STANDARD

ANSI/ASHRAE Standard 188-2018
(Supersedes ANSI/ASHRAE Standard 188-2015)
Includes ANSI/ASHRAE addenda listed in Annex D

Legionellosis: Risk Management for Building Water Systems

See Informative Annex D for approval dates.

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 ISSN 1041-2336

Approved American National Standard
ANSI
www.ansi.org

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Co-cognizant TCs: 3.6, Water Treatment; and 6.6, Service Water Heating Systems
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ANSI/ASHRAE Standard 188-2018
Legionellosis: Risk Management for Building Water Systems

NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE website at www.ashrae.org/technology.

(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

ASHRAE Standard 188 establishes minimum legionellosis risk management requirements for building water systems. The 2018 edition benefits from changes to improve usability and from comprehensive updates that replace permissive language with enforceable, code-intended language to facilitate adoption of the standard for code and regulatory purposes. For a full list of changes to the 2015 edition of Standard 188, see Informative Annex D.

"Legionellosis" refers to two distinct clinical illnesses. When the bacterium Legionella *causes pneumonia, the disease is referred to as "Legionnaires' disease" (LD). The Centers for Disease Control and Prevention (CDC) estimates that each year there are between 8000 and 18,000 cases of LD in the United States and that more than 10% of these cases are fatal.* Legionella *can also cause a less-severe influenza-like illness known as "Pontiac fever." Most outbreak cases of legionellosis are the result of exposure to* Legionella *associated with building water systems.*

The presence of Legionella *bacteria in building water systems is not in itself sufficient to cause LD. Other necessary factors include building water system design and use conditions that promote the growth of* Legionella*; a means of transmitting the bacteria to people in the building, such as aerosol generation; and exposure of susceptible persons to LD colonized water that is inhaled or aspirated into the lungs.* Legionella *bacteria have been only once attributed to transmission from person to person and are not generally transmitted into the lungs through normal eating or drinking of contaminated water. Susceptible persons considered at-risk for Legionnaires' disease include, but are not limited to, those receiving treatment for burns, chemotherapy for cancer, solid organ transplant, or bone marrow transplant; those with underlying diseases, such as cancer, renal disease, diabetes, and chronic lung disease; and people that are immunocompromised, such as the elderly, smokers, and those taking drugs that weaken the immune system.*

This standard is intended for use by owners and managers of human-occupied buildings and those involved in the design, construction, installation, commissioning, operation, maintenance, and service of centralized building water systems and components.

Standard 188 consists of numbered normative sections followed by normative and informative annexes. The normative sections and the normative annex contain the requirements that must be met in order to comply with this standard. Building water systems vary substantially in their design, use, and capability for transmission of Legionella*. The informative annexes contain additional information that may be helpful for a given building water system.*

ASHRAE Standing Standard Project Committee (SSPC) 188 has devoted a considerable amount of time and thought to reviewing and responding to continuous maintenance proposals and public review comments by affected and interested parties. The committee thanks everyone who participated in the development of the standard, especially those who submitted proposals and public review comments.

Standard 188 is on a continuous maintenance cycle, which allows it to be updated through the publication of approved addenda. The current schedule anticipates republication of Standard 188, with approved addenda and errata, every third year.

1. PURPOSE

The purpose of this standard is to establish minimum *legionellosis risk management* requirements for *building water systems*.

2. SCOPE

2.1 This standard provides minimum *legionellosis risk management* requirements for the design, construction, commissioning, operation, maintenance, repair, replacement, and expansion of new and existing buildings and their associated (*potable* and *nonpotable*) *water* systems and components.

2.2 This standard applies to human-occupied commercial, institutional, multiunit residential, and industrial buildings. This standard does not include single-family residential buildings. Only where specifically noted in this standard shall certain *building water systems* or parts of *building water systems* be exempt.

2.3 This standard is intended for use by owners and managers of human-occupied buildings, excluding single-family residential buildings. This standard is also intended for those involved in the design, construction, installation, commissioning, operation, maintenance, and service of *centralized building water systems* and components.

3. DEFINITIONS

analysis of building water systems: the systematic evaluation of potentially *hazardous conditions* associated with each step in the *process flow diagrams*.

at-risk: any person who is more susceptible than the general population to developing *legionellosis* because of age, health, medication, occupation, or smoking.

authority having jurisdiction (AHJ): an organization, office, or individual responsible for enforcing the requirements of this standard.

beneficial occupancy: stage of construction when all or part of a building is to be occupied for its intended purpose, whether before or after completion.

building water systems: *potable* and *nonpotable water systems* in the building or on the site.

centralized building water system: any system that distributes water to multiple uses or multiple locations within the building or site.

construction documents: drawings and specifications used to construct a building, building systems, or portions thereof.

control: to manage the conditions of an operation in order to maintain compliance with established criteria.

control location: a point where a physical, mechanical, operational, or chemical *control measure* is required.

control limit: a maximum value, a minimum value, or a range of values of a chemical or physical parameter associated with a *control measure* that are monitored and maintained in order to reduce the occurrence of a *hazardous condition*.

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*, has the potential to 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 or more buildings within one complex.

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

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

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*.

Program: the *water management program*.

Program documents: procedures, work instructions, specifications, and records for all activities of the *Program*, established or collected by the *Program Team* and residing in one or more locations and formats.

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 activities 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, controls *hazardous conditions* throughout the *building water systems*.

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

water management 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. (See *Program*.)

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 physically or electronically on site for

review by the *authority having jurisdiction* (*AHJ*). This standard does not use or require compliance, training, or certification in any additional *hazard* analysis, *risk* assessment, or *risk management* methodologies.

4.1 Building Designer Requirements

4.1.1 The building designer shall review 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

a. any of the *building water systems* in Section 5.1, then all of those *building water systems* in the new building design shall comply with all applicable requirements of Section 8 of this standard.
b. 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 shall be completed 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 Buildings containing health care facilities that do not meet the qualifications in Section 4.3.2(a) and 4.3.2(b) shall comply with the requirements in Section 4.2, "Building Owner Requirements."

4.3.2 Buildings containing health care facilities that meet the qualifications in Sections 4.3.2(a) and 4.3.2(b) shall comply with either the requirements in Section 4.2, "Building Owner Requirements," 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
    1. within the U.S. has an infection preventionist who is certified in infection prevention and *control* (CIC certification) by the Certification Board of Infection Control and Epidemiology (CBIC), or the health care facility has an epidemiologist with a minimum of a master's degree.
    2. outside the U.S. has an infection preventionist who is certified in infection prevention and *control* by the responsible regional, national, or international certifying body, or the health care facility has an epidemiologist with a minimum of the equivalent of a U.S. master's degree.

