specific building needs and regulatory updates.

Temperature Control

- Hot water temperatures maintained at or above 120°F (49°C)
- Cold water temperatures maintained below 68°F (20°C)
- Daily checks to verify temperature settings

Stagnation Prevention

- Weekly flushing of water systems in non-occupied or low-occupancy buildings
- Regular flushing and maintenance of all water systems, particularly in low-usage areas
- Inspect exposed pipes to ensure they are properly insulated

Water Treatment

- Use of chlorine, chloramine, or other biocides as required
- Regular treatment of potable and non-potable water systems to maintain safe water quality
- Compliance with EPA's regulations on lead-free materials (40 CFR § 143 Subpart B) for all new installations and repairs

Cooling Tower Management

- Quarterly cleaning and disinfection of cooling towers
- Annual cleaning of evaporative condensers/coils
- Semi-annual treatment with biocides to prevent Legionella growth

Monitoring Protocols

- Daily monitoring of water temperatures
- Monthly testing for disinfectant residuals in poorly controlled or uncontrolled systems
- Annual testing of potable water systems for disinfectant residuals
- Weekly water quality monitoring (pH, hardness, and turbidity)
- Assessment of flow rates to avoid stagnation, tailored to building size and water system type

Testing Procedures

- Quarterly Legionella testing for high-risk systems except the Power Plant
- Annual testing of potable water systems for microbial contamination
- Monthly testing of non-potable water systems in the Power Plant for contamination

Documentation and Program Review

- Maintain accurate records of hazard and risk assessments, monitoring data, and test results.
- Keep detailed logs of all corrective actions taken
- Review the water management plan annually to update practices and protocols

Communication Plan

Notify relevant DGS personnel and authorities if there are water quality issues.

Maintain open lines of communication with the building tenants regarding water safety.

