



**RISK
MANAGEMENT**
Consulting Health Scientists

Emerging Drivers for Legionella Risk Management

Abstract

Development of water management plans to reduce the risk of Legionella growth in buildings was mandated by the Centers for Medicare & Medicaid Services in June 2017 for certain types of healthcare facilities. Navigating the complexities of the referenced ASHRAE 188 industry standard can be challenging for facility owners and building engineers. Recent guidance from the Centers for Disease Control and Prevention provides a user-friendly seven step process for developing a Water Management Program using in-house resources and outside professionals to achieve compliance.

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Emerging Drivers for Legionella Risk Management

By Jacob Persky, MPH, CIH

Legionella in the Environment

Legionella is a genus of rod-shaped (bacilli) bacteria with at least 58 known species, of which 20 species are known to have the potential of causing disease in humans. One species, *Legionella pneumophila*, is thought to be responsible for about 90% of respiratory infections that are caused by *Legionella* bacteria. In nature, *Legionella* bacteria are found in fresh water aquatic environments worldwide at relatively low concentrations that typically do not present a health concern.

Key Points in this Article:

- Which facility types are required to comply with the new directive.
- How to build a multi-disciplinary water management team.
- The 7 elements of a Water Management Program.

Legionella in the Built Environment

When *Legionella* bacteria naturally present in a water supply system enter a building, the way that building heats, stores, circulates, and delivers water can sometimes create optimal habitat conditions for the *Legionella* bacteria to multiply (proliferation). This leads to *Legionella* colonizing a building water system and bacteria concentrations rising many thousands of times above the level in the incoming water supply, potentially exposing people to the *Legionella* in the water. Uses of water that create an airborne mist present the greatest risk of exposure. For *Legionella* to cause respiratory disease, the bacteria must be inhaled into the lungs. While swallowing water does not present a concern, incidental aspiration of *Legionella*-contaminated water during drinking can lead to exposure. The most efficient transmission mechanisms are those that expose people to easily inhaled aerosol mists.



Pools, hot-tubs, whirlpools, spas, and saunas can lead to exposure during bathing.



Decorative fountains can also expose passersby to drifting mist.



Centralized domestic hot water systems can lead to exposure during showering, bathing, or aspiration.



Cooling towers with inadequate drift eliminators can expose passersby to mist.

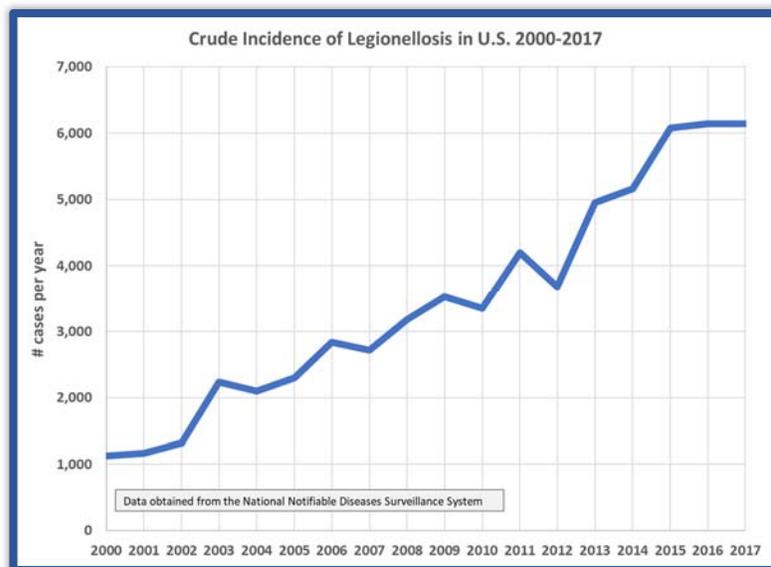


Disease Types

There are two types of disease attributed to *Legionella* bacteria: Pontiac Fever and Legionnaires Disease. Collectively, these two adverse health outcomes are termed Legionellosis. Pontiac Fever is a mild flu-like illness that is non-lethal. The Centers for Disease Control and Prevention (CDC) estimates that Pontiac Fever may develop in more than 90% of persons sufficiently exposed to *Legionella* bacteria. Pontiac Fever is thought to be medically underdiagnosed and resolves without antibiotic therapy. Legionnaires Disease is a more severe form of Legionellosis, which results in pneumonia and is potentially fatal. While less than 5% of persons exposed to *Legionella* develop Legionnaires Disease, the CDC estimates that 5-10% of these cases result in death. However, the death rate may be as high as 50% for susceptible populations, including the elderly or immune compromised, especially when diagnosis and antibiotic treatment are delayed.

