

with a *control measure* must be monitored and maintained in order to reduce the occurrence of a *hazardous condition* to an acceptable level.

control measure: a *disinfectant*, heating, cooling, filtering, flushing, or other means, methods, or procedures used to maintain the physical or chemical conditions of water to within *control limits*.

corrective action: action to be taken to return control values to within established limits when *monitoring* or measurement indicates the control values are outside the established *control limits*.

designee: the individual designated by the building owner to meet the requirements placed on the owner by the standard.

disinfectant: chemical agent or physical treatments used to kill or inactivate pathogens.

disinfection: the process of killing or inactivating pathogens.

disinfectant residual: the net amount of a chemical *disinfectant* remaining in treated water after chemical demand exerted by the water is satisfied.

hazard: *Legionella* bacteria in a *building water system* that, in the absence of *control*, can cause harm to humans.

hazardous condition: a condition that contributes to the potential for harmful human exposure to *Legionella*.

HVAC&R: heating, ventilating, air conditioning, and refrigeration.

immunocompromised: a condition describing an individual who has increased susceptibility to infections due to existing human disease, medication regimens, or other types of medical treatment. (See *at-risk*.)

Legionella: the name of the genus of bacteria that was subsequently identified as the causative pathogen associated with the 1976 outbreak of disease at the American Legion convention in Philadelphia. *Legionella* are common aquatic bacteria found in natural and *building water systems*, as well as in some soils.

legionellosis: the term used to describe Legionnaires' disease, Pontiac fever, and any illness caused by exposure to *Legionella* bacteria.

monitoring: conducting a planned sequence of observations or measurements of the physical and chemical characteristics of *control measures*.

multiple housing units: a classification of housing where multiple separate housing units for residential and commercial inhabitants are contained within one building or several buildings within one complex.

nonpotable: water that is not safe for drinking or for personal or culinary use and that has the potential to cause harmful human exposure to *Legionella*.

process flow diagram: a step-by-step drawing of a *building water system* that includes the location of all water processing steps—including but not limited to conditioning, storing, heating, cooling, recirculation, and distribution—that are part of the *building water systems*.

potable-water system: a building water distribution system that provides hot or cold water intended for direct and indirect human contact or consumption.

Program: the *water management program*.

Program Team: the group or individual designated by the building owner or *designee* to be responsible for developing, implementing, and maintaining the *Program*.

risk: the potential for harm to humans resulting from exposure to *Legionella*.

risk management: systematic practices to reduce *risk*.

testing: conducting a planned sequence of observations or measurements of physical, chemical, or microbial characteristics of water to assess whether conditions throughout *building water systems* meet the goals set by the *Program Team*.

validation: initial and ongoing confirmation that the *Program*, when implemented as designed, effectively controls the *hazardous conditions* throughout the *building water systems*.

verification: initial and ongoing confirmation that the *Program* is being implemented as designed.

water management program (program): the risk management plan for the prevention and *control* of *legionellosis* associated with *building water systems*, including documentation of the plan's implementation and operation.

water service disruption: planned or unplanned events that reduce water delivery pressure below 20 psi (140 kPa) and that are caused by, but not limited to, new construction tie-ins; replacement of valves, hydrants, or meters; pumping failures; pipeline breaks; and other system repairs or emergency conditions.

water use end points: the points at which water exits from all potable and *nonpotable building water systems*, fixtures, and equipment.

4. COMPLIANCE

The results of each Section 4 compliance determination and the associated building survey in Section 5 shall be documented and shall be available for review by the *authority having jurisdiction (AHJ)*.

4.1 Building Designer Requirements

4.1.1 Survey each new building design and its water systems to determine if the design contains any of the devices or factors described in Section 5 that relate to *legionellosis*. If the building and associated property has

- any of the *building water systems* in Section 5.1, then all of those *building water systems* shall comply with all applicable requirements of Section 8 of this standard.
- any of the factors listed in Section 5.2, then the new building design shall comply with the requirements of Section 8 of this standard.

4.2 Building Owner Requirements

4.2.1 The building owner shall survey each existing building, new building, and any renovation, addition, or modification to an existing building and its water systems as described

in Section 5. The survey and conformance with the compliance requirements of Section 4 must occur prior to occupancy of a new building and before construction begins on renovations, additions, or modifications to existing buildings. If the building and associated property has

- a. any of the *building water systems* listed in Section 5.1, then all of those *building water systems* shall comply with the requirements of Section 6 and all applicable requirements of Section 7 of this standard.
- b. any of the factors listed in Section 5.2, then all potable *building water systems* and all *building water systems* listed in Section 5.1 shall comply with the requirements of Sections 6 and all applicable requirements of Section 7 of this standard.

