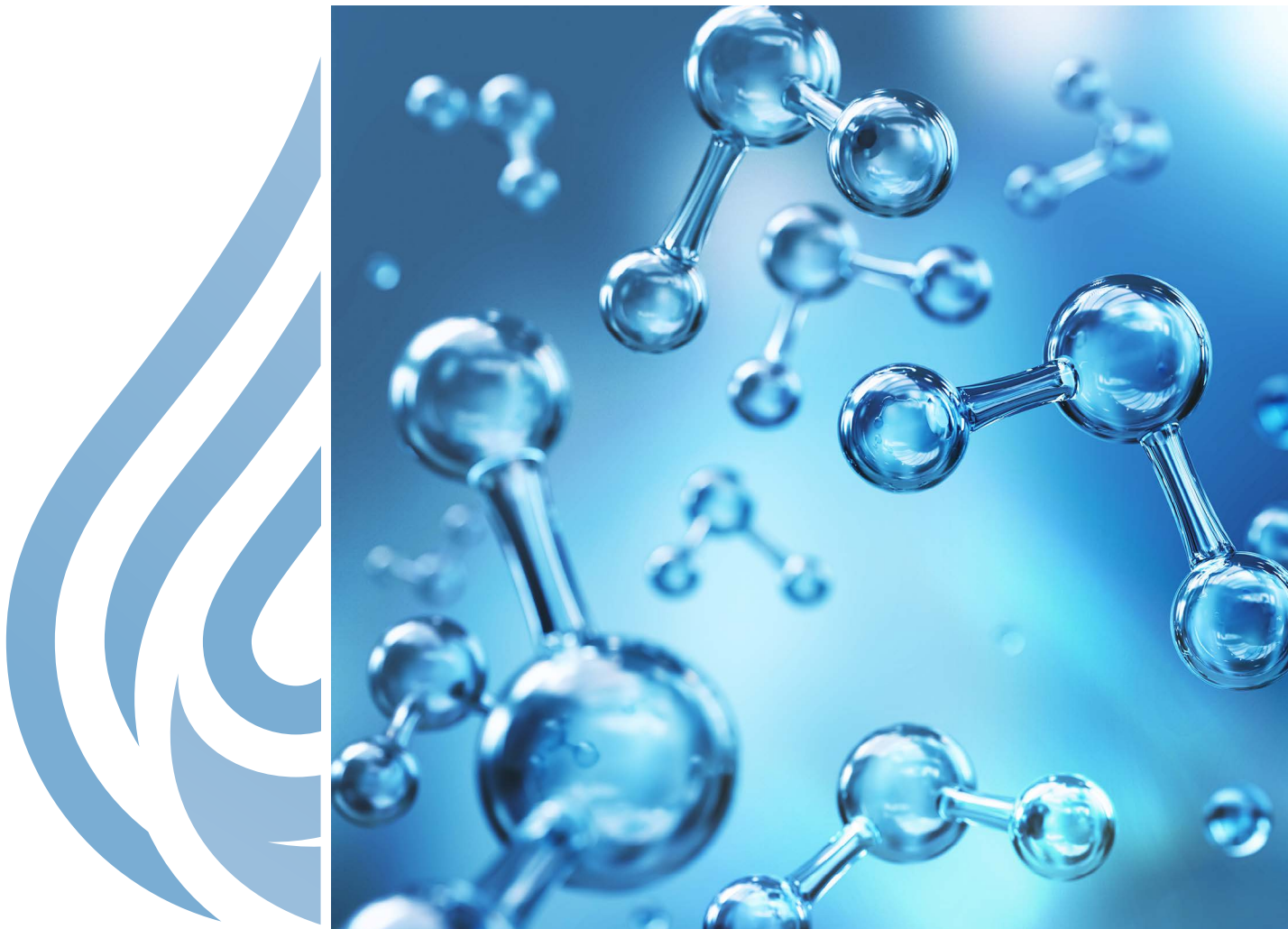




Water Management Program (WMP)

Evaluation Tool





Overview

A water management program (WMP) uses risk management principles to identify critical areas of concern for bacterial growth within a building's water system and outlines processes to address any issues found through routine monitoring to reduce the risk of infections including legionellosis.



The WMP should be a detailed written document that describes a comprehensive set of policies and procedures a facility will use to reduce the risk of growth and spread of *Legionella* and other opportunistic pathogens within its building water system(s) and other devices at high risk for *Legionella* growth and spread. Each WMP should be building-specific and describe processes and procedures for seven (7) key elements in accordance with [ASHRAE Standard 188](#) and the CDC WMP Toolkit [Legionella: Developing a Water Management Program](#).

The following evaluation tool provides a standardized approach to determine if a facility's WMP sufficiently comports with

the seven (7) key elements of ASHRAE Standard 188 and the CDC WMP Toolkit. The evaluation is structured to yield either a "Sufficient" or "Insufficient" determination from a rubric-based scoring system. Nine main criteria must be present for a WMP to be sufficient.

There are eight separate sections to score, and each section is given a section point value of either "0" or "1", which is created using the section's total sub-section points. A WMP can generate a maximum total of seven section points. *NOTE: Section 3 will not generate a section point since it only references one of the nine criteria, and no questions are associated with the criterion.*

The sum of the total possible section points and the criteria points will provide a plan's final score and determination (sufficient or insufficient). Sixteen is the maximum score a facility's WMP can produce. A score <8 represents an insufficient final determination.



This tool is developed with a specific focus on *Legionella* consistent with ASHRAE Standard 188, however, it is important for buildings to consider an all-hazards approach to water management. ASHRAE Standard 514 provides recommendations for physical, chemical, and microbial hazards other than *Legionella*.

An [Excel version of this tool](#) is available to assist with scoring and is hosted on [CSTE's website](#).