Disease Rates on the Rise

In the U.S. during 2017, there were about 6,100 cases of Legionellosis reported to the CDC and it is estimated that the true incidence may have been much higher. Since 2000, the number of cases reported annually has trended upward. It is unclear whether this trend is due to broader hazard awareness,



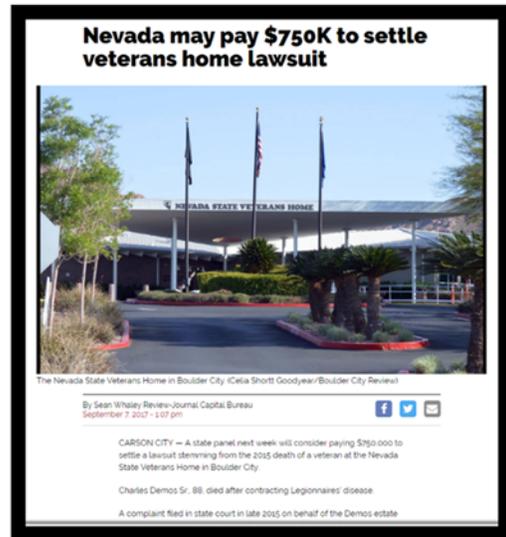
improved clinical diagnostic testing, increased case reporting, or greater susceptibility of an aging demographic.



Risks and Liability

Since its discovery in 1976 following an outbreak at a Philadelphia hotel hosting a namesake conference for the American Legion, Legionnaires' Disease has garnered national attention from the general public and stakeholders, including building owners, facility operators, medical professionals, risk managers, insurers, and attorneys.

Outbreaks of Legionnaires' Disease frequently make headline news and result in damage to reputation, loss of future business, and costly litigation. Newsworthy high-dollar demands or settlements ranging from hundreds of thousands to millions of dollars have graced news



headlines. Within the past year, news coverage of Legionnaires' Disease has implicated a casino resort in Las Vegas, a hotel in the UK, a VA hospital in Illinois, federal buildings in Canada, and the municipal water system for the city of Flint, Michigan. Often such claims are brought absent conclusive clinical and environmental evidence linking an individual's disease with the alleged site of exposure. Claims often proceed based solely on circumstantial evidence such as travel history for the two weeks prior to symptoms onset (incubation period).



Regulations and Standards

The best way to reduce potential risk and build a prevention program is to follow best practices, such as:

- Develop procedures to anticipate where potential *Legionella* hazards exist,
- Create processes to evaluate and manage high risk building water systems,
- Employ monitoring systems to recognize when *Legionella* proliferation conditions are occurring, and
- Be prepared to respond promptly to situations when *Legionella* proliferation is identified, or control-measures are out of range.

A variety of regulations and standards exist to provide guidance in developing site-specific best practices. Notable guidance recently published by ASHRAE® and approved by ANSI in 2015 is found in Standard 188, "*Legionellosis: Risk Management for Building Water Systems*." ASHRAE Standard 188 is a technical document that may be challenging for some building owners to implement without outside assistance. In June 2017, the CDC published an online toolkit, which provides a simplified 7-step process based on key elements of the ASHRAE Standard 188. Also in June 2017, the Centers for Medicare and Medicaid Services (CMS) issued a memorandum requiring certain facility types (hospitals, critical access hospitals, and long-term care facilities) to develop water management programs aimed at reducing the risk of Legionellosis attributable to healthcare facility water systems. The CMS memo references "consideration" of ASHRAE Standard 188 and the CDC toolkit as means for achieving compliance.



**World Health
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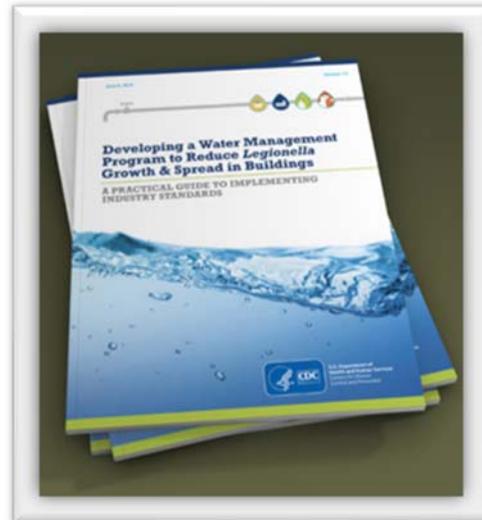


7 Elements of the CDC Toolkit

The CDC Toolkit presents a 7-step process to develop and implement a water management program.