5. BUILDING SURVEY

5.1 The building shall be surveyed to determine whether the building has one or more of the following:

a. Open- and closed-circuit cooling towers or evaporative condensers that provide cooling, refrigeration, or both cooling and 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
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. The building includes *multiple housing units* with one or more centralized potable water-heater systems.
b. The building is more than ten (10) stories high (including any levels that are below grade).
c. The building is a health care facility where patient stays exceed 24 hours.
d. The building contains 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. The building contains one or more areas for the purpose of housing or treating occupants that are *immunocompromised*, *at-risk*, are taking drugs that weaken the immune system, have renal disease, have diabetes, or have chronic lung disease.
f. The building is 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 *control limits*, including a maximum value, a minimum value, or a range of values of a chemical or physical parameter that shall be monitored and maintained in order to reduce *hazardous conditions*.

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 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 *Program Team's* tasks. 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 that the building owner has delegated to have authority and responsibility for the actions required by the *Program*. The *Program Team* shall be permitted to delegate *Program* tasks to subgroups. The *Program Team* shall have knowledge of the *building water system* design and water management as related to *legionellosis*.

Informative Note: Knowledge related to *legionellosis* can be obtained through peer-reviewed 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 the following:

a. The locations of end-point uses of *potable* and *nonpotable water systems*
b. The locations of water processing equipment and components
c. How water is received and processed, including how water is conditioned, stored, heated, cooled, recirculated, and delivered to end-point uses

6.2.3 ***Process Flow Diagrams.*** The information from Section 6.2.2 shall be graphically described in step-by-step *process flow diagrams*. The *process flow diagrams* shall have detail that enables 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* have the potential to occur in the *building water systems* and determine where *control measures* shall be applied to *control* potentially *hazardous* system conditions. The analysis shall consider 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 for chemical and physical parameters.

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. The resulting process is *verification*. The *Program Team* shall establish procedures to confirm, both initially and on an ongoing basis, that the *Program*, when implemented as

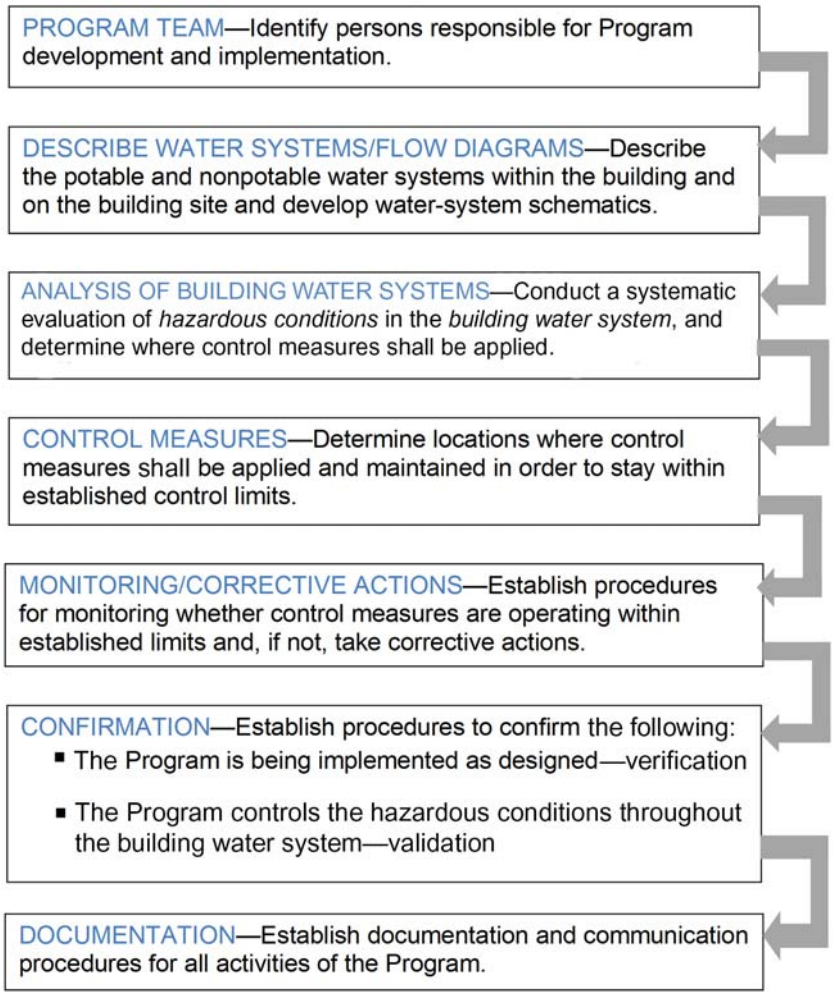

Figure 1 Elements of a *water management program*.

designed, *controls* the *hazardous conditions* throughout the *building water systems*. The resulting process is *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 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.

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 Misters, Atomizers, Air Washers, and Humidifiers"

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 *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 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' instructions for cleaning, *disinfection*, replacement of system components, and other treatments the *Program Team* decides are necessary for the following:
    1. Hot-water and cold-water storage tanks
    2. Ice machines
    3. Water-hammer arrestors
    4. Expansion tanks
    5. Water filters
    6. Shower heads and hoses
    7. Electronic faucets
    8. Aerators
    9. Faucet flow restrictors
    10. Nonsteam aerosol-generating humidifiers
    11. Water heaters
    12. Low-use equipment, including eyewash stations and showers
    13. Other equipment identified by the *Program Team*;
d. maintaining and storing instructions and forms for inspection notes and a *corrective action* log; and
e. maintaining and storing component and equipment operating manuals.

7.1.3 Water Treatment. The *Program documents* shall include

a. *monitoring* method and schedule for temperature measurement in the hot-water and cold-water system;
b. *monitoring* method and schedule for measuring the chemical *disinfectant residual* or physical parameters in the hot-water and cold-water system;
c. procedures to address water supply interruptions or breaks in water supply piping;
d. procedures and schedule for maintaining water treatment system *disinfectants*; and
e. water treatment products, the procedures for their application, and confirmation that the products comply with applicable regulations.