WMP Evaluation Instructions:

- Use this tool to evaluate WMPs for both non-healthcare and healthcare facilities. First complete the Facility/Building Water System and Devices Checklist.
- All nine (9) main criteria with a double asterisk (**) must be present for a WMP to be "sufficient." This encompasses all seven (7) elements of the ASHRAE standard plus additional emphasis on including water schematic in element 2 (describe building water system) and a validation method in element 7 (ensure WMP is running effectively). If one of the nine criteria is missing, a total of "0" points should be added to the final score (page 16). If all nine criteria are present, a total of "9" points should be added to the final score. Write the number "1" adjacent to "Yes" to indicate if ** criteria are included in the WMP (otherwise leave blank or write "0").
- Please assign 0 or 1 point for each sub-section item (note that items related to *Legionella* sampling are worth more points). Note the green shaded sections are only for healthcare facilities. Enter the total number of possible sub-section points earned on the provided line at the end of each section (except Section 3) to quickly calculate total section points for non-healthcare facilities and healthcare facilities, respectively. A section point of "1" can be achieved by scoring \geq to half of the total earned sub-section points (X) added from the number of sub-section items (Y), i.e., if $X \geq Y/2$, then the total section point = 1.
- If an element appears to be only partially satisfied, **reviewers should use their best judgment regarding points and provide the facility feedback** on what is needed to fully satisfy the element.
- Refer to the Appendices for examples of what a building water system schematic should look like, how *Legionella* sampling results could be interpreted, and what to look for in a building water system description.
- A "sufficient" WMP determination is achieved by reaching a total score of ≥ 8 points.

WMP documentation should include:

- A listing of the WMP Team, including names, titles, contact information, and roles and responsibilities specific to the WMP.
- Names of entities/persons responsible for taking appropriate corrective action when identified control limits are exceeded.
- A description of the water system, including written general summary narrative and a process flow diagram that identifies key pieces of water processing equipment, especially any aerosol-generating devices (e.g., hot tubs, decorative fountains, cooling towers, etc.). The description should indicate age, maintenance schedule, location of maintenance logs, operating manuals, and vendors used to maintain equipment.
- Sample collection logs and results.
- Cooling towers, hot tubs, decorative fountains, and other devices with the potential to grow and spread *Legionella* (as specified in ASHRAE Standard 188) should have a device-specific WMP and should follow the design, operation, maintenance, and control principles provided in [ASHRAE Guideline 12](#).
- Locations identified in the system where key water quality parameters are measured, what the control limits are, and how they are applied.
- Confirmatory procedures, including verification steps to show that the program is being followed as written, and validation to show that the program is effective.
- Documentation/reports on actions taken if control limits are exceeded (e.g., daily, or weekly meetings to report results of inspections and detailed entries in a logbook or computer spreadsheet).

Facility/Building Water System and Devices Checklist

Does the facility have any of the following water system components or devices?	Yes	No
Domestic Water Systems (Cold and Hot)		
Backflow prevention assemblies/devices (i.e., between incoming supply and connections to non-potable water systems)	<input type="checkbox"/>	<input type="checkbox"/>
Cold-water holding tanks or cisterns	<input type="checkbox"/>	<input type="checkbox"/>
Water heaters (i.e., boiler, heat exchanger, instantaneous heater, conventional water heater, solar heating)	<input type="checkbox"/>	<input type="checkbox"/>
Hot water storage tanks	<input type="checkbox"/>	<input type="checkbox"/>
Centrally located thermostatic mixing valves	<input type="checkbox"/>	<input type="checkbox"/>
Point of use thermostatic mixing valves	<input type="checkbox"/>	<input type="checkbox"/>
Recirculation loop/return circulatory pumps	<input type="checkbox"/>	<input type="checkbox"/>
Side-stream plumbing equipment (e.g., expansion tanks, hammer arrestors, by-pass lines)	<input type="checkbox"/>	<input type="checkbox"/>
Filtration and Treatment		
Supplemental disinfection systems	<input type="checkbox"/>	<input type="checkbox"/>
Water softener/conditioner systems	<input type="checkbox"/>	<input type="checkbox"/>
Whole-building strainers or filters (i.e., prior to water being distributed throughout the building)	<input type="checkbox"/>	<input type="checkbox"/>
In-line and/or point-of-use filters (i.e., carbon-filters, reverse osmosis, 0.2-micron microbial filters)	<input type="checkbox"/>	<input type="checkbox"/>
Additional non-chemical treatment systems (e.g., UV treatment)	<input type="checkbox"/>	<input type="checkbox"/>

Continued on following page.

Facility/Building Water System and Devices Checklist

Continued from previous page.

Does the facility have any of the following water system components or devices?	Yes	No
Domestic Water Outlets		
Sink faucets (<i>i.e., manual, automatic</i>)	<input type="checkbox"/>	<input type="checkbox"/>
Showerheads	<input type="checkbox"/>	<input type="checkbox"/>
Shower wand/hoses	<input type="checkbox"/>	<input type="checkbox"/>
Bathtubs	<input type="checkbox"/>	<input type="checkbox"/>
Drinking fountains	<input type="checkbox"/>	<input type="checkbox"/>
Emergency eyewash stations	<input type="checkbox"/>	<input type="checkbox"/>
Emergency showers	<input type="checkbox"/>	<input type="checkbox"/>
Ice machines (<i>including those with internal and/or external carbon filters</i>)	<input type="checkbox"/>	<input type="checkbox"/>
Dishwashers	<input type="checkbox"/>	<input type="checkbox"/>
Beverage dispensers	<input type="checkbox"/>	<input type="checkbox"/>
Water conservation devices (<i>i.e., electronic faucets, flow restrictors</i>)	<input type="checkbox"/>	<input type="checkbox"/>
Landscape irrigation or sprinkler systems	<input type="checkbox"/>	<input type="checkbox"/>
Other Water Systems/Devices		
Emergency fire protection systems	<input type="checkbox"/>	<input type="checkbox"/>
Open- and closed-circuit cooling towers or evaporative condensers	<input type="checkbox"/>	<input type="checkbox"/>
Ornamental fountains or other water features	<input type="checkbox"/>	<input type="checkbox"/>
Whirlpools, spas, or hot tubs	<input type="checkbox"/>	<input type="checkbox"/>
Misters, atomizers, or air washers	<input type="checkbox"/>	<input type="checkbox"/>
Centrally installed or portable humidifiers	<input type="checkbox"/>	<input type="checkbox"/>
On-site water reuse systems (<i>i.e., rainwater harvesting, stormwater runoff, gray water, steam condensate, irrigation process water, etc.</i>)	<input type="checkbox"/>	<input type="checkbox"/>
Other:	<input type="checkbox"/>	<input type="checkbox"/>
Health Care Equipment and Devices		
Ventilators and other respiratory care equipment that uses water for humidification, filling, or cleaning (<i>i.e., CPAP or BiPAP machines, oxygen concentrators, nasal irrigation devices</i>)	<input type="checkbox"/>	<input type="checkbox"/>
Respiratory aerosolized care and associated masks, tubing, etc. (<i>i.e., nebulizers, inhalers</i>)	<input type="checkbox"/>	<input type="checkbox"/>
Hydrotherapy/birthing tubs	<input type="checkbox"/>	<input type="checkbox"/>
Dental unit water lines	<input type="checkbox"/>	<input type="checkbox"/>
Dialysis units	<input type="checkbox"/>	<input type="checkbox"/>

Jurisdictions can use this tool to assess WMPs as part of regulatory programs or outbreak investigations.