1. Establish a water management program team.

The team should consist of management personnel with financial decision-making and risk management responsibilities, building engineering staff familiar with the mechanical systems, health care personnel or infection control practitioners, and outside vendors with specialized expertise such as water treatment contractors or industrial hygiene consultants.



2. Describe the building water systems using text and flow diagrams.

It is important to understand how water flows through the facility from point of entry to sewer discharge, and all the ways that it is heated, treated, circulated, and used. Diagramming the water flow pathways with software tools like Microsoft Visio or Publisher are great ways accomplish this step.

3. Identify areas where *Legionella* could grow and spread.

Once the water flow pathways have been mapped, it is easier to review which building water systems present risk factors for *Legionella* proliferation. Identify these areas and hierarchically rank them based on factors such as water holding temperature, disinfectant use, stagnation (low flow), and exposure potential for the end user. Then set parameters to control each of these factors and establish corrective action responses if conditions deviate.



4. Decide where control measures should be applied and how to monitor them.

Decide which of the control points identified in the previous steps require control measures, and then set limits for target parameters. Decide how to monitor your control measures as well. For example, if a building has hot water storage tanks with analog thermostats and no thermometers attached to the output piping, the building owner may elect to install networked digital thermostats that data-log to a centralized computer system and alert maintenance staff if temperatures fluctuate outside of target parameters.

5. Establish ways to intervene when control limits are not met.

When conditions deviate from nominal, it is critical to have an action plan that describes what steps to take. Be prepared and develop response actions in advance for each control point. The CDC toolkit provides 3 example scenarios for application of corrective actions and 3 additional scenarios for contingency response to unexpected upset conditions, such as a water main break.

6. Make sure the program is running as designed and is effective.

Verification and validation are key elements of a water management program. Verification steps are designed to ascertain whether "we are doing what we said we would do." For example, a verification step may include checking records to ensure that temperature readings or disinfectant concentrations were recorded at the frequency stated in the written program. Validation steps are designed to ascertain whether the program is working as intended. This may involve collection of water samples for laboratory analysis to determine whether *Legionella* is present, and if so determine what the concentration and positivity rate is for each building water system. Periodic water testing results are an important part of understanding whether the plan is working or requires additional modifications to achieve the desired level of risk management.

7. Document and communicate all the activities.

Documentation is key to implementing a water management program in a defensible manner. The written program should include names, job titles, and roles of individuals on the water management team. Data for parameters



subjected to control limits may be archived. Water testing records and laboratory reports should be organized and accessible. As the CDC toolkit mentions, "You have worked hard to develop your water management program and you have carefully documented all aspects of it. Resist the temptation to put it on a shelf and walk away." An effective program requires continuous program review.

Managing the Risks

Increased attention on *Legionella* hazards requires risk managers to reconsider water management practices for their facility. While healthcare and other facilities with at-risk populations are mandated to develop water management programs, the risks are not negligible for other facility types. Considering the spike in reported incidence of Legionellosis and the accompanying media attention and litigation it has attracted, risk managers for facilities that have less at-risk populations, but have centralized domestic hot water systems, pools and spas, decorative water features, or cooling towers may also consider implementing a water management program using best-practices guidelines. While the cost of implementing and continually operating a water management program is not trivial, it should be viewed as both the proper approach and a cost-savings measure, when compared to the liabilities incurred in the unfortunate event of a building-related case of Legionellosis.

Take a few minutes and begin the process by completing the one-page survey in the CDC toolkit to determine whether your facility has key risk factors.¹ If risk factors are present, decide whether a water management program is right for your facility, and if so, start building your water management team of internal stakeholders and outside professionals. If you need help guiding your team through the process, the CDC has provided some excellent points to consider when hiring an outside consultant.²

¹ <https://www.cdc.gov/legionella/downloads/toolkit.pdf>

² <https://www.cdc.gov/legionella/maintenance/consultant-considerations.html>



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About RHP Risk Management

[RHP Risk Management](#) is a leader in the field of Industrial Hygiene and Occupational Safety. We specialize in the evaluation of exposures to chemicals, noise, vapors, hazardous materials, and biological contaminants, in your workplace and in our state-of-the-art Exposure Simulation Laboratory.

Our staff of Certified Industrial Hygienists and occupational health specialists have extensive experience identifying hazards, measuring exposures, evaluating risks, and formulating solutions that are legally defensible and anchored in reliable scientific methods. We have an established reputation with a wide variety of industry sectors for responsiveness and quality service that provides peace of mind to our clients.