7.1.4 Contingency Response Plan. For both hot-water and cold-water systems, the *Program documents* shall include

a. procedures to be followed if there are known or suspected cases of *legionellosis* associated with the use of *potable* water from the *building water systems*;
b. directives issued by national, regional, and local health department authorities;
c. if the *Program Team* determines *testing* for *Legionella* shall be performed, the procedures shall include criteria for when and where the tests shall be performed;
d. procedures for emergency *disinfection*; and
e. procedures for other actions as determined by the *Program Team* to prevent exposure to contaminated water.

7.2 Cooling Towers and Evaporative Condensers. This section describes the preventive measures required for cooling towers and evaporative condensers that provide cooling, refrigeration, or both cooling and refrigeration for the *HVAC&R* system or for other devices or systems in the building. 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*.

7.2.1 Equipment Siting. Prior to the beginning of construction of new or replacement open-circuit cooling towers, closed-circuit cooling towers, or evaporative condensers, *construction documents* shall be reviewed and the following items shall be addressed:

a. Potential contamination from building systems or facility processes to be drawn into the equipment
b. Potential for equipment to discharge into occupied spaces, trafficable areas, pedestrian thoroughfares, outdoor air intakes, and building openings
c. Potential for equipment siting that inhibits access to the equipment for the required maintenance and inspection consistent with the manufacturer's instructions and guidelines

7.2.2 New-System Start-Up. The *Program documents* shall include procedures for cleaning steps that are part of commissioning of the cooling system. The *Program document*s shall include procedures for management and *control* means of ensuring that ongoing water treatment is initiated immediately once the system is charged with water.

7.2.3 System Maintenance. The *Program documents* shall include

a. a schedule for inspection of system cleanliness, of drift eliminator condition and fill material condition, and of water distribution system operation;
b. requirements and schedule for basin or remote sump cleaning and purging of stagnant or low-flow zones; and
c. documentation requirements.

7.2.4 Water Treatment. The *Program documents* shall include the water treatment requirements to *control* microbiological activity, scale, and corrosion and shall

a. specify all equipment and chemicals used for the purpose of treating the open recirculating loop;
b. include the minimum required schedule for inspection, maintenance and *monitoring*, and a *corrective actions* plan; and
c. identify the minimum requirements for documenting system water treatment.

7.2.5 Shutdown and Start-Up. The *Program documents* shall include start-up and shutdown requirements to manage *hazardous conditions* associated with operation of fans during untreated water conditions and procedures for

a. shutdown that includes all chemical pretreatment steps, pump cycling protocols, and procedures for system drainage for shutdown periods longer than the duration specified by the *Program Team*;
b. start-up from a drained system; and
c. start-up from an undrained or stagnant system that exceeds the number of idle days specified by the *Program Team.*

7.2.6 *Disinfection* of Cooling Towers and Evaporative Condensers. The *Program documents* shall include procedures and identify the responsible person for initiating the process for

a. remedial *disinfection* while in operation, including the conditions that require the application of remedial *disinfection*; and
b. emergency *disinfection*, including the conditions that require the application of emergency *disinfection*.

7.2.7 Location of Cooling Tower Makeup Valve. The *Program documents* shall include requirements for the location of cooling tower makeup valves and for maintaining compliance with all applicable local, regional, and national codes and regulations for air gaps and backflow preventers. If such codes and regulations do not exist for the location, then the *Program* shall include requirements for maintaining compliance with ASME/ANSI A112.1.2 [1] for air gaps and for maintaining compliance with codes and regulations applicable to other locations, selected by the owner or *designee*, for backflow preventers.

7.2.8 Contingency Response Plan. The *Program documents* shall include

a. procedures to be followed if there are known or suspected cases of *legionellosis* associated with the use of cooling towers and evaporative condensers;
b. directions issued by national, regional, and local health department authorities;
c. if the *Program Team* determines *testing* for *Legionella* or other pathogens shall be performed, procedures shall include criteria for when and where the tests shall be performed, sampling procedures, and the interpretation of test results;
d. procedures for emergency *disinfection*;
e. procedures for other actions identified by the *Program Team* to prevent exposure to contaminated water.

7.3 Whirlpool Spas. This section describes the preventative measures required for public whirlpool spas. 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*.

7.3.1 Applicable Codes. Public whirlpool spas and their operation shall comply with national, regional, and local codes.

7.3.2 Bather-Related Requirements. The *Program documents* shall include the

a. allowable bather load for each whirlpool spa,
b. the procedures for posting and enforcing the allowable bather load for each whirlpool spa, and
c. the procedures for posting a notice to bathers of the increased health *risk* related to use of whirlpool spas by individuals who are *at-risk* or *immunocompromised* or who have chronic lung disease.

7.3.3 Filter Operation and Maintenance. The *Program documents* shall include procedures for filtration of whirlpool spa water.

7.3.3.1 Cartridge (Canister) Filters. The *Program documents* shall include procedures and schedules for inspection and replacement of cartridge-type filters, pressure gages, valves, and related equipment.

7.3.3.2 Granular Filters. The *Program documents* shall include procedures and schedules for backwashing, inspection, and replacement of granular-type filters, pressure gages, valves, and related equipment.

7.3.4 Water Quality, *Disinfection*, and *Monitoring*. The *Program documents* shall include procedures for

a. the scheduled changing of whirlpool spa water;
b. maintaining the pH of the water within the range specified by local, regional, and national codes and regulations;
c. maintaining *disinfectant* levels, the products to be applied, and requirements to follow *disinfectant* label directions;
d. shock *disinfection* of the whirlpool spa at the end of each day by achieving the *disinfectant residual* and minimum circulation time specified by the *disinfectant* manufacturer;
e. maintenance of the *disinfection* system in accordance with the manufacturer's instructions;
f. a measurement schedule and logbook of all residual *disinfectant* measurements;
g. recording *corrective actions* in logbooks; and

h. recording operations in logbooks maintained for the periods specified in local, regional, and national codes and regulations and for at least 12 months and retained for at least an additional 12 months.

7.3.5 Microbiology. The *Program documents* shall include procedures for the microbiological standards required by local, regional, and national health departments that are to be achieved by public whirlpool spas.

7.3.5.1 Microbiological *Testing*. The *Program documents* shall include procedures for

a. a minimum of monthly *testing* of spa water for indicator organisms and pathogens identified by the *Program* microbiological standards;
b. maintaining the total heterotrophic aerobic bacteria colony count at or below the maximum level specified by local, regional, and national codes and regulations or ≤200 CFU/mL if codes or regulations do not apply;
c. maintaining the levels of indicator organisms at or below the standard threshold;
d. when and where tests shall be performed, proper sampling procedures, and the interpretation of test results when the *Program Team* determine that *testing* for *Legionella* or other pathogens is required; and
e. responding to test results, including *disinfection* record review and repetition of microbiological tests.