4.2.2 The building owner shall require the designer of any new building, and any renovation, addition, or modification to an existing building, to follow the requirements of Section 4.1 for the provided design.

4.2.3 The building owner shall conduct and document the compliance determination in Section 4 of this standard at least once per year and any time renovations, additions, or modifications are made to the building.

4.3 Health Care Facility Requirements

4.3.1 Health care facilities that do not meet all of the qualifications of Section 4.3.2 shall comply with the requirements in Sections 4.2, 6, and 7.

4.3.2 Health care facilities that meet all of the following qualifications shall comply with either the requirements in Sections 4.2, 6, and 7 or the requirements in Normative Annex A, "Health Care Facilities":

- a. The health care facility is accredited by a regional, national, or international accrediting agency or by the *authority having jurisdiction (AHJ)* over the health care facility Infection Prevention and Control (IC) activities.
- b. The health care facility IC program has an infection preventionist that is certified in infection prevention control (CIC) by the Certification Board of Infection Control and Epidemiology (CBIC) or other regional, national, or international certifying body, or the health care facility has an epidemiologist with a minimum of a master's degree or equivalent.

5. BUILDING SURVEY

5.1 The building shall be surveyed to determine whether it has one or more

- a. open- and closed-circuit cooling towers or evaporative condensers that provide cooling and/or refrigeration for the *HVAC&R* system or other systems or devices in the building;
- b. whirlpools or spas, either in the building or on the site; or
- c. ornamental fountains, misters, atomizers, air washes, humidifiers, or other *nonpotable* water systems or devices that release water aerosols in the building or on the site.

5.2 The building shall be surveyed to determine whether it is characterized by one or more of the following factors that relate to *legionellosis*:

- a. It includes *multiple housing units* with one or more centralized potable water-heater systems.
- b. It is more than 10 stories high (including any levels that are below grade).
- c. It is a health care facility where patient stays exceed 24 hours.
- d. It is a building containing one or more areas for the purpose of housing or treating occupants receiving treatment for burns, chemotherapy for cancer, or solid organ transplantation or bone marrow transplantation.
- e. It is a building containing one or more areas for the purpose of housing or treating occupants that are *immuno-compromised*, *at-risk*, are taking drugs that weaken the immune system, have renal disease, have diabetes, or have chronic lung disease.
- f. It is a building identified by the owner or *designee* as being for the purpose of housing occupants over the age of 65 years.

6. GENERAL REQUIREMENTS

Required compliance with this section shall be determined by Section 4.

6.1 Principles of a Water Management Program. A *Program* utilizing the risk management principles in the following subsections shall be used to reduce the risk of *legionellosis* associated with *building water systems*.

6.1.1 Analysis of Building Water Systems. Conduct a systematic analysis of *hazardous conditions* in the *building water systems*.

6.1.2 Control Locations. Determine the locations in the system where *control measures* are required.

6.1.3 Control Limits. For each *control measure* at each *control location* established in Section 6.1.2, determine the limits including but not limited to a maximum value, a minimum value, or a range of values within which a chemical or physical parameter must be monitored and maintained in order to reduce *hazardous conditions* to an acceptable level.

6.1.4 Monitoring. Establish a system for *monitoring* the parameters associated with the *control limits* established in Section 6.1.3.

6.1.5 Corrective Actions. Establish the *corrective actions* to be taken when *monitoring* indicates that the *control* parameters are outside of the established *control limits*.

6.1.6 Confirm Program Implementation. Establish procedures to confirm that all of the *Program* elements are being implemented as designed.

6.1.7 Documentation and Recordkeeping. Establish documentation concerning all procedures, and maintain records appropriate to these principles and their application.

6.2 Program Development. When the building survey required by Sections 4 and 5 indicates the presence of one or more of the *building water systems* listed in Section 5.1 but none of the factors listed in Section 5.2, a program shall be