Facilities can also independently use this tool as part of proactive efforts to determine the quality of their WMP and implement revisions to improve it. This tool is not intended to determine if a facility is effectively controlling *Legionella* growth and spread in their water systems or devices. Owners and operators are responsible for verifying and validating their water management program.

During a public health case or outbreak investigation, the public health authority having jurisdiction may consider additional information or weigh findings differently when evaluating a water management program.

Additionally, owners and operators are responsible for following all rules and regulations of their jurisdiction.



Contact information for local, state, or regional support:



	Non-Healthcare Facility	Healthcare Facility
Sufficient	≥8	≥8
Insufficient	<8	<8

Facility Name / Identification #:

Facility Address:

Date WMP Developed:

Consultant Used to Develop WMP (if applicable):

Date of WMP Evaluation:

Reviewer:

Determination:

Sufficient/Insufficient # of ** Criteria Included:



WMP document contains a description of the WMP Team**

Yes ☐



The water management program team (WMP team) should be a multidisciplinary group comprised of people with a variety of skills and authority to effectively develop and implement the WMP. The team should primarily be comprised of facility staff, but could also include outside experts/consultants, as needed. If a consultant was used to develop the WMP, they should be identified above. For healthcare facilities, the team should include someone who understands facility accreditation standards and someone with expertise in infection control.

Key personnel:

☐ Facilities administration/building management 0 / 1

☐ Facilities engineering/maintenance department 0 / 1

Healthcare Facilities Only

WMP team includes:

☐ Personnel with expertise in infection prevention 0 / 1

☐ Personnel with an understanding of facility accreditation standards 0 / 1



People with appropriate backgrounds who might be a part of the WMP team include building manager/administrator; maintenance/engineering staff; health and safety officer /industrial hygienist; and consultants with expertise in water treatment, microbiology and/or environmental health. For healthcare facilities, additional team members include infection preventionist and clinician with expertise in infectious disease. See [CDC's HAI WMP Checklist](#) for additional personnel.

Continued on following page.

KEY



What to look for



Member roles and responsibilities:

Team members are identified who can satisfy the following:

- | | |
|---|-------|
| <input type="checkbox"/> Implement the WMP and direct corrective action as needed | 0 / 1 |
| <input type="checkbox"/> Maintain working knowledge of the facility water system(s) | 0 / 1 |
| <input type="checkbox"/> Identify system control locations and control limits | 0 / 1 |
| <input type="checkbox"/> Monitor and document program performance | 0 / 1 |



The WMP should clearly list the roles and responsibilities of each team member as well as an individual responsible for program oversight. Based on the job descriptions provided, determine if there are team members who can monitor and document activities, and if there are team members who have the authority to take corrective action when identified control limits are exceeded.

Non-healthcare facility total sub-section points earned:

___ / 6 total possible* section items

Healthcare facility total sub-section points earned:

___ / 8 total possible* section items

Section 1 Total Section Points:

0 / 1

Non-healthcare facility total sub-section points $\geq 3 = 1$; $< 3 = 0$.

Healthcare facility total sub-section points $\geq 4 = 1$; $< 4 = 0$.



2 Describes Building Water System(s)



WMP document contains a text description of the building water systems**

Yes ☐



The written narrative should provide a readily understandable description of how water is received and processed (e.g., treated), stored, heated, cooled, recirculated, and delivered to end-point uses throughout the facility. The description should also reflect any recent changes made to the facility's water system. Per ASHRAE Standard 188, the following water systems should be included in a water management program: potable water systems; cooling towers and evaporative condensers; whirlpool spas, decorative fountains and other water features; aerosol-generating misters, atomizers, air washers, and humidifiers.

Description contains the following information, as applicable:

☐ The supply of potable water to the facility

0 / 1



The public water supplier should be identified or if water is supplied by its own source, the source (e.g., groundwater vs. surface water) and treatment should be specified. The type of disinfection used by the supplier (e.g., chlorine, chloramine, UV) should be identified. The number and location of water entry points to the facility should be identified. Basic incoming water quality characteristics (e.g., disinfectant residual, pH, temperature) should also be described.

☐ Cold water distribution system

0 / 1



Description of the type of piping material, age, cold water storage, and the number and location of cold-water outlets in the facility. Identification of any flow restrictors, aerators, showerheads, wand attachments, drinking fountains, etc.

☐ Hot water distribution system

0 / 1



Description should indicate if hot water is recirculated. There should also be a description of the type of piping material, age, and type and extent of any insulation used to help maintain temperature. The description of the building water system should specify the number of hot water outlets and location of any thermal mixing valves within the facility.

☐ Water heating method, storage, (if present) mixing valves, and number of heating units

0 / 1

Continued on following page.

KEY



What to look for

2 Describes Building Water System(s)



Description contains the following information, as applicable:

Continued from previous page.



Information on the age, model, and manufacturer of the heating units including the type of heating (e.g., electric, gas, oil), capacity of the units, and temperature settings.

- | | |
|--|-------|
| <input type="checkbox"/> Description and level of any secondary treatment provided to either the hot or cold-water system such as water softening, filtering, and/or supplemental disinfectant | 0 / 1 |
| <input type="checkbox"/> <i>Building/facility does not have secondary water treatment</i> | 0 / 1 |
| <input type="checkbox"/> Point of use outlets (cold and hot water) | 0 / 1 |
| <input type="checkbox"/> <i>Building/facility does not have point of use outlets</i> | 0 / 1 |
| <input type="checkbox"/> Hot tubs or whirlpool spas, decorative fountains, ice machines, or other water devices connected to the building water system | 0 / 1 |
| <input type="checkbox"/> <i>Building/facility does not have any of the above features</i> | 0 / 1 |
| <input type="checkbox"/> Cooling towers | 0 / 1 |
| <input type="checkbox"/> <i>Building/facility does not have cooling towers</i> | 0 / 1 |
| <input type="checkbox"/> Equipment with water spraying function connected to the building water system (e.g., irrigation systems, fire suppression, emergency eye wash stations) | 0 / 1 |
| <input type="checkbox"/> <i>Building/facility does not have these systems or devices</i> | 0 / 1 |
| <input type="checkbox"/> Description of any water or energy conservation systems or devices for the building that impact water storage, distribution, or use | 0 / 1 |
| <input type="checkbox"/> <i>Building/facility does not have these systems or devices</i> | 0 / 1 |



Certain types of water conservation devices can create areas of stagnation, low or absent biocide residual, or temperatures favorable for *Legionella* growth. These can include rainwater collection, greywater (recycled water) storage, solar water heaters, cisterns, or any device that may store or distribute water separately from the primary building water system.