7.3.5.2 When Contamination Is Discovered. The *Program documents* shall include procedures to be followed if there is evidence of feces, vomiting, or other gross contamination and shall include procedures for immediately taking the spa out of use for spa cleaning, for *disinfection* of the entire spa system, and for restoring the spa to service.

7.3.5.3 Contingency Response Plan. The *Program documents* shall include

a. procedures to be followed if there are known or suspected cases of *legionellosis* associated with the use of whirlpool spas;
b. directions issued by national, regional, and local health department authorities;
c. when the *Program Team* determines *testing* for *Legionella* or other pathogens shall be performed, procedures shall include criteria for when and where the tests shall be performed, what sampling procedures shall be used, and how to interpret test results;
d. procedures for emergency *disinfection*; and
e. procedures for other actions identified by the *Program Team* to prevent exposure to contaminated water.

7.3.6 Operating Manuals. The *Program documents* shall include procedures for regularly updating all operating manuals for filters, pumps, and *disinfection* equipment and for maintaining the *Program documents* at one or more locations accessible to maintenance personnel.

7.4 Ornamental Fountains and Other Water Features. This section describes the preventative measures required for ornamental fountains and other water features that release water aerosols in the building or on the site. 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*.

7.4.1 Equipment Siting. Prior to beginning construction of an ornamental fountain or other water feature, *construction documents* shall be reviewed and the following items shall be addressed:

a. Potential organic contamination from adjacent sources
b. The capacity of drains and the impact of stagnant areas
c. Access to pumps, filters, tanks, and treatment equipment
d. The potential for external heat sources and reduced airflow that cause water temperatures favorable to the growth of *Legionella*

7.4.2 Operation. The *Program documents* shall include a description of the procedures for

a. draining, cleaning all components, disinfecting, and refilling if the water feature is not in operation for periods that exceed the number of idle days specified by the *Program Team*;
b. confirming submerged lights will not operate unless the circulating pump is running; and
c. confirming circulating pumps are running.

7.4.3 Maintenance. The *Program documents* shall include procedures for regular cleaning; for cleaning the visible buildup of dirt, organic matter, or other debris; and for maintaining pumps and filters as specified in the manufacturer's instructions.

7.4.4 Water Treatment. The *Program documents* shall include procedures for

a. the weekly cleaning and *disinfection* of equipment and components and replacement of water in systems with total water volume <5 gal (20 L), or for when to apply a *disinfectant*, following the *disinfectant* manufacturer's instructions;
b. when to apply a *disinfectant*, following the *disinfectant* manufacturer's instructions for systems ≥5 gal (20 L); and
c. maintaining water temperature within the *control limits* in the *Program*.

7.4.5 Contingency Response Plan. The *Program documents* shall include

a. procedures to be followed if there are known or suspected *legionellosis* health problems associated with the use of decorative fountains and other water features in building systems;
b. directions issued by national, regional, and local health department authorities;
c. procedures that include criteria for when and where tests shall be performed if the *Program Team* determines that *testing* for *Legionella* shall be performed;
d. procedures for emergency *disinfection*; and
e. procedures for other actions identified by the *Program Team* to prevent exposure to contaminated water.

7.5 Aerosol-Generating Misters, Atomizers, Air Washers, and Humidifiers. This section describes the preventative measures required for misters, atomizers, air washers, and humidifiers that cool or humidify by generating small water droplets discharged into the air. 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*.

7.5.1 Equipment Siting. Prior to beginning construction for installation of new or replacement aerosol-generating misters, atomizers, air washers, or humidifiers, *construction documents* shall be reviewed and the following items shall be addressed:

a. The potential for contamination from building systems, facility processes, or other sources
b. Access to pumps, filters, and treatment equipment for maintenance and inspection
c. The potential for external heat sources and reduced airflow that cause water temperatures favorable to the growth of *Legionella*

7.5.2 New-System Start-Up. The *Program documents* shall have procedures for cleaning that is required when commissioning misters, atomizers, air washers, and humidifiers.

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

a. a maintenance schedule and instructions for maintaining air-washer mist eliminators, evaporative cooler/humidifier media, spray nozzles, water distribution system operation, and other equipment and components identified by the *Program Team*;
b. a maintenance schedule and instructions for cleaning basins and remote sumps and for cleaning and purging stagnant and low-flow zones; and
c. maintenance procedure documentation, inspection documentation, and *corrective actions*.

7.5.4 Water Treatment. When water treatment is used, the *Program documents* shall have procedures for

a. all equipment and chemicals used for the purpose of treating the open recirculating loop,
b. an inspection and maintenance schedule for the water treatment equipment, and
c. the schedule for all *monitoring* required by the water treatment program.

7.5.5 System Shutdown and Start-Up. The *Program documents* shall have procedures for

a. system shutdown, including any required chemical pretreatment or pump cycling, and procedures for shutdown periods that exceed the number of idle days specified by the *Program Team*;
b. system start-up from a drained condition; and
c. system start-up from an undrained or stagnant condition that exceeds the number of idle days specified by the *Program Team.*

7.5.6 *Disinfection*. The *Program documents* shall have procedures for remedial on-line *disinfection* and the conditions requiring its application and for emergency *disinfection* and the conditions requiring its application.

7.5.7 Contingency Response Plan. The *Program documents* shall include

a. procedures to be followed if there are known or suspected cases of *legionellosis* associated with the use of aerosol-generating misters, atomizers, air washers, and humidifiers;
b. directions issued by national, regional, and local health department authorities;
c. procedures that include criteria for when and where the tests shall be performed if the *Program Team* determines that *testing* for *Legionella* shall be performed;
d. procedures for emergency *disinfection*; and
e. procedures for other actions identified by the *Program Team* to prevent exposure to contaminated water.