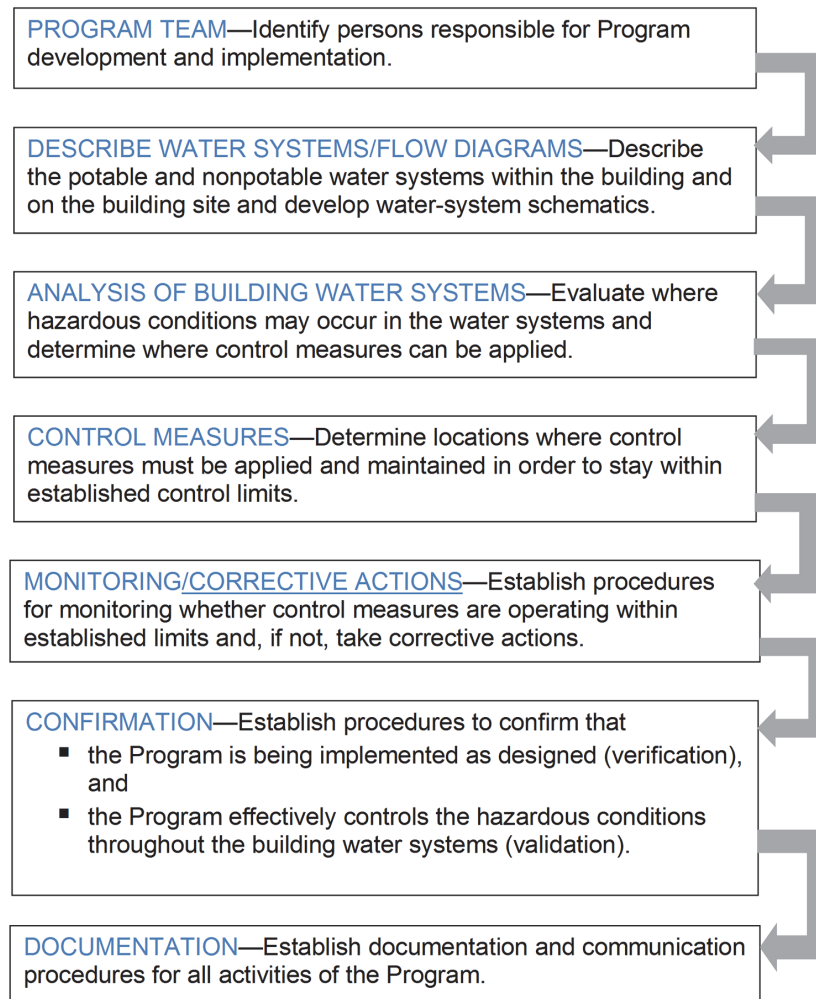


FIGURE 1 Elements of a water management program.

implemented to manage the risk of *legionellosis* for those *building water systems* listed in Section 5.1. When the building survey required by Sections 4 and 5 indicates the presence of one or more of the factors listed in Section 5.2, a *Program* shall be implemented to manage the risk of *legionellosis* for *potable building water systems* and for *building water systems* listed in Section 5.1. A summary of the program development steps are represented in Figure 1. The *Program* shall be detailed in a plan that embodies all of the principles described in Section 6.1 and shall include the elements described in the following subsections.

6.2.1 Program Team. Identify the persons on the *Program Team* responsible for developing and implementing the *Program* and the tasks for which they are responsible. The *Program Team* shall include one or more individuals selected from the following: the building owner or *designee*, employees, suppliers, consultants, or other individual or individuals to whom the building owner has delegated authority and responsibility for the actions required by the *Program*. The *Program Team* can delegate *Program* tasks to subgroups. The *Program Team* shall have knowledge of the *building water system* design and water management as it relates to *legionellosis* that can be obtained through informative documents,

such as ASHRAE Guideline 12, *Minimizing the Risk of Legionellosis Associated with Building Water Systems*.

6.2.2 Describe the Building Water Systems. The *Program Team* shall identify and describe the *potable* and *nonpotable water systems* within the building and on the building site, including (at a minimum)

- the locations of end-point uses of *potable* and *nonpotable water systems*,
- the location of water processing equipment and components, and
- how water is received and processed (conditioned, stored, heated, cooled, recirculated, and delivered to end-point uses).

6.2.3 Process Flow Diagrams. The information from Section 6.2.2 must be graphically described in step-by-step *process flow diagrams*. The *process flow diagrams* shall have sufficient detail to enable the identification, analysis, and management of the risk of *legionellosis* throughout the *building water systems*. The *Program Team* shall confirm that the *process flow diagrams* are representative of the systems as built.

6.2.4 Analysis of Building Water Systems. The *Program Team* shall use the *process flow diagrams* in Section 6.2.3 to

evaluate where *hazardous conditions* may occur in the *building water systems* and determine where *control measures* can be applied to *control* potentially hazardous system conditions. The analysis shall also take into consideration the vulnerability of occupants and shall include the *building water systems* identified in Section 5.1. The analysis shall include provisions to respond to water service disruptions.

