Legionella Water Management Planning Overview

by

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The following article is submitted to NAHLE for reprint in ***Lodging Engineer***. This document is originally submitted and intended as a supplement to our Educational Training programs Certified Chief Engineer (CCE) and Certified Director of Engineering (CDOE).

This section is provided as a tool to help you meet minimum safety levels for water within a hotel setting and provide a safe and clean environment for your guest and employees in controlling and preventing exposure to water borne pathogens. Swimming pools and spas should be maintained, treated and tested on-site by qualified personnel in accordance with safe practices as required by your local building and safety departments, jurisdiction having authority, and any requirements prescribed by your hotel's management and ownership teams. This appendix section is provided as an overview for learning about additional safeguards and testing protocols to consider when administering a water management program to reduce disease risk.

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FORWARD:

While there is no single or simple blueprint for a universal water management program, the ANSI/ASHRAE Standard 188: Legionellosis Risk Management for Building Water Systems provides what is needed, along with invaluable guidance. It has become the "standard of care" for owners of buildings with complex water systems and/or water features known to be associated with the potential to cause Legionnaires' disease through the generation of fine mist of water droplets contaminated with (Legionella) bacteria. Legionnaires' disease is a form of bacterial pneumonia which kills one in ten people who are diagnosed with it. The same process and components of an ASHRAE Standard 188 water management program (WMP) can be used to identify and control the risk from other waterborne pathogens as well, such as E. coli and Pseudomonas aeruginosa.

What Contaminants Should You Consider?

First and foremost, follow any state, local or other authorities having jurisdiction (AHJ) regulations. For example, many jurisdictions require specific frequencies of monitoring and recording pool & spas disinfection and pH levels. They may also require periodic microbial testing.

Bacteria are in the hotel water system from the municipality supplied or other water source provider, as well as from biofilm contamination of the water once it's on the property (in the building). Both routes should be considered in the Water Management Program. While fecal contamination may very occasionally stem from the distribution system, it is most often a concern in swimming pools, where contamination can be caused by pool users. Similarly, Pseudomonas aeruginosa typically enters the building water system through individuals' skin contact with surfaces or water. Legionella pneumophila is a naturally occurring environmental bacteria in many types of source waters, generally in very low, even non-detectable levels. Thus, it may be present in the distribution system water, particularly after pressure-related or other water quality disturbance events such as main breaks or construction. However, both Legionella and Pseudomonas only grow to concentrations which create a health risk once they are in building water systems and find a favorable habitat of warm water temperature, biofilm and/or insufficient disinfectant levels – thus, why these need to be and can be "managed".

For pools and spas, the World Health Organization suggests considering periodic monitoring of these microorganisms:

- Heterotrophic plate count (HPC) a measure of overall bacteria
- E. coli or thermotolerant coliforms, indicators of fecal contamination
- Pseudomonas aeruginosa, cause of "swimmer's ear" and "hot tub rash"
- Legionella, cause of potentially fatal Legionnaires' disease

From a public health standpoint, for non-pool and spa water, Legionnaires' disease is the primary concern in hotel settings. Both potable water and nonpotable water elements of the water system should be assessed for Legionella risk.

Who Should Develop Your Water Management Plan?

ASHRAE Standard 188 and the Centers for Disease Control & Prevention (CDC) Toolkit recommend establishing a Water Safety Management "Team" to develop and oversee the ongoing implementation and validation of the Water Management Program.

Collectively, the Water Safety Management Team (members) should bring the following skills (and authority) to the Water Management Program:

- ✓ Ability to oversee program implementation and authority to make cost decisions
- ✓ Knowledge of the building/facility water systems
- ✓ **Ability to identify Legionella control: locations, strategies, limits & corrective actions**
- ✓ Ability to monitor and document performance (is the program being followed)
- ✓ Ability to confirm program performance (is the program working to control the risk)
- ✓ Ability to communicate regularly about the program (internal and external communications)

Hiring a consultant with prerequisite expertise may be needed or helpful for the initial development and/or implementation of the Water Management Program. However, it is essential that hotel management and staff be active members of the Water Safety Management Team. The process requires specific knowledge of the systems and "ownership" of Team activities and functions cannot be completely outsourced.

The CDC suggests considering the following factors when hiring a consultant:

- **Level of experience:** For example, what kind of *Legionella*-specific credentials and experience do they have – particularly the consultant?
- **Laboratory expertise:** For example, is the laboratory they use or recommend accredited for environmental testing?
- **Environmental assessment expertise**: For example, how much experience does the company have with environmental assessments and/or sampling for *Legionella*?
- **Remediation expertise:** For example, how frequently does the company provide remediation services and can they describe situations where they remediated *Legionella* from a building water system in a facility of your size/type?
- **Water management expertise:** For example, how much experience does the company have creating water management programs compliant with industry standards for a facility of your size/type?
- **Knowledge of codes, standards, and regulations:** For example, does the company have previous experience working in your state and/or jurisdiction?
- **Potential conflicts of interest**: For example, does the company have interest in promoting specific services or products?