Continued on following page.

2 Describes Building Water System(s)



Description contains the following information, as applicable:

Continued from previous page.

Healthcare Facilities Only

- | | |
|---|-------|
| <input type="checkbox"/> Description of medical procedures or devices that may expose patients to water droplets, such as hydrotherapy tubs, respiratory therapy equipment, humidification devices and dental unit water lines | 0 / 1 |
| <input type="checkbox"/> <i>Facility does not have these procedures or devices</i> | 0 / 1 |
| <input type="checkbox"/> Description of areas with patients more vulnerable to infection (e.g., bone marrow transplant units, oncology floors, or intensive care units) | 0 / 1 |
| <input type="checkbox"/> <i>Facility does not have these areas</i> | 0 / 1 |
| <input type="checkbox"/> Description of clinical support areas (including dietary and central supply) which could contribute to spread by aspiration. Include all components and devices that can contribute to <i>Legionella</i> growth and spread | 0 / 1 |
| <input type="checkbox"/> <i>Facility does not have these areas</i> | 0 / 1 |

Non-healthcare facility total sub-section points earned:

___ / 10 total possible* section items

Healthcare facility total sub-section points earned:

___ / 13 total possible* section items

**Only one point is possible in groupings where there is an italicized "does not have" option.*

Section 2 Total Section Points:

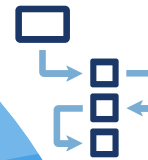
0 / 1

Non-healthcare facility total sub-section points $\geq 5 = 1$; $< 5 = 0$.

Healthcare facility total sub-section points $\geq 6.5 = 1$; $< 6.5 = 0$.



3 Flow Diagram



WMP contains process flow diagrams that graphically depict building water system and sampling locations**

Yes ☐



The flow diagram should provide an understanding of how water is supplied to the facility/building, how it is processed, distributed, and used throughout the facility/building. The diagram, and accompanying text, should include all areas of potential concern, such as dead ends/low flow areas, cold and hot water storage tanks, treatment processes, and cooling towers. In addition, any devices in the facility that can create aerosols, such as decorative fountains or hot tubs, should also be included and detailed. The diagram should also include sampling points identified in elements 3 and 4. See Appendix 1 for an example of a building water system process flow diagram.

KEY



What to look for

4 Identifies Areas at Highest Risk for *Legionella* Growth/Spread



WMP identifies areas and equipment within the facility/building water systems where conditions could promote the growth/spread of *Legionella*** Yes ☐



Based on the water system description and flow diagram, the WMP should specify the chemical and physical conditions of each area and all equipment identified at risk of *Legionella* growth. Key areas to be identified are areas within the facility/building water system prone to low water flow and/or stagnation; areas of sediment accumulation; backflow preventer installations; areas of potential cross connections; hot or cold-water storage; water lines with temperatures in range to support *Legionella* growth; and low disinfectant levels.

WMP document identifies potentially hazardous areas including:



WMP documents should clearly identify areas and equipment within the facility/building water system where conditions could promote the growth of *Legionella*. The type of hazardous condition identified at each location, (e.g., tepid water temperature, water stagnation, and/or lack of disinfectant) should be described. Note that pH should be monitored as it will impact disinfectant efficacy.

- | | |
|---|-------|
| <input type="checkbox"/> Hot and/or cold-water storage tanks | 0 / 1 |
| <input type="checkbox"/> Building/facility does not have water storage tanks | 0 / 1 |
| <input type="checkbox"/> Water conditioning equipment such as filtration units, water softeners, etc. | 0 / 1 |
| <input type="checkbox"/> Building/facility does not have any of the above equipment | 0 / 1 |



Water filters and secondary treatment systems need appropriate maintenance and support to ensure they do not become areas where *Legionella* can grow. Water filters (including internal and external carbon filters)/softeners in particular can create conditions where *Legionella* can grow and can deplete disinfectant. Supplemental disinfection occurs when adding disinfectant to a water system on site; this may require permitting for potable water systems. Supplemental disinfection systems for potable water should always be automated and require a trained operator based on regulatory requirements.

- | | |
|---|-------|
| <input type="checkbox"/> Areas where water may be stagnant for periods of time including dead legs in water piping, wings or rooms that are vacant, temporarily unused or have been repurposed, and/or areas with variable temperature or disinfectant level indicating increased water age | 0 / 1 |
|---|-------|

Continued on following page.

KEY



What to look for

4 Identifies Areas at Highest Risk for *Legionella* Growth/Spread



WMP document identifies potentially hazardous areas including:

Continued from previous page.

- | | |
|--|-------|
| <input type="checkbox"/> Areas with consistently low or no residual disinfectant | 0 / 1 |
| <input type="checkbox"/> Areas where temperatures can support <i>Legionella</i> growth (e.g., hot water should be stored above 140°F, hot water in circulation should not fall below 120°F, and cold water should be stored and circulated below 77°F) (e.g., point of use fixtures, return loops) | 0 / 1 |
| <input type="checkbox"/> Fixtures of concern (i.e., sinks, faucets, hoses, shower heads, aerators, flow restrictors, shower wands, or other fixtures that aerosolize water) | 0 / 1 |
| <input type="checkbox"/> Water fixtures or devices within and associated with the facility that are conducive to <i>Legionella</i> growth and spread (e.g., cooling towers, decorative fountains, ice machines, sinks/showers, and/or hot tubs) | 0 / 1 |
| <input type="checkbox"/> Building/facility does not have these fixtures or devices | 0 / 1 |

Healthcare Facilities Only

- | | |
|--|-------|
| <input type="checkbox"/> Based on an Infection Control Risk Assessment, identification of water exposure in areas that routinely house high-risk patients. Examples include immune system disorders, systemic malignancy, diabetes, renal failure, or hepatic failure. | 0 / 1 |
| <input type="checkbox"/> Potential exposures of patients to water in these areas are identified | 0 / 1 |



CDC's Water Infection Control Risk Assessment (WICRA) for Healthcare Settings provides a step-by-step guide for WMP team members to evaluate water sources, modes of transmission, patient susceptibility, and patient exposure. See [Water Infection Control Risk Assessment \(WICRA\) for Healthcare Settings \(cdc.gov\)](https://www.cdc.gov/wicra/). WMP should identify medical devices that use water (e.g., respiratory therapy devices), and indicate that they are being maintained and cleaned per manufacturer recommendations.