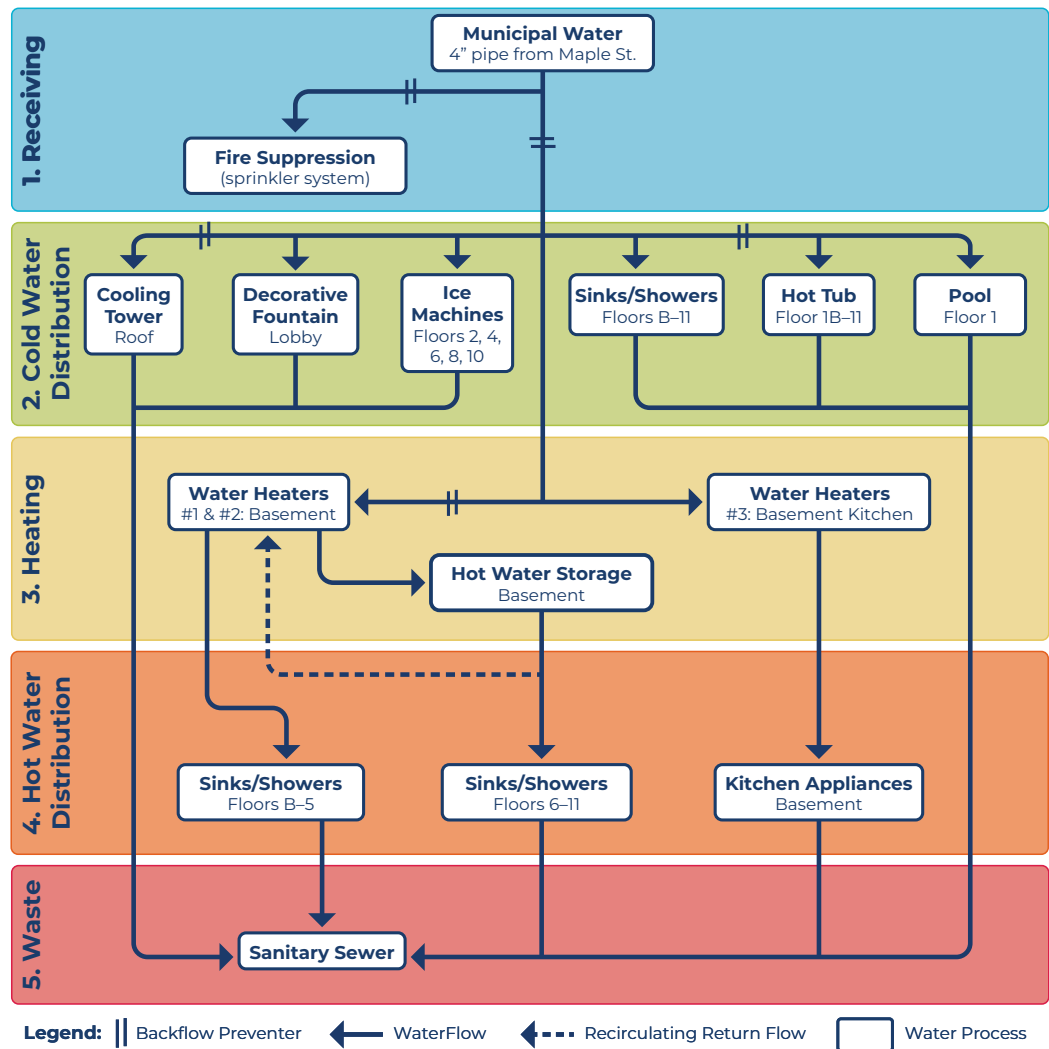
Training and Education

Annual training for staff on water management principles and procedures



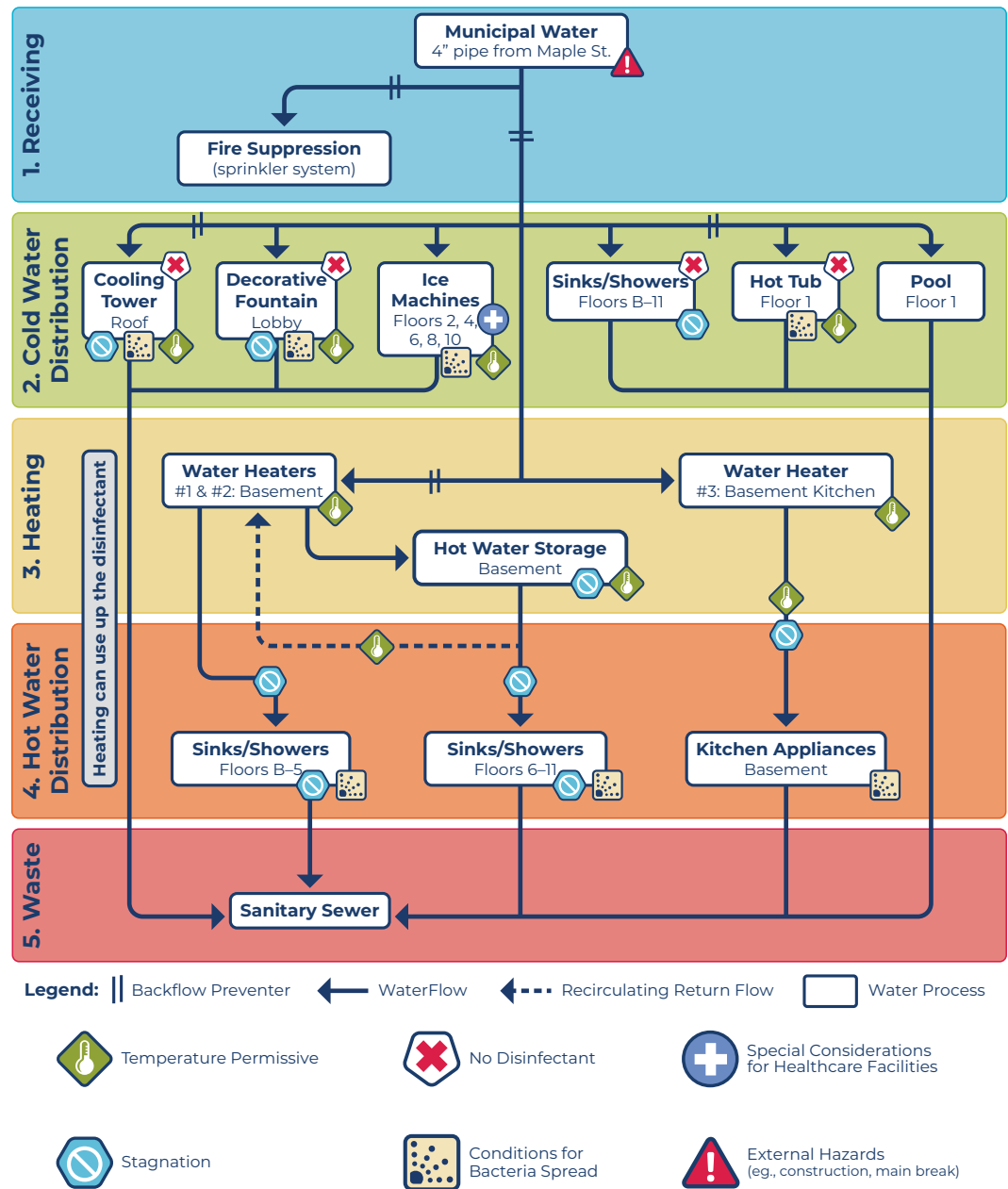
Sample Flow Chart for Building's Water System

In addition to developing a written description of each building's water systems, you should develop a process flow diagram. Below is an example of a process flow diagram for a commercial building. Note that this diagram doesn't need to be as detailed as the building's plan. It's best if all team members can easily understand the process flow diagram.



