SPECIAL PATHOGENS LABORATORY®
THE LEGIONELLA EXPERTS®

WATERTECH of America, Inc.

Wisconsin Healthcare Engineering Association

WATER SAFETY CONSTRUCTION CONSIDERATIONS

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Today's Topics

- Brief *Legionella* overview
- *Legionella* case investigation vs postive culture test
- What is expected after case investigation or outbreak
- Construction and renovation control measures
- Construction responsibilites
- What to expect for 2022 Joint Commission surveys
- ASSE Certification

Presenter – Kyle Pachowitz

Kyle Pachowitz
Director of Water Safety

- Seven years of direct water treatment industry experience in the prevention and remediation of *Legionella* and other waterborne pathogens.
- Experience implementing and consulting on AAMI TIR34 standard, VHA Directive 1061, and ASHRAE 188-2015.
- Bachelor's in Biochemistry
- ASSE 12080 certification

Presenter – Michael Castro

Michael Castro, MPH, CWT

Director of Healthcare Services

- Over 21 years in water safety:
  - Nalco
  - Pall Medical
  - Special Pathogens Laboratory
- ASHRAE 188 Committee Member
- Mechanical Engineer
- Masters in Public Health (MPH)
- Certified Water Technologist (CWT)

Mission: End Legionnaires' Disease

- No one should die from a preventable disease caused by a bacteria in water.
- Legionnaires' disease can and should be prevented.

Introduction to SPL

- *Legionella* and water quality experts
- *Legionella* laboratory
- Policy development
- Water safety plan development
- Resource for facilities
- Resource for water treatment provider

LEGIONELLA BACKGROUND

Legionella is NOT Ubiquitous

- Not ubiquitous, but found in ~50% of building water systems
- *Legionella* bacteria are found in:
  - 12-70% of hospital water systems
  - Up to 60% of large high rise buildings
  - 10-40% of residential homes
  - 30-50% of cooling towers colonized with *Legionella*

Cases Linked to Water Systems

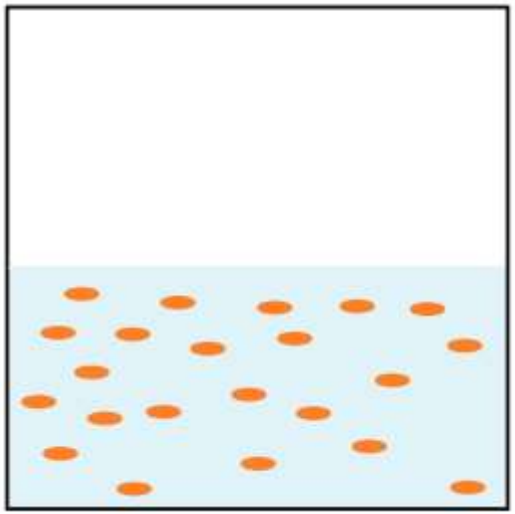
- Warm water distribution in:
  - Hospitals
  - Nursing homes
  - Rehabilitation centers
  - Office buildings
  - Apartment buildings
  - Hotels

Cases Linked to Water Systems

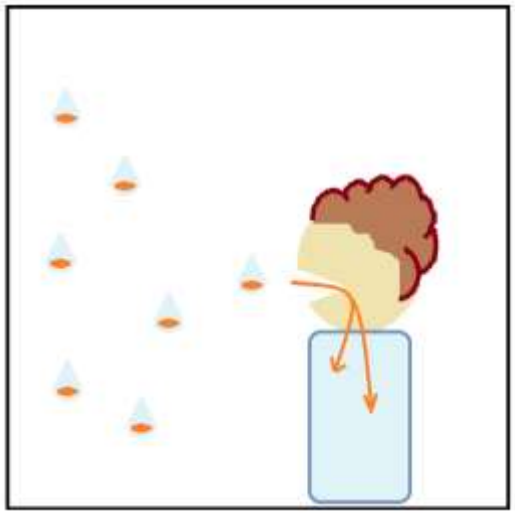
- Other water systems:
  - Potable cold water
  - Cooling towers
  - Spas and hot tubs
  - Decorative fountains
  - Humidifiers

Multi-factorial Risk of Acquiring Legionnaires' Disease

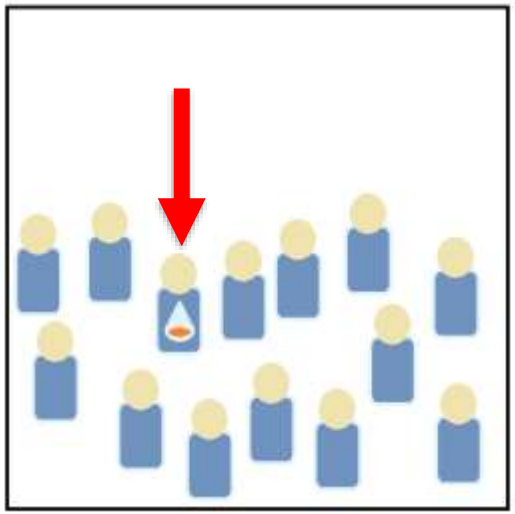
Reservoir + Transmission + Susceptible Host



