



Water Talk

ASHRAE Standard 188P; Prevention of Legionellosis in Building Water Systems

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INTRODUCTION

Two dreaded words no facility manager wants to hear: Legionnaires' disease. The mere mention evokes haunting images of the 1976 American Legion Convention in Philadelphia at which 220 became ill and 30 died. No one wants the stigma of *Legionella* bacteria associated with their building. Just one case of Legionnaires' disease can shine an unwanted spotlight on a building's water system and wreak havoc by creating negative publicity, disruptive emergency disinfection, damaged reputations, diminished property values, legal liability and potentially huge expense.

According to a Centers for Disease Control and Prevention (CDC) report released in August 2011, over the past 10 years, Legionnaires' disease cases have increased by 217 percent. That translates to 18,000 to 20,000 cases annually in the United States. Of those cases, 10 to 30 percent were fatal. Additionally, according to published research, up to 70 percent of all building water systems are contaminated with *Legionella*, the bacteria that cause Legionnaires' disease (a serious but preventable form of pneumonia), as well as Pontiac Fever, a flu-like illness. Pontiac Fever was the pathogen responsible for sickening more than 200 people in the widely reported outbreak at the Playboy mansion.

Together, these two diseases are called Legionellosis. Occupants in buildings can become

ill when they ingest or inhale water or aerosols contaminated with *Legionella*. In a health care setting, it can also be transmitted through respiratory devices. Although anyone at any age can contract Legionellosis, the people most at risk are smokers, the elderly, and individuals with impaired immune systems.

Legionella guidelines have been around for years, but currently there is no consensus on the best industry practices to follow for prevention and control of Legionellosis. Making matters worse, many recommendations in existing guidelines are backed by little or no scientific evidence. Some of these ineffective practices are labor-intensive, costing facility managers wasted time and money. To respond to this growing threat to public health, the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) will release *ASHRAE Standard 188P: Prevention of Legionellosis Associated with Building Water Systems*. This new standard will require that facility managers implement stronger safeguards through pro-active risk assessment and risk management practices.

ASHRAE STANDARD 188P, written by engineering, microbiology, disease prevention and water treatment experts, provides a comprehensive set of practices that facility managers can follow, to help prevent Legionellosis. The standard specifies uniform practices for risk assessment and management. It covers potable water systems; cooling towers and evaporative condensers; whirlpool spas; decorative fountains; other water features; and aerosol-generating air coolers, humidifiers, and washers.

Facility Manger Responsibilities

Determining responsibility for water safety in buildings has historically been murky. It typically falls somewhere among the building owner, the facility manager and a water treatment company. ASHRAE STANDARD 188P lays the responsibility for water safety squarely at the feet of those responsible for the water systems. That means everyone associated with design, construction, installation, ownership, operation, management, and maintenance are required to ensure building water systems are designed, maintained and operated in a manner that minimizes the risk of Legionellosis. There is no question that the new standard puts facility managers on the front line of Legionellosis prevention.

ASHRAE Standard 188P applies to water systems in human-occupied buildings — new and existing. Single-family residential homes are exempt. To comply with the standard, facility owners and managers will be required to do an annual survey of their buildings, on a building-by-building basis, to determine risk characterization. If a building possesses one or more of the risk characteristics set out in the standard, it will be necessary to develop a risk management plan for *Legionella* control. This includes conducting an evaluation using Hazard Analysis Critical Control Point (HACCP) methodology, documenting water system operation and maintenance, and verifying monitoring and control.

ASHRAE Standard 188 also requires validating that *Legionella* is under control in all water systems. These include: potable and utility water systems for water used for drinking, cooking, washing, bathing, and also water emitted from plumbing fixtures, cooling towers, boilers and other HVAC-related equipment.

Annual Survey to Determine Risk Characteristics

There are specific building characteristics that allow *Legionella* to colonize building water systems. Facilities at high risk for *Legionella* include healthcare facilities, such as hospitals and nursing homes. An increasing number of cases have been reported from assisted-living and long-term care facilities.

Under the new standard, facility managers are charged with conducting an annual survey to determine what risk is present in their buildings. Specific risk factors called out in the standard are:

- multiple housing units with one or more centralized water heaters
- more than 10 stories (including levels below grade)
- cooling tower or evaporative condenser
- one or more whirlpools or spas within or adjacent to building
- devices that release aerosols (e.g., ornamental fountains, misters, air washers or humidifiers)
- incoming potable water containing less than 0.5 ppm residual halogen such as chlorine
- inpatient health care facility
- occupants primarily older than age 65
- occupants receiving chemotherapy for cancer or bone marrow transplantation.

If a facility manager determines that at least one of these risk factors is present, then a risk management team must be assembled to prepare and implement a HACCP plan designed to prevent the threat posed by *Legionella* bacteria.

What facility managers should know about Standard 188P and HACCP

ASHRAE Standard 188 is modeled after HACCP — a tool used to determine, plan and protect against risks found in a variety of industries, from manufacturing to food service. It is a method employed to improve quality and safety. In the food industry, it is employed to prevent disease from infectious organisms transmitted into food and water. The effectiveness of this approach for assessing the hazards of *Legionella* in building water systems is yet to be proven, but it nevertheless provides a structured course of action aimed at reducing risk for waterborne pathogens.