8. REQUIREMENTS FOR DESIGNING BUILDING WATER SYSTEMS

8.1 Design Documents. When designing for new construction, renovations, refurbishment, replacement, or repurposing of a facility, the following shall be documented:

a. A system overview and intended mode of system operation
b. Design compliance that addresses *hazardous conditions* for each of the following:
   1. Schematic diagrams of water systems
   2. *Monitoring* and *control* diagrams of water systems
   3. Local, regional, and national code compliance
   4. Locations of the following points: makeup, flush, sampling, temperature *monitoring*, and drain
   5. Locations of outdoor air intakes
   6. Building water equipment
   7. Commissioning
   8. Operating instructions and procedures
   9. Maintenance schedules, frequencies, and procedures
   10. No-flow and low-flow portions of the piping and *building water systems*
   11. Impact of heat loss from hot water or heat gain by cold water in piping and water system components
   12. Cross connections between potable and *nonpotable* water
   13. Access to water expansion tanks, water-hammer arrestors, water storage tanks, water heaters, and other equipment and components that contain water

8.2 Final Installation Documents

8.2.1 Drawings and documents of the actual installation shall be provided to the building owner or *designee* and shall include

a. the location of each piece of equipment associated with the *building water systems*;
b. a drawing of the water distribution piping system, including system materials, pipe sizes, design flow rates, design temperatures, temperature *monitoring* points necessary to confirm design temperatures throughout the system, fill

provisions, blow-down provisions, makeup provisions, sampling points, treatment points, and drain provisions;

c. the location of all outdoor air intakes;

d. size and options for each piece of water system equipment;

e. applicable *control* system wiring diagrams, schematics, equipment and component locations, calibration information, and operational sequences;

f. material specifications for all *building water system* components;

g. material specifications for all water systems insulation;

h. safety data sheets (SDS) for applicable materials used for *building water system* treatment, cleaning, flushing, disinfecting, and sealing;

i. installation requirements for all equipment;

j. start-up requirements for all equipment;

k. operational requirements for all equipment and systems; and

l. maintenance procedures for all equipment and water systems, including required actions, frequencies, and durations.

8.3 Balancing. All water systems shall be balanced, and a balance report for all water systems shall be provided to the building owner or *designee*.

8.4 Commissioning. Instructions for commissioning of all *building water systems* shall be provided to the building owner or *designee*. Commissioning shall include the following:

a. Procedures for flushing and *disinfection*

   1. Procedures shall meet the requirements of AWWA C651 [2] or AWWA C652 [3] or comply with all applicable national, regional, and local regulations.
   2. *Disinfection* and flushing shall be completed within three weeks prior to whole or partial *beneficial occupancy*.
      i. If *beneficial occupancy* of any part of the building is delayed more than two weeks but less than four weeks after *disinfection*, flushing of all fixtures shall again be completed.
      ii. If *beneficial occupancy* of any part of the building is delayed four weeks or more after *disinfection*, the need for *disinfection*, flushing, or both *disinfection* and flushing of unoccupied areas shall be determined by the *Program Team.*

b. Confirmation that *building water system* performance meets design performance parameters documented in Sections 8.2.1 and 8.3

9. REFERENCES

1. ASME. 2012. ASME/ANSI A112.1.2, *Air Gaps in Plumbing Systems (for Plumbing Fixtures and Water-Connected Receptors)*. New York: The American Society of Mechanical Engineers.
2. AWWA. 2014. AWWA/ANSI C651, *Disinfecting Water Mains*. Denver, CO: American Water Works Association.
3. AWWA. 2011. AWWA/ANSI C652, *Disinfection of Water Storage Facilities.* Denver, CO: American Water Works Association.

(This is a normative annex and is part of this standard.)

NORMATIVE ANNEX A
HEALTH CARE FACILITIES

These requirements are only applicable to health care facilities meeting the qualifications of Section 4.3.2.

A1. SUPPLEMENTAL DEFINITIONS FOR TERMS USED IN ANNEX A

Designated Team: the interdisciplinary group with the authority and responsibility for developing and implementing a *legionellosis risk management plan*.

epidemiologically linked case: a case in which transmission of the infection from a health care facility point source by the usual modes is plausible.

legionellosis risk management plan: the documents that contain all information pertaining to the development and implementation of the *legionellosis risk management* activities of a health care facility.

water system flow diagram: a step-by-step drawing of a *building water system* that includes all water processing steps and identifies areas of the health care facility designated for specialized care.

A2. *DESIGNATED TEAM*

A2.1 Senior organizational leadership shall select the individual responsible for leading the *Designated Team* from the group responsible for compliance with physical environment accreditation standards. The membership of the *Designated Team* shall include, but is not limited to,

a. a person with senior organizational leadership authority to make command decisions about water restrictions or other response measures;
b. a member of the facilities management staff with knowledge of the *building water systems*; and
c. a member of the heath care facility Infection Prevention and Control (IC) program
    1. within the U.S., who is an infection preventionist certified in infection prevention and *control* (CIC certification) by the Certification Board of Infection Control and Epidemiology (CBIC), or who is an epidemiologist with a minimum of a master's degree.
    2. outside the U.S., who is an infection preventionist certified in infection prevention and *control* by the responsible regional, national, or international certifying body, or who is an epidemiologist with a minimum of the equivalent of a U.S. master's degree.

A2.2 The *Designated Team* is responsible for developing, implementing, and documenting all applicable requirements of Annex A and any other activities assigned by senior organizational leadership or their *designee*.

A3. *WATER SYSTEM FLOW DIAGRAM*

A3.1 The *building water systems* shall be graphically represented in *water system flow diagrams*. These diagrams shall enable the identification, analysis, and management of the *risk* of *legionellosis* throughout the building water systems. The following is a listing of elements to be reviewed for inclusion into the flow diagram:

a. All water supply sources
b. All water supply service entrances
c. All water treatment systems and *control measures*, including *disinfection* and filtration
d. All water processing steps, including but not limited to receiving, conditioning, storing, heating, cooling, recirculating, and distributing
e. All areas where *hazardous conditions* have the potential to contribute to *Legionella* growth, including the following:
    1. All clinical support areas, including dietary and central sterile
    2. All patient care areas, including dialysis, respiratory therapy, and hydrotherapy
f. All *water-use end points*, including the following:
    1. Cooling towers
    2. Open water features
    3. Spas and whirlpools
    4. Pools
    5. Ice machines
    6. Humidifiers
g. Other points determined by the *Designated Team*