Continued on following page.

4 Identifies Areas at Highest Risk for Legionella Growth/Spread



WMP document identifies potentially hazardous areas including:

Continued from previous page.

Cooling Tower Systems

- ☐ Cooling tower system design, configuration, and placement are consistent with ASHRAE Guideline 12 and CDC recommendations 0 / 1
- ☐ *Building/facility does not have cooling tower system(s)* 0 / 1



The description includes appropriate back flow prevention devices at makeup water and other cross connections, automated water treatment system(s) (e.g., automated anti-corrosion, anti-scale, and disinfectant addition and monitoring systems), high-efficiency drift eliminators, location relative to building air intakes (at least 25 feet away), and water recirculation during intermittent use. System piping is designed to avoid stagnation or dead legs in all associated equipment, components, devices, heat exchangers, chillers, pumps, bypasses, and equalizer(s).

Non-healthcare facility total sub-section points earned:
___ / 8 total possible* section items

Healthcare facility total sub-section points earned:
___ / 10 total possible* section items

**Only one point is possible in groupings where there is an italicized "does not have" option.*

Section 4 Total Section Points: 0 / 1

Non-healthcare facility total sub-section points $\geq 4 = 1$; $< 4 = 0$.

Healthcare facility total sub-section points $\geq 5 = 1$; $< 5 = 0$.



5 Establishes Control Measures and Monitoring Plan



Control point locations in building water system are identified with corresponding control limits**

Yes ☐



Control locations should be identified throughout the building system. They should be strategically chosen to appropriately address each potentially hazardous condition. At each hazardous location identified in section 3, clear control limits such as maximum/minimum water temperature and disinfectant concentrations must be established to ensure conditions are not conducive to the growth of *Legionella* bacteria. For example, the hot water heater located in the basement of the facility is considered a hazard, and to control this hazard a temperature control limit is established that is required to be monitored at a set frequency. If the temperature is found to be outside that limit a protocol is in place to reestablish the required limit (see Section 5 below). Water heater type (e.g., gas or electric) and size respective to the facility should be considered.

☐ Specifies control point locations, parameter to be measured (e.g., temperature, pH, disinfectant level), and acceptable level or range of each parameter

0 / 1

☐ Specifies control limits (quantitative or qualitative) for each control location

0 / 1



The monitoring locations should correspond to the identified hazardous areas. In addition, monitoring locations should be representative of the entire facility. If the facility has multiple hot water zones/loops, there should be monitoring locations for each zone/loop. Monitoring of water quality parameters should be measured throughout the system to identify changes that may lead to *Legionella* growth, such as a drop in chlorine levels. Sampling should be performed at representative outlets (e.g., bathroom sinks, room sinks, kitchen, etc.) throughout the facility.

☐ Specifies the frequency each location is to be monitored (e.g., daily, weekly, monthly, quarterly)

0 / 1



In general, there are three types of hazard controls that should be discussed in the WMP: (1) water age and stagnation, which can lead to reduction of water temperature and disinfectant level and promotes bacterial growth; (2) disinfectant levels, which can be reduced through heating, storage and/or filtering; and (3) thermal control of premise plumbing water.

☐ Provides a sampling plan in response to scheduled/unanticipated changes in building water system

0 / 1

Continued on following page.

KEY



What to look for

5 Establishes Control Measures and Monitoring Plan



An established sampling plan and monitoring frequency in response to scheduled or unanticipated changes in water quality such as: changes in treatment by municipal water utilities (e.g., seasonal chlorine burns), a water main break or boil water advisory in the facility/building service area; failure of water distribution equipment in the facility; regularly scheduled maintenance of water related equipment; and renovations, construction, or installation of new equipment to the facility/building water system. The plan may include water quality parameter measurements or *Legionella* testing.

Cooling Tower Systems

- ☐ Cooling tower system design, configuration, and placement are consistent with ASHRAE Guideline 12 and CDC recommendations

0 / 1

- ☐ *Building/facility does not have cooling tower system(s)*

0 / 1



Manufacturer recommendations for cleaning and disinfection prior to commissioning, before startup, when idling, and after shutdown should be followed. Cooling tower systems should be operated at the lowest possible water temperature, and below the most favorable *Legionella* growth range (77-113 °F, 25-45 °C), if possible. Addition and monitoring of anti-corrosion, anti-scale, and disinfectant products should be automated. Inventory of treatment products should be monitored and maintained. Water quality parameters such as disinfectant residual, pH, temperature, and conductivity should be monitored on a regular basis. Measurement frequency should be based on performance of the [WMP](#) or *Legionella* performance indicators for control. Frequency should be adjusted according to the stability of performance indicator values (e.g., the measurement frequency should be increased if there is a high degree of measurement variability and/or measurements are outside of established control measures). Low-flow pipe runs, bypasses, auxiliary equipment, and dead legs should be flushed at least weekly. Operating times should be balanced among cooling towers to prevent stagnation when multiple cooling towers or cells exist. Automated blowdown (intentional discharge of system water and replacement with supply water) should be implemented to maintain system water quality. Filtration should be considered to reduce the level of suspended solids in the cooling water based on system factors (e.g., cooling tower location, particle load). Off-line disinfection and cleaning should be performed at least annually. Cooling towers should be monitored for water service disruptions and plans should be developed to respond accordingly. Testing for *Legionella* should be considered in accordance with the [routine testing module](#) of the CDC Toolkit. Site-specific log sheets, test procedures, service reports, and test results should be maintained on-site.

Continued on following page.

5 Establishes Control Measures and Monitoring Plan



Non-healthcare facility total sub-section points earned:

___ / 5 total possible* section items

Healthcare facility total sub-section points earned:

___ / 5 total possible* section items

**Only one point is possible in groupings where there is an italicized "does not have" option.*

Section 5 Total Section Points:

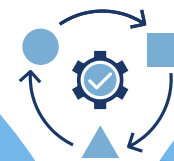
0 / 1

Non-healthcare facility total sub-section points $\geq 2.5 = 1$; $< 2.5 = 0$.