6.2.5 Control Measures. Based on the results of the *analysis of building water systems* in Section 6.2.4, the *Program Team* shall determine the *control measures* to be maintained. *Control measures* shall include preplanning of physical design and equipment siting. *Control measures* shall include treatment methods, technical and physical processes, and procedures and activities or actions that monitor or maintain the physical or chemical conditions of water to within established *control limits*.

- a. **Control Locations.** The *Program Team* shall determine the locations in the *building water system* where *control measures* are required.
- b. **Control Limits.** The *Program Team* shall determine a maximum value, minimum value, or range of values to which a chemical or physical parameter must be maintained.

6.2.6 Monitoring. The *Program Team* shall establish a system for *monitoring* whether the measured physical and chemical characteristics of *control measures* are within the *control limits*. The system shall include the means, methods, and frequency for *monitoring* activities.

6.2.7 Corrective Actions. For each *control location*, the *Program Team* shall establish procedures for *corrective actions* to be taken when *monitoring* shows that *control measures* are outside of established *control limits*, shall identify the person responsible for taking the *corrective action*, shall identify the required response time for taking the *corrective action*, and shall identify all persons to be notified.

6.2.8 Program Confirmation. The *Program Team* shall establish procedures to confirm, both initially and on an ongoing basis, that the *Program* is being implemented as designed (*verification*). The *Program Team* shall establish procedures to confirm, both initially and on an ongoing basis, that the *Program*, when implemented as designed, effectively controls the *hazardous conditions* throughout the *building water systems* (*validation*). The *Program Team* shall determine whether *testing* for *Legionella* shall be performed and if so how test results will be used to *validate* the *Program*. If the *Program Team* determines that *testing* is to be performed, the *testing* approach, including sampling frequency, number of samples, locations, sampling methods, and test methods, shall be specified and documented. The *Program Team* shall include consideration of the following as part of the determination of whether to test for *Legionella*:

- a. *Program control limits* are not maintained in *building water systems*, including in water systems with supplemental *disinfection*.
- b. A health care facility provides in-patient services to *at-risk* or *immunocompromised* populations.
- c. A prior history of *legionellosis* is associated with the *building water system*.

6.2.9 Documentation and Communication. The *Program Team* shall establish documentation and communication procedures for all activities of the *Program*. The *Program Team* is responsible for all water systems and for communication and coordination among subgroups covering different portions of the *building water system* and associated equipment. A master document providing the location of all *Program* documents shall be maintained.

7. REQUIREMENTS FOR BUILDING WATER SYSTEMS

All water treatments implemented in connection with this standard shall be applied in conformance with, and shall comply with, all applicable national, regional, and local regulations.

Informative Note: Recommendations and guidance on the design, maintenance, and operation of *building water systems* are provided in ASHRAE Guideline 12, *Minimizing the Risk of Legionellosis Associated with Building Water Systems*.

Required compliance with the following sections shall be determined by Section 4.

- a. Section 7.1, “Potable Water Systems”
- b. Section 7.2, “Cooling Towers and Evaporative Condensers”
- c. Section 7.3, “Whirlpool Spas”
- d. Section 7.4, “Ornamental Fountains and Other Water Features”
- e. Section 7.5, “Aerosol-Generating Mistifiers, Atomizers, Air Washers, and Humidifiers”

7.1 Potable Water Systems. This section describes the preventive measures required for *potable water systems*. The program documents shall include identification of the responsible persons for every step of each *Program* requirement.

Informative Note: Recommendations and guidance on the design, maintenance, and operation of *building water systems* are provided in ASHRAE Guideline 12, *Minimizing the Risk of Legionellosis Associated with Building Water Systems*.

7.1.1 System Start-Up and Shutdown. The *Program* documents shall include procedures for

- a. flushing and *disinfection* before commissioning any new system;
- b. shutdown, including any draining, purging, cleaning treatment, and *control* settings;
- c. any unplanned loss of operating energy, loss of water treatment chemicals, or system component repair or replacement;
- d. restarting safely from a drained shutdown condition and from an undrained shutdown condition;
- e. *monitoring* and treatment following water supply interruptions or breaks in water supply piping; and
- f. reestablishing required temperatures throughout the hot water distribution system.

7.1.2 System Maintenance. The *Program* documents shall include procedures for

- a. inspection of, and inspection schedule for, water-containing vessels and system components;
- b. flushing or mixing of stagnant or low-flow areas;
- c. maintenance and *monitoring* procedures based on equipment manufacturers’ recommendations for cleaning, *dis-*