Pathogenic *Legionella* in water system



Exposure to water & Water reaches airway



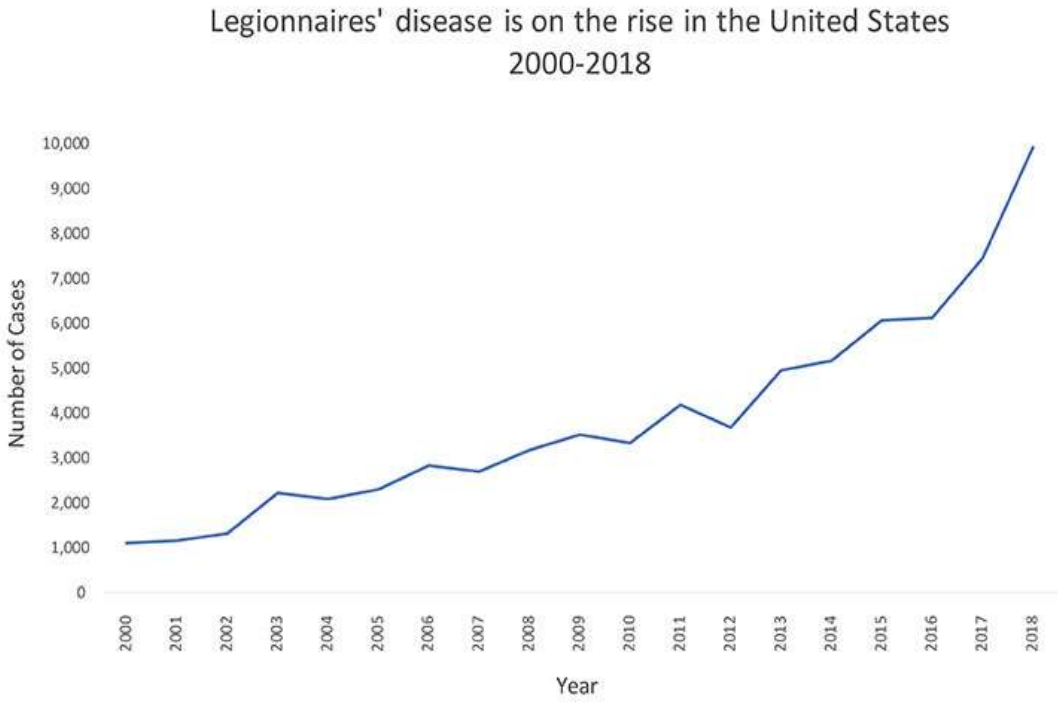
Disease can occur if host is susceptible

Origins of *Legionella* in Building Water Systems

- Incoming potable water (undetectable or very low concentration)
- Building water systems with warm water (provide growth factors, including temperature and biofilms)
- Amplification/growth of *Legionella* and other microbes

Legionnaires' Disease Is Increasing

"In the US, the rate of reported cases of Legionnaires' disease has grown by nearly nine times since 2000."



https://www.cdc.gov/legionella/about/history.html

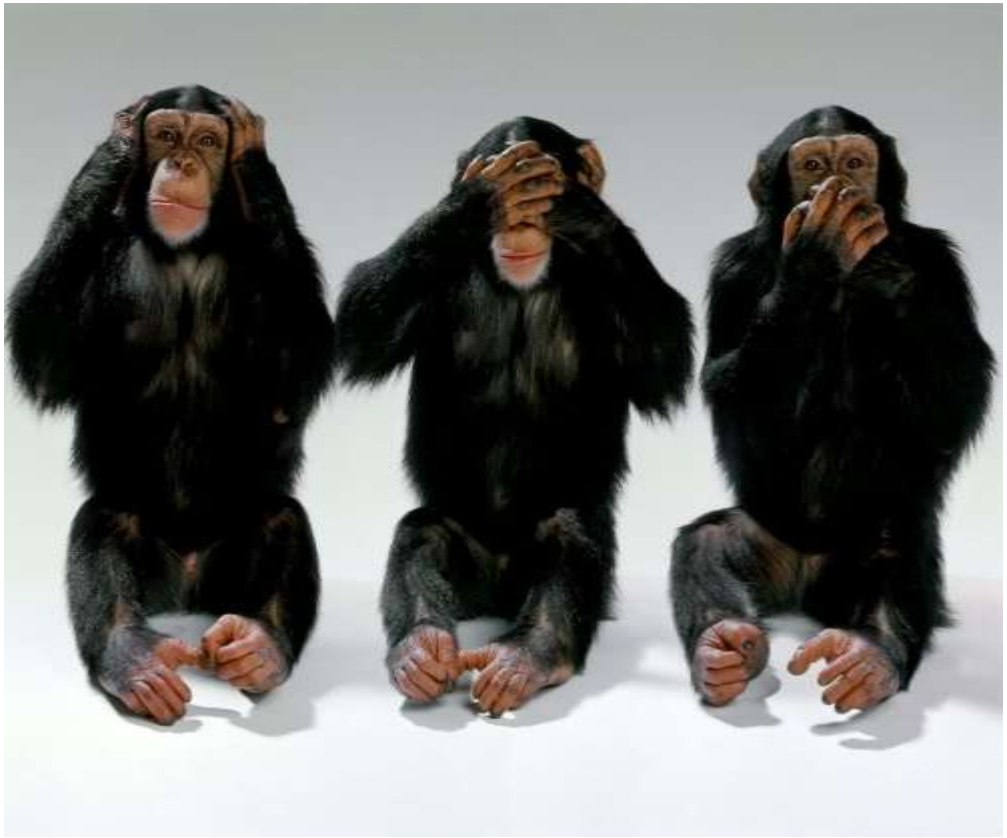
Why Test?