Healthcare facility total sub-section points $\geq 2.5 = 1$; $< 2.5 = 0$.



6 Establishes Corrective Actions When Control Limits Are Not Met



WMP describes corrective action process when control limits are determined to be out of range**

Yes ☐



WMP should clearly describe the actions that will be taken in response to measured limits being out of range. These actions are necessary to bring the control measure(s) back into an acceptable range to prevent *Legionella* growth. The corrective actions should be facility/equipment specific and include the details of the action. For example, if “flushing” is identified as a corrective action to address a disinfectant residual control limit excursion, it should indicate how, where, and for how long the flushing will proceed. Control limits should follow the recommendation in ASHRAE Guideline 12. Additional steps are indicated if control limit failures recur. Additional resources can be found at: [Toolkit for Control of Legionella in Common Sources of Exposure | CDC](#).

☐ Contains a plan for identifying and addressing areas of the facility/building where water may have become stagnant

0 / 1

As appropriate, WMP also addresses:

☐ Elimination of any identified pipework that is no longer in use or has become isolated from the regular flow of water in the facility/building’s water distribution system (e.g., dead legs)

0 / 1

☐ *Building/facility does not have such pipework*

0 / 1

☐ Procedures for allowing the reoccupation of rooms or closed off areas of the facility/building through a combination of water fixture flushing and monitoring (e.g., start-up/shut down procedure)

0 / 1

☐ *Building/facility does not have vacant rooms or closed off areas*

0 / 1

☐ An action plan for addressing high risk aerosolizing water features (e.g., decorative fountains)

0 / 1

☐ *Building/facility does not have high risk aerosolizing water features*

0 / 1



The water features could be scheduled for removal, repurposed, or placed on a frequent schedule for monitoring. Control of *Legionella* can be based on limiting not only its growth, but also by minimizing opportunities for people to be exposed. Please note that per ASHRAE Guideline 12, decorative water features should not be operated on healthcare facility premises.

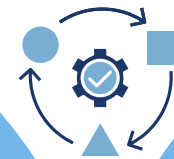
Continued on following page.

KEY



What to look for

6 Establishes Corrective Actions When Control Limits Are Not Met



As appropriate, WMP also addresses:

Continued from previous page.

- | | |
|---|-------|
| <input type="checkbox"/> Identifies person(s) responsible for taking corrective action(s) and time frame for action(s) | 0 / 1 |
| <input type="checkbox"/> Identifies notification procedures when control limits are exceeded and corrective action is required | 0 / 1 |
| <input type="checkbox"/> Procedures are identified if control limits are not met despite corrective action (e.g., steps to take if flushing, for example, does not resolve issue) | 0 / 1 |
| <input type="checkbox"/> Includes an environmental <i>Legionella</i> testing program | 0 / 6 |



Although not specifically required by ASHRAE Standard 188, *Legionella* monitoring through routine testing is more effective for validating the effectiveness of WMP control measures than water quality parameter measurement alone. It may be particularly valuable in healthcare and other facilities that serve a vulnerable population (e.g., assisted or senior living facilities). If *Legionella* monitoring is not being performed it should be strongly encouraged. *Note this element is worth six (6) points to emphasize the importance of this activity.*

Non-healthcare facility total sub-section points earned:

___ / 13 total possible* section items

Healthcare facility total sub-section points earned:

___ / 13 total possible* section items

**Only one point is possible in groupings where there is an italicized "does not have" option.*

Section 6 Total Section Points:

0 / 1

Non-healthcare facility total sub-section points $\geq 6.5 = 1$; $< 6.5 = 0$.

Healthcare facility total sub-section points $\geq 6.5 = 1$; $< 6.5 = 0$.



7 Ensures Program is Running as Designed and is Effective



WMP has a process for verifying that it is being implemented as designed**

Yes ☐

- ☐ Specifies the use of logbooks, or other types of documentation, to identify monitoring and any appropriate response actions

0 / 1



WMP should contain examples/templates of the document/log being used to collect the information, to include the date, time, location, and person performing the specific activity

- ☐ Requires documentation of analysis results and observations and comparison to control limits

0 / 1

- ☐ Describes and requires documentation of specific actions taken if control limits are exceeded

0 / 1

- ☐ Describes and requires documentation of additional actions to be taken if control limits are found to be repeatedly exceeded at any monitoring location

0 / 1



WMP has a procedure for validating that WMP is effectively controlling the hazardous conditions throughout the building water systems**

Yes ☐

If *Legionella* monitoring is being performed:

- ☐ Describes the number of samples to be collected, sampling locations, sample collection protocols and analytical method used. The number of samples provides an appropriate representation of the building's water systems

0 / 1



Representative sampling points throughout the facility/building with an emphasis on samples collected from incoming water, water leaving the water heating system, from a midpoint of the hot water distribution, and a distal point in the system. In warmer climates where cold-water temperatures are permissive for *Legionella*, sampling of cold-water systems may also be beneficial. There should be an adequate number of samples (e.g., 1-3 sampling points would not be adequate for a complicated facility/building). The description should include how samples are collected (e.g., flushed vs. first draw sample), the method used for sample analysis (e.g., culture, PCR, immunochromatography), and the analyte(s) detected (e.g., *L. pneumophila* serogroup 1, all *L. pneumophila*, all *L. species*). Preferably Legionella analysis is performed by an accredited laboratory.

Continued on following page.

KEY



What to look for



If *Legionella* monitoring is being performed:

Continued from previous page.

- ☐ Contains a testing frequency (e.g., monthly, quarterly, annually) appropriate for the risk of legionellosis in the facility/building (e.g., annual sampling may not be adequate to validate WMP performance) 0 / 1
- ☐ WMP indicates what events, in addition to routine testing, trigger additional testing (e.g., water service disruptions, before returning unoccupied areas to service, associated cases of legionellosis) 0 / 1
- ☐ Contains context for interpreting results both from the percentage of positive samples found, location(s) of *Legionella* detection, the quantified number of *Legionella* in each sample, the trends over time, and the type of *Legionella* detected 0 / 1
- ☐ **Building/facility does not perform** 0 / 1



Interpretation of routine *Legionella* testing should consider a multifactorial approach including the number of samples found to be positive, location(s) of detection, the concentration of *Legionella* found, changes in *Legionella* detections, and concentrations over time in accordance with CDC guidance on interpretation of results: [Routine *Legionella* Testing: A multifactorial approach to performance indicator interpretation \(CDC.gov\)](#) (Appendix 2.)