How Should You Create and Implement the Plan – after (#1) forming the TEAM?

2. Describe the water system/Cooling tower: using simple text or diagrams, describe the system to be managed, flows of hot and cold water, return loop systems, where water enters the building or tower, etc.

Engineering drawings are not required and often not helpful in this process. It is most important to have a schematic which clearly and accurately illustrates the flows of water through the facility and can be easily understood by all members of the team.

3. Identify areas of risk: such as stagnant water areas, areas where high risk populations reside, where water use could create aerosolization or where there could be a low disinfectant residual.

Every hotel and building may be different, with different water flows. You should specifically identify the risk areas of your building(s). The following area of a hotel or resort are particularly important to consider because they create opportunities for contaminated water to become aerosolized and for hotel guests or employees to breathe in contaminate moist air and become infected:

- ✓ Faucets and shower heads
- ✓ Spas and whirlpool tubs
- ✓ Decorative fountains
- ✓ Sprinklers
- ✓ Ice machines
- ✓ Cooling towers and evaporative condensers
- ✓ Humidifiers

4. Decide where to apply control limits: what is the hot water temperature in storage tanks and delivery locations, what level of disinfectant is monitored (being achieved) to control *L. pneumophila,* or other target pathogens to a pre-determined acceptable level.

Identify initial (fix-it actions) to reduce risks. For example, removal of water stagnating "dead legs" or no-flow water sources, such as a deteriorated pipe that is capped and unused – allowing accumulated water to promote biofilm growth and contaminate other parts of the water system.

Also, be cognizant and implement on-going controls (for example) to:

- Keep water temperatures outside the favorable range for *Legionella* growth. "KEEP the Hot water HOT and KEEP the Cold water COLD!"
- Ensure adequate disinfection. Flush programs can be set up, particularly during periods and in areas of low occupancy or use,
- Maintain devices to prevent biofilm, scale, corrosion, which provide a habitat and nutrients for *Legionella pneumophila.* Typically, this requires treatment programs for cooling towers, pools, spas, fountains, etc.

5. Monitor & Corrective Actions: determine what will be done if verification testing indicates a part of the system is out of control limits; have a documented action plan.

For example, if a weekly visual inspection of a decorative fountain reveals slimy growth, the corrective action could be to drain the fountain, clean it per the manufacturer's recommendations, refill the fountain and test the disinfectant residual. Or, for example, if a floor is unoccupied during

a renovation, increase flushing from weekly to daily and institute daily checks of water temperature and disinfectant residual.

The Corrective Action plan should also clearly identify the steps to follow when a water feature or area of the building does not meet the standard in the plan, for example, temperatures or disinfectant were not at sufficient levels. It should also specify who in the Water Safety Management Team and within the hotel management structure should be notified for specific incidences of the water not being "in control".

6. Verification and Validation: verification testing monitors control limits such as water temperature, disinfectant levels to determine if a Program is being implemented as designed; Validation testing determines if the Water Management Program is effectively controlling the pathogen *L pneumophila*, *P. aeruginosa*, etc. by testing water samples from the building/spa/cooling tower for the presence of the pathogen.

Verification confirms that the activities of the Program are being done, aka an internal audit. For example, for the pool and spa, checking the logbooks to see:

- ✓ Were chlorine checks performed and documented?
- ✓ Were monitoring results as expected and, if not, were pre-determined corrective actions taken?

Validation ensures your Water Management Program is successfully controlling the hazard (waterborne pathogen exposure). Focused validation testing on the pathogen of highest risk, in the case of managing Legionnaires' disease, is *Legionella pneumophila.* Sampling should be done using fixed sample sites, regular timing (monthly, quarterly) and a consistent sampling process for each site. For example, procedures such as collecting 100 mL samples, first draw from showers, collection in vessels with sodium thiosulfate, etc. should be followed. Samples should be sent to an accredited laboratory for analysis with a validated method.

The Water Management Program should have various levels of action based on results of validation testing and those actions should clearly describe what the Team must do if the limits of bacteria (i.e. *L. pneumophila*) indicate the system is out of compliance. For example, should a cooling tower be shut down and remediated? Should senior management be notified? At what level of contamination should the local health department be notified?

Validation data that drives decision-making must be reliable both to ensure dangerous conditions are not overlooked and to ensure corrective actions are actually required and avoid unnecessary cost and risk for building owners. To ensure data reliability, the Water Safety Management Team should follow ASHRAE Standard 188, Appendix C guidance and contract with a laboratory accredited to one or more nationally recognized ANSI or International Standards Organization (ISO) standards such as: ISO 17025, AIHA/EMLAP or the TNI Standard.