Responding to *Legionella* in your water system will require a team effort. ASHRAE recommends that the first step is to convene a risk management team consisting of a combination of employees, suppliers and consultants. Who is on the team is more important than the number of members. Nevertheless, ASHRAE requires at least one person who is familiar with HACCP principles and one person that understands the building water systems. An optimal team might consist of someone in your organization with knowledge of safety and health issues, a representative from your water treatment company, a *Legionella* risk management professional and a laboratory with *Legionella* expertise.

Once the team is established, its task is to conduct a hazard analysis of the building's potable and utility water. From these hazard analyses, two separate diagrams will be created. These diagrams will identify control points; determine critical control points; establish monitoring procedures and corrective actions; verify that *Legionella* is controlled; and create documentation concerning all procedures and records appropriate to these principles. ASHRAE specifically requires that for every critical control point (i.e., where the presence of *Legionella* bacteria is of most concern), the team must address four issues about the hazard control method being applied:

- (1) critical control limit of *Legionella* bacteria,
- (2) hazard control monitoring method,
- (3) frequency of monitoring hazard control, and
- (4) corrective actions to be taken if the critical control limit is exceeded.

HACCP Documentation

ASHRAE STANDARD 188P requires a written, comprehensive, prevention plan. The HACCP documentation should include process flow diagrams, hazard analysis summaries, the monitoring schedule, equipment device maintenance schedules, validation summary, verification schedule and planned responses to disruptions in water services.

The written plan should include procedures for maintenance of each potable or utility water device identified in the process flow diagrams; cleaning and disinfection before commissioning any new system; restarting safely after a drained shutdown or any unplanned loss of energy; treatments following water supply interruption or breaks in water supply piping; and the method and frequency of temperature measurements in the water heaters and in the distribution system. In addition, facility managers must identify conditions that could allow cooling tower exhaust (drift) to infiltrate buildings and develop water treatment procedures to control *Legionella* in cooling towers and evaporative condensers. Other aerosol-generating equipment (decorative fountains, misters, air coolers, humidifiers, and air washers) that disperse small water droplets into the air also require procedures to guard against the amplification and dissemination of *Legionella* bacteria.

Monitoring, disinfection and legal considerations

Monitoring for *Legionella* is the key to prevention. Testing your water system is the only way to confirm the presence of *Legionella*. Studies show

there are no substitutes for testing — including the temperature, chlorine, and disinfectant residual — that can predict the presence or absence of *Legionella*. For example, total bacterial counts aren't predictive of the presence or absence of *Legionella*. Simply put, if you don't test, you don't know. Leading experts in the detection and remediation of *Legionella* have recommended culturing water to assess risk and to verify the efficacy of disinfection.

Disinfection

If a Legionnaires' disease or Pontiac fever outbreak is suspected to have originated from your water system, ASHRAE STANDARD 188P requires disinfection. Chemical and thermal systems or a combination are recommended. Selecting a disinfection method that works best requires analysis based on efficacy, cost, installation and maintenance. No disinfection technique can be successful without a conscientious monitoring program and a committed staff. If a disinfection system is installed, *Legionella* site positivity and disinfectant concentrations need to be routinely monitored — often for the life of the system.

Legionella Expertise Recommended

While the standard goes a long way in providing guidance to control *Legionella*, it is by no means an exhaustive guide for effective prevention and disinfection. According to some industry experts, some of the methods of disinfection mentioned in the standard are of questionable effectiveness in controlling *Legionella*. Given that Standard 188P requires that the risk assessment team include persons knowledgeable in *Legionella* and HACCP, this may require seeking outside consultation with professionals. One useful place to start is by seeking the guidance from current publications and sources such as www.legionella.org.

Where ASHRAE Standard 188P is adopted in building codes, it will have the force of law. Even where not formally made part of a code, standards such as this are often argued to establish best practices for the industry. Compliance with a standard can assist in establishing compliance with the industry standard of care. Conversely, if compliance is not attempted or achieved, you can expect that a plaintiff will argue that the defendant(s) could have acted to prevent the injury but chose not to do so.

While the increased accountability contained in Standard 188P will call for increased risk management, compliance with these measures should translate into greater protection from accusations of negligence in those instances where illness or death is alleged to have occurred. Facility managers following guidelines issued by organizations other than ASHRAE may want to do more research or seek assistance on how to develop, implement, and maintain your plan to comport with ASHRAE Standard 188. In addition, using both an accredited and CDC-ELITE (Environmental Legionella Isolation Techniques Evaluation) certified lab for *Legionella* testing can give you the confidence your treatment methods are capably performed and save you time and money. Overall, the new ASHRAE standard gives facility managers the basic steps they need to implement a plan to control *Legionella* while saving lives and avoiding the time and expense of contentious claims and litigation.

Impact of Standard 188 on Legal Liability