Healthcare Facilities Only

- ☐ WMP incorporates facility's routine surveillance for healthcare-associated *Legionnaires'* disease as part of the validation protocol 0 / 1



While clinical surveillance for *Legionnaires'* disease is not an appropriate method of WMP validation, it is important that healthcare facilities are able to rapidly identify legionellosis cases and use appropriate testing and reporting practices.

Continued on following page.

7 Ensures Program is Running as Designed and is Effective



Non-healthcare facility total sub-section points earned:

___ / 8 total possible* section items

Healthcare facility total sub-section points earned:

___ / 9 total possible* section items

**Only one point is possible in groupings where there is an italicized "does not have" option.*

Section 7 Total Section Points:

0 / 1

Non-healthcare facility total sub-section points $\geq 4 = 1$; $< 4 = 0$.

Healthcare facility total sub-section points $\geq 4.5 = 1$; $< 4.5 = 0$.



8 Documents and Communicates WMP Implementation Activities



WMP is embodied in a written document that provides all the key elements of the program in a clear and concise manner so that it can be communicated and followed by WMP team**

Yes ☐

☐ Specifies communication between team member and facility/building management on results and actions taken while implementing WMP and who is responsible for communicating information to other entities

0 / 1

☐ Specifies that WMP is, at a minimum, reviewed annually and when there have been changes to the facility/building water system, including the addition of new equipment/features that could generate aerosols

0 / 1



The WMP should be a living document that is reviewed and updated as necessary, minimally on an annual basis. All WMP implementation activities should be clearly documented, including testing, results, corrective action(s) taken, and communication between team members and facility/building management. The WMP should be comprehensive, containing all the elements from above, specifically those listed on page 2.

Non-healthcare facility total sub-section points earned:
___ / 2 total section items

Healthcare facility total sub-section points earned:
___ / 2 total section items

Section 8 Total Section Points: 0 / 1

Non-healthcare facility total sub-section points $\geq 1 = 1$; $< 1 = 0$.

Healthcare facility total sub-section points $\geq 1 = 1$; $< 1 = 0$.



KEY



What to look for

FINAL

WMP Scoring:



Section 1 Total Section Points:

Describes Water Management Program Team

0 / 1



Section 2 Total Section Points:

Describes Building Water System(s)

0 / 1



Section 4 Total Section Points:

Identifies Areas at Highest Risk for *Legionella* Growth/Spread

0 / 1



Section 5 Total Section Points:

Establishes Control Measures and Monitoring Plan

0 / 1



Section 6 Total Section Points:

Establishes Corrective Actions When Control Limits Are Not Met

0 / 1



Section 7 Total Section Points:

Ensures Program is Running as Designed and is Effective

0 / 1



Section 8 Total Section Points:

Documents and Communicates WMP Implementation Activities

0 / 1

Notes

Non-Healthcare Facility

Healthcare Facility

Sufficient

≥8

≥8

Insufficient

<8

<8

All nine (9) main criteria with a double asterisk (**) must be present for a WMP to be "sufficient."

Total Criteria Points** (0-9): _____ +

Total Section Points (0-7): _____ =

TOTAL SCORE: _____

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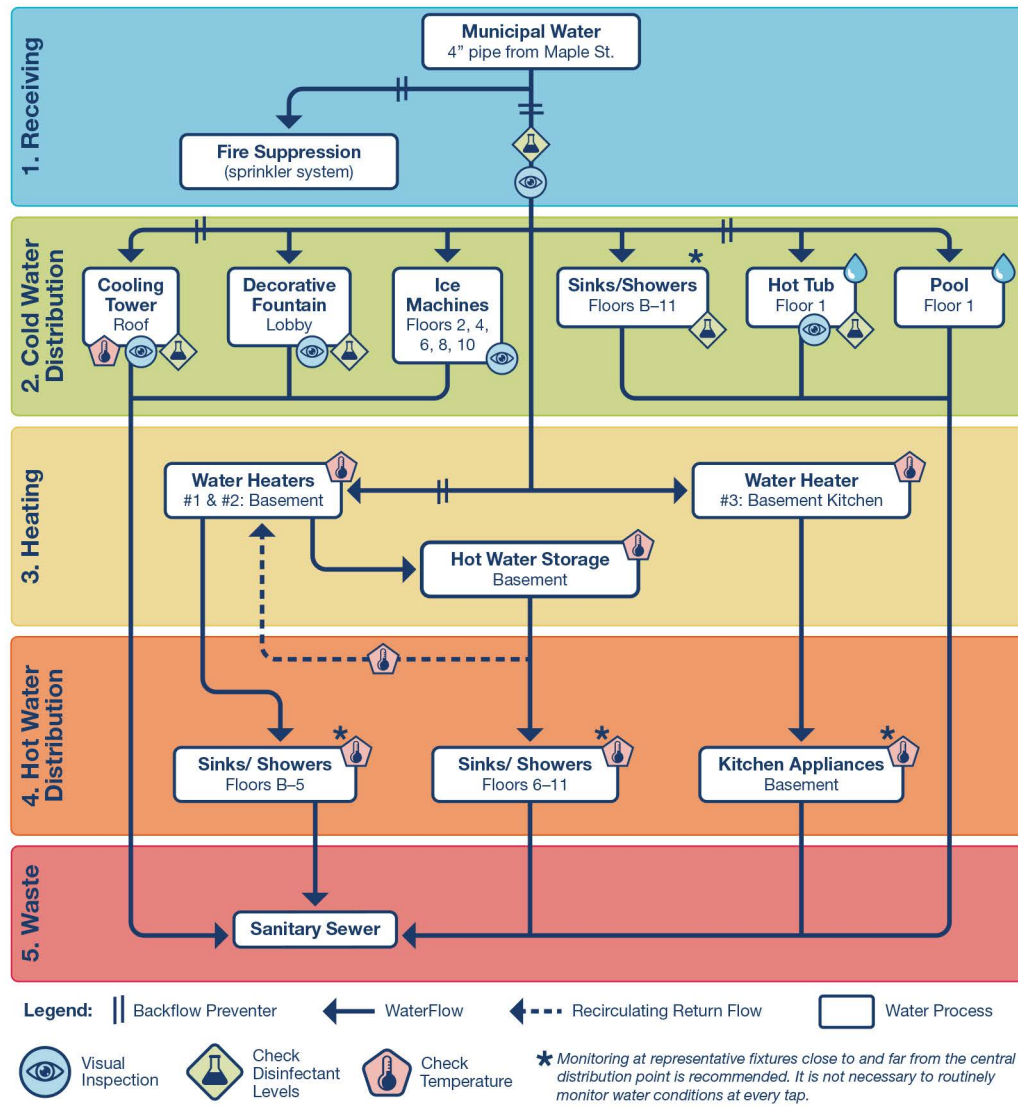
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For questions about this tool, please contact:

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Appendix 1: Building Water System Schematic Example



Disclaimer: Example content is provided for illustrative purposes only and is not intended to be relevant to all buildings.