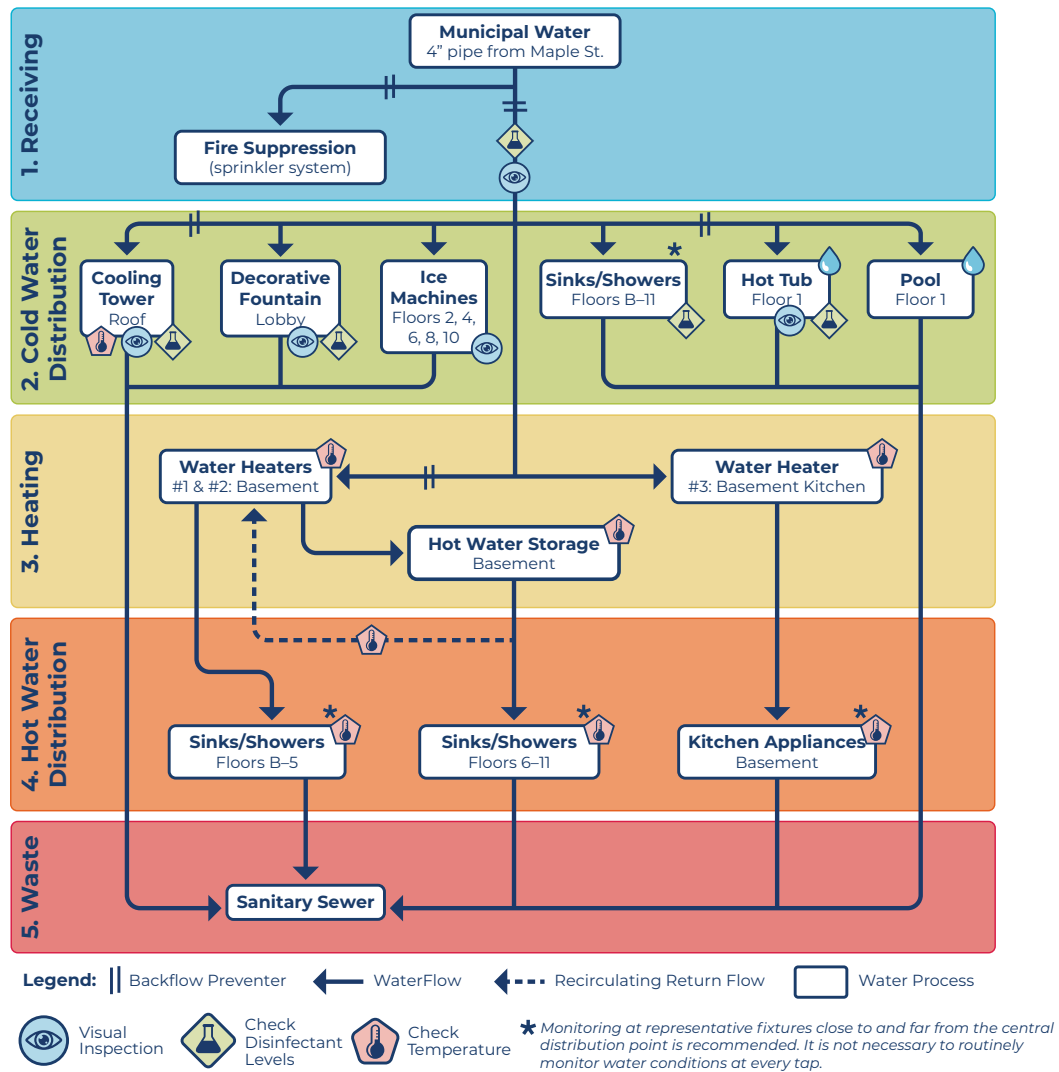
Sample Flow Chart to Identify Areas Where Legionella Could Grow and Spread

After developing the process flow diagram, identify potential hazardous conditions that could occur in the building's water system. The diagram should include locations and types of hazardous conditions that are expected from the building. Each potentially hazardous condition should be addressed individually with a control point, measure, and limit.



Sample Flow Chart to Monitor Control Measures

Control measures and limits should be established for each control point. The types of monitoring that could occur at different locations within the building's water system should be designed like the sample flow chart below.





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