A4. *RISK MANAGEMENT* PLAN

A4.1 The *legionellosis risk management plan* must be contained within one or more documents. These documents are allowed to contain information that is not part of the *legionellosis risk management plan*, and a master document providing the location of all plan documents shall be maintained. The *legionellosis risk management plan* at a minimum shall include

a. the name, title, and contact information for the *Designated Team* leader and the role and contact information for other *Designated Team* members;
b. the *water system flow diagrams*;
c. the systematic evaluation of physical and chemical conditions associated with each step in the *water system flow diagrams* to determine where *hazardous conditions* have the potential for occurring in the *building water systems* and where *control measures* shall be applied;
d. identification of areas with higher probability of infection throughout the facility based on the intended use of water-based processes and the relative vulnerability of patients to *legionellosis* in areas designated for specialized care;
e. an evaluation of the results of Sections A4.1(c) and A4.1(d) to estimate the likelihood of *legionellosis*;
f. the procedures required for prevention and *control* of *legionellosis* associated with the health care facility's *building water systems*, including
    1. identification of the *control locations*,
    2. determination of the *control limits*,
    3. development of *monitoring* procedures, and
    4. determination of *corrective actions*;
g. assignment of responsibility for each action required by the *legionellosis risk management plan*;

h. documentation of all aspects of the *legionellosis risk management plan*, including development, implementation, *verification*, and *validation*;
i. disease prevention responses to elevated *risk* through *monitoring* of disease surveillance, including but not limited to
    1. notification of relevant IC, Environment of Care (EC)/ facilities management, and provider staff of any test results that indicate elevated potential for *Legionella* growth, transmission, or infection;
    2. procedures to be implemented when *monitoring* of *control measures* indicates deviation from *control limits*; and
    3. a determination if, when, where, and how environmental *testing* for *Legionella* is to be performed;
j. actions to be taken when the IC department identifies *legionellosis* cases that are *epidemiologically linked* to the health care facility; the actions shall
    1. follow established IC processes, including compliance with the current requirements of the U.S. Centers for Disease Control and Prevention (CDC) or other regional or national authority;
    2. include implementation of remediation actions as necessary;
    3. include evaluation of the *legionellosis risk management plan* and any necessary changes; and
k. procedures established by the *Designated Team* to confirm initially and on an ongoing basis that the *legionellosis risk management plan* is implemented as designed (*verification*) and that, when implemented as designed, the *legionellosis risk management plan controls* the *hazardous conditions* throughout the *building water systems* (*validation*).

A5. EXISTING BUILDINGS, NEW CONSTRUCTION, AND RENOVATIONS

A5.1 Existing Buildings. The *Designated Team* shall conduct an evaluation and estimate of the likelihood of *legionellosis* as specified in Section A4.1(e) for each existing building at least once per year. Based on the results of this evaluation and estimate, the *Designated Team* shall modify the *legionellosis risk management plan* and establish what *building water system* changes or events shall require a reevaluation of the *legionellosis risk management plan.* These changes or events shall include building renovations affecting water systems, water systems component upgrades or replacements, and water service interruption events.

A5.2 For new construction and renovations, the *Designated Team* shall review the scope of work and determine the *risk* associated with the project, and the senior organizational leadership or their *designee* shall require the building designer and builder

a. to work cooperatively with the *Designated Team* to conduct an evaluation and estimate of the likelihood of *legionellosis* for the project as specified in Section A4.1(e); based on the results of this evaluation and estimate, the *Designated Team* shall modify the *legionellosis risk management plan* as necessary for the project (1) during the early planning, (2) during each phase of design and construction, and (3) during commissioning;
b. to work cooperatively with the *Designated Team* to comply with all applicable portions of Section 8, "Requirements for Designing *Building Water Systems*";
c. to provide timely documented reports to the *Designated Team* confirming compliance with the *legionellosis risk management plan*; and
d. to provide a commissioning plan.

A6. *BUILDING WATER SYSTEM* PROCEDURES

A6.1 The *legionellosis risk management plan* shall include procedures for the following *building water systems*, or shall include a determination and rationale by the *Designated Team* for any procedures that are not required:

a. ***Potable water systems***
    1. **Systems start-up and shutdown.** The *legionellosis risk management plan* documents shall include procedures for
        i. flushing and *disinfection* before commissioning any new system;
        ii. shutdown, including any draining, purging, cleaning treatment, and *control* settings;
        iii. any unplanned loss of operating energy, loss of water treatment chemicals, or system component repair or replacement;
        iv. restarting from a drained shutdown condition and from an undrained or stagnant shutdown condition;
        v. *monitoring* and treatment following water supply interruptions or breaks in water supply piping; and
        vi. reestablishing required temperatures throughout the hot-water distribution system.
    2. **System maintenance.** The *legionellosis risk management plan* documents shall include procedures for
        i. inspection and the inspection schedule for water-containing vessels and system components;
        ii. flushing or mixing of stagnant or low-flow areas;
        iii. maintenance and *monitoring* procedures based on equipment manufacturers' instructions for cleaning, *disinfection*, replacement of system components, and other treatments the *Designated Team* decides are necessary for
            (a) hot-water and cold-water storage tanks;
            (b) ice machines;
            (c) water-hammer arrestors;
            (d) expansion tanks;
            (e) water filters;
            (f) shower heads and hoses;
            (g) electronic faucets;
            (h) aerators;
            (i) faucet flow restrictors;
            (j) nonsteam aerosol-generating humidifiers,
            (k) water heaters;
            (l) low-use equipment, such as eyewash stations and showers;
            (m) other equipment identified by the *Designated Team*;
            (n) maintaining and storing instructions and forms for inspection documents and a correction action log; and

(o) maintaining and sorting component and equipment operating manuals.

3. **Water treatment.** The *legionellosis risk management plan* documents shall include
   i. *monitoring* method and schedule for temperature measurement in the hot-water and cold-water systems;
   ii. *monitoring* method and schedule for measuring the chemical *disinfectant residual* or physical parameters in the hot-water and cold-water system;
   iii. procedures to address water supply interruptions or breaks in water supply piping;
   iv. procedures and schedule for maintaining water treatment system *disinfectants*; and
   v. water treatment products, the procedures for their application, and confirmation that the products comply with applicable regulations.

b. **Cooling towers and evaporative condensers.** This section describes the preventive measures required for cooling towers and evaporative condensers that provide cooling, refrigeration, or both cooling and refrigeration for the *HVAC&R* systems or for other devices or systems in the building. The *legionellosis risk management plan* documents shall include identification of the responsible persons for every step of each *legionellosis risk management plan* requirement.

