ABSTRACT: The first U.S. standard for the prevention of Legionnaires’ disease was published by the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) on June 26, 2015. The normative sections of the standard include development of a Water Management Plan for building water systems and devices including open and closed circuit cooling towers and evaporative condensers. ASHRAE Standard 188 is a process standard and critical decisions are left to the discretion of the Water Management Team. Information will be shared to help inform these decisions so that they are evidence-based and defensible.

INTRODUCTION

ANSI/ASHRAE Standard 188-2015 Legionellosis: Risk Management for Building Water Systems is a good step in preventing Legionnaires’ disease in building water systems. However, the standard provides only minimum requirements and compliance would not insure Legionella control. Building owners are presented with a framework for a risk management approach to the prevention of Legionellosis, but are left to rely on their own judgment and knowledge in deciding the most appropriate course of action. This gap between the understanding of the how, what and why of compliance, and the creation of an effective Water Management Program could leave building owners vulnerable to liability claims if cases occur. At the end of the day, building owners could develop a plan without Legionella control.

IMPLEMENTING THE STANDARD

Compliance is based on defining water systems in buildings, determining if they are covered by the standard, and going through risk management steps in the standard, but not necessarily demonstrating the effectiveness of the plan in controlling Legionella. This represents a critical "gap" that could be closed with in-depth knowledge and decision-making. ASHRAE has placed the standard on "continuous maintenance" providing a mechanism for changes throughout this process that could address these “gaps” in future iterations of the standard.

The plan must include confirmation that the Program effectively controls the hazardous conditions throughout the building water systems. Practically speaking, the “hazard” is growth and exposure to Legionella bacteria in the building water systems and subsequent risk of illness. A Water Management Team is formed to develop and implement the Water Management Program for Legionella control in the building water systems. The standard tells the team what to do, but provides little specific information on how to successfully control Legionella in building water systems. Reliance on evidence-based decisions validated from peer-reviewed scientific investigations will strengthen the effectiveness of the Team and defensibility of the Program and close the “gaps.”
THE “GAPS”

Following are a few instances of potential gaps within the standard:

1. Critical knowledge for effective disease prevention
   - The “Water Management Program Team” must have "knowledge of the building water system design and water management as it relates to Legionellosis."
   - This critical knowledge of *Legionella* will not typically be available in-house as most building owners don’t possess the necessary specialized knowledge of *Legionella* in the built environment.
   - For example, the presence and growth of *Legionella* can be impacted by how water systems are operated and maintained. The Water Management Team should understand the differential effectiveness of control strategies, including defining control limits and monitoring of the water treatment/biocide program for cooling towers and secondary water treatment of the building water system if applicable.
   - For the first time, many building owners may be confronted with decisions such as whether or not to install a disinfection system. Selecting the most appropriate and cost-effective technology requires knowledge of *Legionella* and engineering, as well as water treatment expertise.

2. The microbiology of prevention
   - In the case of outbreaks involving cooling towers, the causative agent has almost exclusively been *Legionella pneumophila*, serogroup 1. The majority of drinking water-associated outbreaks are caused by *Legionella pneumophila*. Overall, most reported cases of Legionnaires’ disease are caused by *L. pneumophila*, serogroup 1, with other serogroups (mostly 3, 4 and 6) and *Legionella micdadei*, and *Legionella longbeachae* accounting for a small percentage of cases.
   - Interpreting the relative risk of these disease-causing strains is important for determining and deploying resources for risk management. The Water Management Team is tasked with decisions for testing (if, where, how many locations) and results interpretation.

3. Sources of exposure to *Legionella*
   - For sporadic community-acquired cases, the public health threat from improperly managed cooling towers is relatively unknown—with the exception of well-defined outbreaks like the 2015 outbreak in the Bronx in New York City that reportedly caused 130 cases and 12 deaths. In contrast, warm water distribution systems inside buildings are a well-defined source of exposure.
   - The risk of illness from building water systems was established with our 1982 publication in *The New England Journal of Medicine*. We showed that hospitalized patients acquired Legionnaires’ disease from the water in their hospital rooms, not from cooling towers. Since then, the link between illness and exposure to *Legionella* from building warm water distribution systems in
hospitals, hotels, senior high rise apartments, prisons, nursing homes, and private homes has been well established.

- In 2006, a National Research Council report cited *Legionella* as “the single most common etiologic [disease-causing] agent associated with outbreaks involving drinking water.”

- Recently, the Centers for Disease Control and Prevention (CDC) reported that for the period between 2011 and 2012, *Legionella* accounted for 66% of the drinking water–associated outbreaks that resulted in 431 cases of illness, 102 hospitalizations, and 14 deaths. All 14 outbreak-associated deaths reported were caused by *Legionella*, including 12 (86%) cases associated with health care facilities. *Legionella* in building plumbing systems was among the two most commonly identified deficiencies [factors] leading to drinking water–associated outbreaks.

4. ASHRAE 188 does not require *Legionella* testing to validate that your risk management program is working.

   - Studies show that the only reliable way to validate efficacy of your risk management program and residual disinfectant (if you are using one) and the threat from *Legionella* is to test for *Legionella*.


5. ASHRAE 188 requires hazardous conditions be redressed to “acceptable” levels but doesn’t define “acceptable.” That’s left up to the Water Management Team.

The approval of ASHRAE standard 188 has the potential to introduce a new era Legionnaires’ disease prevention. The success of this effort will depend upon well-informed Water Management Team and evidence-based Water Management Programs. Such efforts could prevent illness and death from a preventable waterborne disease.
REFERENCES


