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## Developing a Water Plan

# What's Proposed in Legionella Standard

By Matthew R. Freije, Member ASHRAE

**E**ach year 8,000 to 18,000 people in the U.S. are hospitalized with Legionnaires' disease, which can be fatal in 5% to 30% of all cases, according to the Centers for Disease Control and Prevention. The culprit is *Legionella*, which also can cause a less severe illness called Pontiac fever. Essentially all cases of both illnesses (legionellosis) are the result of exposure to *Legionella* associated with building water systems.

Proposed ANSI/ASHRAE Standard 188P, *Prevention of Legionellosis Associated with Building Water Systems*, requires a *Legionella* hazard analysis and critical control point (HACCP) water plan for hospitals, nursing homes, office and apartment buildings, hotels, and other buildings with 10 or more stories, centralized water heaters, or an incoming water supply with a chlorine concentration of less than 0.5 ppm. The standard, which is expected to be released later this year, will also require HACCP principles in the maintenance of cooling towers, whirlpool spas, ornamental fountains, misters, air washers, and humidifiers.

Responsibility for complying with the new ASHRAE standard will fall primarily on building owners and operators but will also affect architects, engineers, contractors, and water treatment companies. Standard 188 is the first ANSI/ASHRAE standard to address *Legionella*, and it is the first consensus-based standard that has broad support of government agencies, experts and industry groups.

### What is an HACCP Water Plan?

The HACCP process has been used for years in the food industry, and since

2007 has been advocated by the World Health Organization in managing building water systems for the control of *Legionella* bacteria.<sup>1</sup>

Developing and implementing a *Legionella* HACCP water plan boils down to identifying points and processing steps for all building water systems, establishing control measures at points where they can and should be applied, verifying that the control measures are implemented within specific performance limits, and validating that the plan is effective in preventing Legionnaires' disease.

Standard 188 will require that the *Legionella* HACCP water plan include a list of all water systems and at least two flow diagrams: one for potable (domestic) and one for nonpotable (utility) systems. For systems having the potential of harboring and transmitting *Legionella* bacteria, control measures must be outlined at critical control points.

As an example, consider a hotel property with four 15-story towers, two swimming pools, four hot tubs, three water features, one cooling water system (four cooling tower cells and four chillers), as well as fire protection, heat-

ing hot water, and irrigation systems. The owner needs only one *Legionella* HACCP water plan, assuming all four buildings are on the same campus, served by the same water supply, and managed by the same personnel. The points (e.g., points of building entry) and processing steps (e.g., domestic water heaters) for the water systems need to be listed in hazard analysis summaries and illustrated in flow diagrams.

Control measures would be established at locations in the building water systems determined to present a significant potential for *Legionella* growth and transmission, as well as an opportunity for *Legionella* control. These are called critical control points.

Specific control limits (e.g., chlorine concentration in a decorative fountain) must be established for each control measure, along with a monitoring method and frequency for checking to see if the control limits are within the target range. Corrective action needs to be specified to bring unacceptable control limits within range. All the measures need to be documented and the documentation checked periodically by the person responsible for verifying implementation. Finally, the overall effectiveness of the plan in preventing Legionnaires' disease would have to be validated.

### Standard 188 & Legionnaires' Disease

Lawsuits related to Legionnaires' disease occur in part because when someone contracts Legionnaires' disease, it is nearly certain that a contaminated water system is the source of *Legionella* bacteria that caused it.

Assuming Standard 188 leads to increased implementation of *Legionella* preventive measures, it will decrease the number of lawsuits because fewer people will contract the disease. Scientific literature is replete with reports of reasonable control measures and disinfection technologies that successfully reduced *Legionella* positivity and concentrations in water systems and

subsequently prevented new cases of Legionnaires' disease associated with those systems.<sup>2-7</sup>

Consider whirlpool spas (hot tubs). Outbreak investigators found spa-related Legionnaires' disease was linked to poor maintenance,<sup>8</sup> leading to the development of guidelines for maintenance of spas. The Health Protection Agency in London reported in 2006 that every spa it investigated in connection with Legionnaires' disease was not maintained according to its guidelines.<sup>9</sup>

ASHRAE Guideline 12-2000, *Minimizing the Risk of Legionellosis Associated with Building Water Systems*, states that, in surveys of spas, *Legionella* has been found only when disinfectant levels were not maintained adequately.<sup>10</sup> Therefore, adhering to the requirements of Standard 188 could have a profound effect on reducing Legionnaires' disease.

### Saving Money Using Standard 188

Standard 188 can be cost effective if it is properly implemented.