1. **System maintenance.** The *legionellosis risk management plan* documents shall include
   i. a schedule for inspections of system cleanliness, drift eliminator condition, condition of fill material, and water distribution system operation;
   ii. requirements and the schedule for basin or remote sump cleaning and purging of stagnant or low-flow zones; and
   iii. documentation requirements.
2. **Water treatment.** The *legionellosis risk management plan* documents shall include the water treatment requirements to *control* microbiological activity, scale, and corrosion and shall
   i. specify all equipment and chemicals used for the purpose of treating the open recirculating loop;
   ii. include the minimum required schedule for inspection, maintenance, and *monitoring* and a *corrective actions* plan; and
   iii. identify the minimum requirements for documenting system water treatment.
3. **Shutdown and start-up.** The *legionellosis risk management plan* documents shall include start-up and shutdown requirements to manage *hazardous conditions* associated with operation of fans during untreated water conditions and procedures for
   i. shutdown that include all chemical pretreatment steps, pump cycling protocols, and procedures for system drainage for shutdown periods longer than the duration specified by the *Designated Team*;
   ii. start-up from a drained system; and
   iii. start-up from an undrained or stagnant system that exceeds the number of idle days specified by the *Designated Team*.
4. ***Disinfection* of cooling towers and evaporative condensers.** The *legionellosis risk management plan* documents shall include procedures and identify the person responsible for initiating the process for
   i. remedial *disinfection* while in operation, including the conditions that require its application; and
   ii. emergency *disinfection*, including the conditions that require its application.
5. **Location of cooling tower makeup valve.** The *legionellosis risk management plan* documents shall include requirements for the location of cooling tower makeup valves and for maintaining compliance with all applicable local, regional, and national codes and regulations for air gaps and backflow preventers and for the height of the discharge outlets and makeup valve over the rim of the overflow in the cooling tower or evaporative condenser cold-water basins. If such codes and regulations do not exist for the location, then the *legionellosis risk management plan* shall include requirements for maintaining compliance with ASME/ANSI A112.1.2 [1] for air gaps and for maintaining compliance with codes and regulations applicable to other locations, selected by the owner or *designee*, for backflow preventers and for the height of the discharge outlets and makeup valve over the rim of the outflow in the cooling tower or evaporative condenser cold-water basins.

c. **Pools and spas.** Pools and spas shall be operated and maintained in accordance with original equipment manufacturer (OEM) requirements.

d. **Ornamental fountains and open water features**

1. **Operation.** The *legionellosis risk management plan* documents shall include a description of the procedures for
   i. draining, cleaning all components, disinfecting, and refilling if the water feature is not in operation for periods that exceed the number of idle days specified by the *Designated Team*;
   ii. confirming that submerged lights will not operate unless the circulating pump is running; and
   iii. confirming that circulating pumps are running.
2. **Maintenance.** The *legionellosis risk management plan* documents shall include procedures for regular cleaning; for cleaning the visible buildup of dirt, organic matter, or other debris; and for maintaining pumps and filters as specified by the manufacturer.
3. **Water treatment.** The *legionellosis risk management plan* documents shall include procedures for
   i. the weekly cleaning and *disinfection* of equipment and components and replacement of water in systems with total water volume <5 gal (20 L), or when to apply a *disinfectant*, following the *disinfectant* manufacturer's instructions;
   ii. when to apply a *disinfectant*, following the *disinfectant* manufacturer's instructions for systems ≥5 gal (20 L); and
   iii. maintaining water temperature within the *control limits* in the *legionellosis risk management plan*.

(This annex is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

INFORMATIVE ANNEX B
BIBLIOGRAPHY

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INFORMATIVE ANNEX C
GUIDANCE IF *LEGIONELLA TESTING* IS UTILIZED IN THE ABSENCE OF SUSPECTED OR CONFIRMED FACILITY-ASSOCIATED DISEASE

When *testing* of environmental water samples is utilized, it should be performed by a laboratory with demonstrated proficiency in the subject method, such as may be evidenced by certification by a national, regional, or local government agency or by an accredited nongovernmental organization (NGO).

Laboratories performing routine microbiological *testing* of environmental water samples should be accredited by a regional, national, or international accrediting body according to a nationally or internationally recognized standard, for example ISO/IEC 17025:2017, *General Requirements for the Competence of Testing and Calibration Laboratories*, or similar. *Legionella testing* should be included in the laboratory's scope of accreditation.

In the case of suspected or confirmed facility-associated disease, consult the *AHJ*.

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INFORMATIVE ANNEX D
ADDENDA DESCRIPTION INFORMATION

ANSI/ASHRAE Standard 188-2018 incorporates ANSI/ASHRAE Standard 188-2015 and Addenda a, b, c, d, e, f, g, and h to ANSI/ASHRAE Standard 188-2015. Table D-1 lists each addendum and describes the way in which the standard is affected by the change. It also lists the ASHRAE and ANSI approval dates for each addendum.

Table D-1 Addenda to ANSI/ASHRAE Standard 188-2015

Addendum	Section(s) Affected	Description of Changes*	Approval Dates • ASHRAE Standards Comm. • ASHRAE Tech Council • ANSI
a	Normative Annex A	Addendum *a* revises Section A3, "Water System Flow Diagram" to allow the program team the flexibility to determine what needs to be included in the flow diagram to manage the risk of *legionellosis* in the building water systems of health care facilities. It also removes the permissive language that was previously in the standard.	June 23, 2017 June 28, 2017 June 29, 2017
b	3; 4.2.1; 5.1; 6.1.3; 6.2.1; 6.2.2; 6.2.3; 6.2.4; 6.2.8; Figure 1; 7.1.2; 7.1.4; 7.2; 7.3.5.1; 7.5.1; 8.1; 9	Addendum *b* defines the term *construction documents*. It also revises multiple portions of the standard to remove permissive language and replace it with mandatory, code-enforceable language and removes a reference that is not used in the normative section.	June 23, 2017 June 28, 2017 June 29, 2017
c	Normative Annex A	Addendum *c* revises portions of Annex A that apply to health care facilities. The intent of these revisions is to replace permissive language with mandatory, code-enforceable language. Section A5.1 was changed to clarify as to when the designated team needs to reevaluate the *legionellosis* risk management plan.	June 23, 2017 June 28, 2017 June 29, 2017
d	4.1; 7.2.7; 8.4	Addendum *d* revises Sections 4, 7, and 8. Section 4.1, "Building Designer Requirements," now specifies that a building designer shall review the building design, and the requirement to survey a new building design has been removed. The requirement to delineate the height of either the discharge outlet or makeup valve relative to the overflow of the tower basin has been removed from Section 7.2.7, "Location of Cooling Tower Makeup Valve." The requirement for the designer to provide detailed instructions for the commission of all building water systems has been removed from Section 8.4, "Commissioning."	January 28, 2017 February 1, 2017 February 2, 2017
e	4	Addendum *e* modifies Section 4, "Compliance," to clarify that ASHRAE Standard 188 does not use or require compliance, training, or certification in any additional hazard analysis, risk assessment, or risk management methodologies.	June 23, 2017 June 28, 2017 June 29, 2017
f	4.3	Addendum *f* makes changes to Section 4.3, "Health Care Facility Requirements," to clarify the requirements for all buildings containing health care facilities.	January 20, 2018 January 24, 2018 January 25, 2018

* These descriptions may not be complete and are provided for informative purposes only.