7. Documentation: all good Water Management Programs are well-documented, with emphasis given to documenting verification and validation testing[i]

Thorough documentation of the Program and of the on-going implementation and review of the Program are essential. First, hotel and resort facilities are constantly changing, with renovations, equipment changes and new personnel – as well as a constant (daily) influx of new clients. Second, the Water Safety Management Team will learn from the process of implementing, verifying and validating the Program and will improve the Program. These changes need to be added and the Program documents updated. Finally, in the event the hotel is ever under scrutiny or the object of litigation, the documentation of the Team's activities and response to their verification and validation results will play a key role in any findings.

Conclusion

Proactive management of your hotel's water systems to minimize disease risk is an essential part of protecting your guests' and employees' health and well-being. A well-articulated, "right-sized" Water Management Program developed by an interdisciplinary team with the required experience and firsthand knowledge of the property is the first step. Carefully implementing and updating that program, including testing to ensure the program is effective, and documenting your actions at every step is your best protection of your patrons and your business.

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[i] US Centers for Disease Control and Prevention (CDC), Federal Guide, 2017, *Developing a Water Management Program to Reduce Legionella Growth & Spread in Buildings.* Version 1.1

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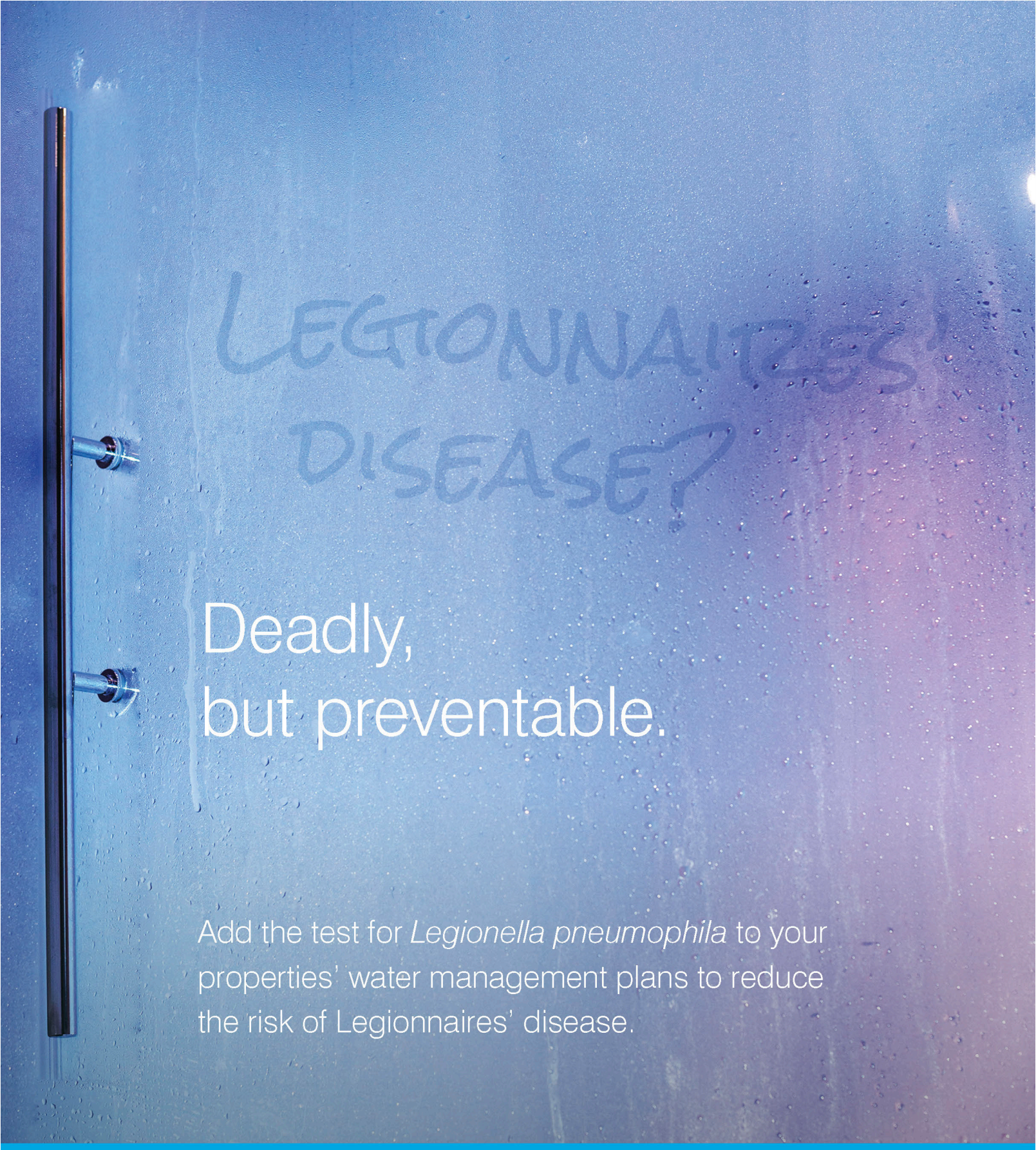

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