The Centers for Disease Control and Prevention (CDC) reports that *Legionella* is the number one cause of waterborne disease outbreaks in the United States and is the most expensive.<sup>11,12</sup> The average cost of a hospital stay associated with Legionnaires' disease, per 2007 Medicare data, was \$86,014.<sup>13</sup> Direct health-care costs for the disease run from \$101 to \$321 million annually, according to the CDC.<sup>12</sup> Adding indirect

costs for lost employee work time and productivity brings the estimated total to more than one billion dollars per year.<sup>14</sup>

Litigation can be another cost associated with Legionnaires' disease. And, loss of business resulting from media attention and bad word-of-mouth can be crippling; some hotels have shut down permanently following an outbreak.

For building owners, the cost of applying the standard includes establishing a *Legionella* HACCP water plan, implementing the control measures in the plan, and validating that the plan is effective in preventing Legionnaires' disease.

The cost of getting a HACCP plan varies depending in part on whether the building owner gathers some of the water system data himself or hires an outside vendor to do the work. But, in either case the cost will not be excessive. Moreover, developing the HACCP plan will be a one-time expense, other than some costs for periodic updating.

Implementing the plan's control measures may increase maintenance budgets for some buildings; However, these are primarily to initiate measures that should have been in place beforehand. It's unreasonable to blame Standard 188 for increased costs associated with bringing maintenance up to par.

Validating that the HACCP plan is effectively preventing Legionnaires' disease doesn't need to be costly. Although testing water for *Legionella* might be an appropriate validation method for some facilities, Standard 188 will not require it.

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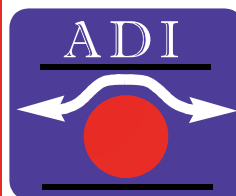
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How much will Standard 188 ultimately cost net of maintenance that should have been done anyway? And, how much will it ultimately save in medical care and other costs? In five to 10 years, data might be available to answer those questions with fairly good accuracy.

### References

1. WHO. 2007. "Legionella and the Prevention of Legionellosis." World Health Organization.
2. Shelton, B.G., G.K. Morris, G.W. Gorman. 1993. "Reducing risks associated with *Legionella* bacteria in building water systems." In Barbaree, J.M., R.F. Breiman, A.P. DuFour, eds. *Legionella: Current Status and Emerging Perspectives*.
3. Shelton, B.G., W.D. Flanders, G.K. Morris. 1994. "Legionnaires' disease outbreaks and cooling towers with amplified legionella concentrations." *Current Microbiology* (28):359–363.
4. Stout, J., V.Yu. 2003. "Experiences of the first 16 hospitals using copper-silver ionization for *Legionella* control: Implications for the evaluation of other disinfection modalities." *Infection Control and Hospital Epidemiology* 24(8):563–568.
5. Sidari, F., et al. 2004. "Keeping *Legionella* out of water systems." *Journal AWWA* 96(1):111–119.
6. O'Loughlin, R.E., et al. 2007. "Restaurant outbreak of Legionnaires' disease associated with a decorative fountain: An environmental and case-control study." *BMC Infectious Diseases* (7):93.
7. Zhang, Z., et al. 2009. "*Legionella* control by chlorine dioxide in hospital water systems." *Journal American Water Works Association* 101(5):117–127.
8. Modi, A., Gardner, J., Lighton, L., Coetzee, N. 2008. "Pontiac fever outbreak associated with a spa-pool, United Kingdom, April 2008." *Eurosurveillance* (13):7–9.
9. HPA. 2006. "Management of Spa Pools: Controlling the Risk of Infection." Health Protection Agency.
10. ASHRAE Guideline 12-2000, *Minimizing the Risk of Legionellosis Associated with Building Water Systems*.
11. CDC. 2008. "Surveillance for waterborne disease and outbreaks associated with drinking water and water not intended for drinking—United States, 2005–2006." *MMWR Surveillance Summaries* 57(SS09):39–62. Centers for Disease Control and Prevention. [www.cdc.gov/mmwr/preview/mmwrhtml/ss5709a4.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5709a4.htm).
12. CDC. 2010. "Waterborne diseases could cost over \$500 million annually in U.S." Centers for Disease Control and Prevention. [www.cdc.gov/media/pressrel/2010/r100714.htm](http://www.cdc.gov/media/pressrel/2010/r100714.htm).
13. NARA. 2008. "Proposed changes to the hospital inpatient prospective payment systems and fiscal year 2009 rates." National Archives and Records Administration. *Federal Register* 73(84):23553–23554.
14. McCoy, W., W. Pearson. 2011. "ASHRAE Standard 188P: Prevention of legionellosis associated with building water systems." *Proceedings of the Water Quality Technology Conference and Exposition*.

Matt R. Freije is the founder and president of HC Information in San Diego and instructor for the online training program, "Preparing to Develop a Legionella HACCP Water Plan." ■

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