Table D-1 Addenda to ANSI/ASHRAE Standard 188-2015 *(Continued)*

Addendum	Section(s) Affected	Description of Changes*	Approval Dates • ASHRAE Standards Comm. • ASHRAE Tech Council • ANSI
g	Informative Annex C	Addendum *g* revises Informative Annex C text regarding testing laboratories to be more generic to facilitate use of Standard 188 in both the United States and globally.	March 8, 2018 (ASHRAE)
h	3; 4; 4.3; 5.2; 6.2.5; 7.1.2; 7.2.1; 7.2.6; 7.2.7; 7.3.1; 7.3.5.3; 7.3.6; 7.4.1; 7.4.3; 7.4.4; 7.5.1; 8.1; 8.4; Normative Annex A	Addendum *h* adapts the text of Standard 188 to use code intended language to the fullest extent possible.	June 23, 2018 June 27, 2018 June 28. 2018

* These descriptions may not be complete and are provided for informative purposes only.

NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE website at www.ashrae.org/technology.

NOTICE

INSTRUCTIONS FOR SUBMITTING A PROPOSED CHANGE TO THIS STANDARD UNDER CONTINUOUS MAINTENANCE

This standard is maintained under continuous maintenance procedures by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. SSPC consideration will be given to proposed changes within 13 months of receipt by the Senior Manager of Standards (SMOS).

Proposed changes must be submitted to the SMOS in the latest published format available from the SMOS. However, the SMOS may accept proposed changes in an earlier published format if the SM`OS concludes that the differences are immaterial to the proposed change submittal. If the SMOS concludes that a current form must be utilized, the proposer may be given up to 20 additional days to resubmit the proposed changes in the current format.

ELECTRONIC PREPARATION/SUBMISSION OF FORM FOR PROPOSING CHANGES

An electronic version of each change, which must comply with the instructions in the Notice and the Form, is the preferred form of submittal to ASHRAE Headquarters at the address shown below. The electronic format facilitates both paper-based and computer-based processing. Submittal in paper form is acceptable. The following instructions apply to change proposals submitted in electronic form.

Use the appropriate file format for your word processor and save the file in either a recent version of Microsoft Word (preferred) or another commonly used word-processing program. Please save each change proposal file with a different name (for example, "prop01.doc," "prop02.doc," etc.). If supplemental background documents to support changes submitted are included, it is preferred that they also be in electronic form as word-processed or scanned documents.

For files submitted attached to an e-mail, ASHRAE will accept an electronic signature (as a picture; *.tif, or *.wpg) on the change submittal form as equivalent to the signature required on the change submittal form to convey non-exclusive copyright.

Submit an e-mail containing the change proposal files to:
change.proposal@ashrae.org

Alternatively, mail paper versions to:
ASHRAE
Senior Manager of Standards
1791 Tullie Circle, NE
Atlanta, GA 30329-2305

Or fax them to:
Attn: Senior Manager of Standards
404-321-5478

The form and instructions for electronic submittal may be obtained from the Standards section of ASHRAE's Home Page, www.ashrae.org, or by contacting a Standards Secretary via phone (404-636-8400), fax (404-321-5478), e-mail (standards.section@ashrae.org), or mail (1791 Tullie Circle, NE, Atlanta, GA 30329-2305).

FORM FOR SUBMITTAL OF PROPOSED CHANGE TO AN ASHRAE STANDARD UNDER CONTINUOUS MAINTENANCE

NOTE: Use a separate form for each comment. Submittals (Microsoft Word preferred) may be attached to e-mail (preferred), or submitted in paper by mail or fax to ASHRAE, Senior Manager of Standards, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: change.proposal@ashrae.org. Fax: +1-404-321-5478.

1. Submitter:

Affiliation:

Address: City: State: Zip: Country:

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I hereby grant ASHRAE the non-exclusive royalty rights, including non-exclusive rights in copyright, in my proposals. I understand that I acquire no rights in publication of the standard in which my proposals in this or other analogous form is used. I hereby attest that I have the authority and am empowered to grant this copyright release.

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All electronic submittals must have the following statement completed:

I *(insert name)*_____, through this electronic signature, hereby grant ASHRAE the non-exclusive royalty rights, including non-exclusive rights in copyright, in my proposals. I understand that I acquire no rights in publication of the standard in which my proposals in this or other analogous form is used. I hereby attest that I have the authority and am empowered to grant this copyright release.

2. Number and year of standard:

3. Page number and clause (section), subclause, or paragraph number:

4. I propose to: *(check one)*

[ ] Change to read as follows
[ ] Add new text as follows
[ ] Delete and substitute as follows
[ ] Delete without substitution

Use underscores to show material to be added (<u>added</u>) and strike through material to be deleted (~~deleted~~). Use additional pages if needed.

5. Proposed change:

6. Reason and substantiation:

7. Will the proposed change increase the cost of engineering or construction? If yes, provide a brief explanation as to why the increase is justified.

[ ] Check if additional pages are attached. Number of additional pages: _____

[ ] Check if attachments or referenced materials cited in this proposal accompany this proposed change. Please verify that all attachments and references are relevant, current, and clearly labeled to avoid processing and review delays. *Please list your attachments here:*

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

ASHRAE · 1791 Tullie Circle NE · Atlanta, GA 30329 · www.ashrae.org

About ASHRAE

ASHRAE, founded in 1894, is a global society advancing human well-being through sustainable technology for the built environment. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration, and sustainability. Through research, Standards writing, publishing, certification and continuing education, ASHRAE shapes tomorrow's built environment today.

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To ensure that you have all of the approved addenda, errata, and interpretations for this Standard, visit www.ashrae.org/standards to download them free of charge.

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