Reference: ASHRAE 188: *Legionellosis: Risk Management for Building Water Systems* June 26, 2015. ASHRAE: Atlanta. www.ashrae.org

Note: In addition to whatever you do to prevent Legionella, state and local regulations may exist that govern the design, construction, operation, and maintenance of public aquatic facilities (e.g., pools and hot tubs). See CDC's Model Aquatic Health Code at www.cdc.gov/mahc/index.html for helpful information, but this document is not a substitute for state and local regulations.

Note: Heterotrophic plate counts can aid in your monitoring program as an indicator of water quality, but should not be used as a control measure.

Source: <https://www.cdc.gov/legionella/downloads/toolkit.pdf>

Appendix 2: Interpreting Routine *Legionella* Testing

Figure 1. Routine *Legionella* testing: A multifactorial approach to performance indicator interpretation^{*a}

Concentration indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled			
≥10 CFU/mL [†] in potable water	1.0–9.9 CFU/mL in potable water	Detectable to 0.9 CFU/mL in potable water	No <i>Legionella</i> detected in a single round of testing	No <i>Legionella</i> detected in multiple rounds of testing	No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species
OR ≥100 CFU/mL in non-potable water	OR 10–99 CFU/mL in non-potable water	OR Detectable to 9 CFU/mL in non-potable water			

Change in concentration over time indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled			
100-fold or greater increase in concentration (e.g., 0.05 to 5 CFU/mL)	10-fold increase in concentration (e.g., 0.05 to 0.5 CFU/mL)	<i>Legionella</i> concentration steady (e.g., 0.5 CFU/mL for two consecutive sampling rounds)	No <i>Legionella</i> detected in a single round of testing	No <i>Legionella</i> detected in multiple rounds of testing	No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species

Extent indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled			
Detection in multiple locations AND a common source location [‡]	Detection in a common source location that serves multiple areas	Detection in a few of many tested locations within a water system	No <i>Legionella</i> detected in a single round of testing	No <i>Legionella</i> detected in multiple rounds of testing	No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species
OR Detection across many locations within a water system	OR Detection in more than one location within a water system				

Type^a of *Legionella* (species and serogroup) associated with Legionnaires' disease:

Highly Associated	Less Associated
<i>L. pneumophila</i> serogroup 1; Non-Lp1 <i>L. pneumophila</i> ; Presence of multiple different <i>Legionella</i> species or serogroups	Any non- <i>pneumophila</i> <i>Legionella</i> species including "blue-white" fluorescent <i>Legionella</i>

^{*}This figure is intended for use during routine testing only. Test results are performance indicators and are not a measure of risk of human illness. This figure is not intended for use if a building or device is associated with Legionnaires' disease (LD) cases or an outbreak.

^aSee "Routine testing for *Legionella*" for guidance regarding suggested response activities. Comparable results may lead to different suggested response activities when other factors are considered (e.g., if there is evidence of poorly controlled growth at a healthcare facility).

^aConsidering the type of *Legionella* identified along with other *Legionella* testing performance indicators provides a clearer picture of water system control than the results of any single indicator. For example, facility owners and operators may consider implementing immediate interventions for a healthcare facility with: A. detectable but <10

colony-forming units per milliliter (CFU/mL), B. non-Lp1 *Legionella pneumophila*, C. observed at steady concentrations, but D. detected at multiple distal locations including a central water heater.

[†]Concentrations expressed as CFU/mL are for test results generated by traditional spread plate culture methods. If other test methods are used, consult testing lab or manufacturer instructions for appropriate interpretation.

[‡]Common source location examples include water heaters, hot water returns, storage tanks, and cooling tower basins.

^aIf a facility has a history of associated LD cases, then sequencing isolates obtained during routine testing may provide performance indicators regarding outbreak strain persistence (if that strain is detected).



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Source: <https://www.cdc.gov/legionella/downloads/Control-Toolkit-Routine-Testing-Figure-1.pdf>

Appendix 3: What to Look for in a Building Water System Description

Modified from: CDC *Legionella* Environmental Assessment Form

<https://www.cdc.gov/legionella/outbreak-toolkit/>

General Facility Information:

- Age of the facility; date of construction
- Type of facility (e.g., *public/private; healthcare/non-healthcare; office building; hotel/motel*)
- Number of buildings at the facility that share a water system
- Number of stories/levels within each building at the facility
- Occupancy numbers
- Description of any recent renovations and/or additions to the facility

Water Supply Source:

- Provided onsite or by a public water system
- If provided by a public water system:
 - Name of water supplier
 - Public water supply source: groundwater or surface water
 - How the water supply is disinfected (e.g., *chlorine, chloramine, ozone, UV etc.*)
- If an onsite source
 - Type of treatment and disinfection used

Premise Water System Description:

- Presence and number of any cold-water storage tanks
- Any additional treatment of incoming water:
 - Water filtration units
 - Water softening units
 - Supplemental disinfection units
 - Type of system (e.g., *chlorine, ozone, chloramine, etc.*)
 - Water system served (e.g., *cold, hot, or both*)

Hot Water System Description:

- Type of water heating system used
 - Instantaneous heaters without hot water storage
 - Heater/boiler with hot water storage
- Whether or not hot water is recirculated
- Number of heating systems present
- If hot water storage tanks are used, the number and capacity of units
- Use of thermostatic mixing valves
 - Number and location

Other Water System Components:

- Cooling towers and evaporative condensers
 - Manufacturer
 - Capacity
 - Type of disinfectant/chemical treatment used
 - Service provider used and frequency of service
 - Location of device (e.g., *rooftop, ground, adjacent building, etc.*)
- Ice machines
- Backflow prevention devices
 - Number, location and testing schedule
- Hot tubs/whirlpools/hydrotherapy spas
 - Type of filter and disinfectant used
- Decorative fountains
 - Location and type (if any) of filtration and disinfection used
- Irrigation system
- Fire suppression/sprinkler system