If you don't look for it, you won't find it.

If you don't find it, you don't think you have a problem.

If you don't think you have a problem, you don't do anything about it.

–Bruce Dixon, M.D.
Director, Pittsburgh ACHD



Approaches to Prevention

REACTIVE

- After cases identified
  - Case investigation and environmental investigation
  - *Legionella* source identified = decontaminate

Approaches to Prevention

REACTIVE

- After cases identified
  - Case investigation and environmental investigation
  - *Legionella* source identified = decontaminate

PROACTIVE

- Before cases occur, perform environmental testing
  - *Legionella* source identified = decontaminate
- Before occupancy (new construction)

Testing Can Be Revealing

Hospitals performing *Legionella* environmental testing are more likely to prevent cases of hospital-acquired Legionnaires' disease

Squier CL, Stout JE, Krystofiak S, McMahon J, Wagener MM, Dixon B. Yu VL. Am. J. Infect. Control 2005; 33(6): 360-367.

ROUTINE TESTING FOR LEGIONELLA

Testing Helps You Understand Risk

- *Legionella* is not ubiquitous
  - Are you in the 50% of buildings with or without *Legionella*?
- Not all *Legionella* have the same risk
  - *L. pneumophila* serogroup 1 has highest risk for disease
- How widespread is *Legionella* colonization?
  - *Legionella* present at >30% of distal outlets increases risk for disease
- What type of clinical diagnostics are used?
  - Urinary Antigen test is most common, but only detects disease from *L. pneumophila* serogroup 1

Sample Collection Goal

"What is the greatest chance that someone may run into *Legionella* from the water system?"

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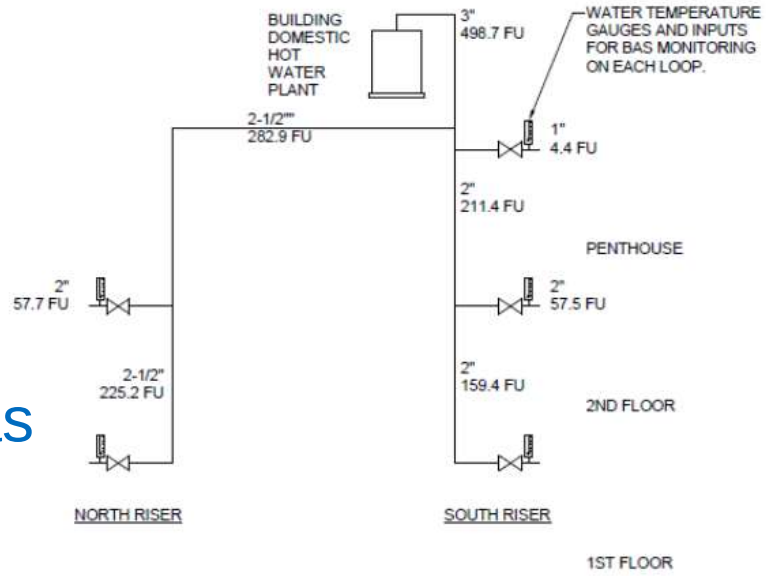
Sampling Hot Water System

- Minimum of 10 per system
- Minimum of 2 per floor
- Select locations from:
  - Different risers
  - Different fixture types (showers/faucets)
  - Patient rooms and care areas
- Avoid:
  - Sinks in custodial closets
  - Unused faucets in central plant



Do Not Flush Prior to Sample Collection

- Distal Outlets
  - Collect immediately after opening faucet or shower valve
  - Flushing reduces recovery
    - Immediate draw 97.7% positive reduced to 69.1% after 2 min. flush

Sampling Cooling Towers & Fountains

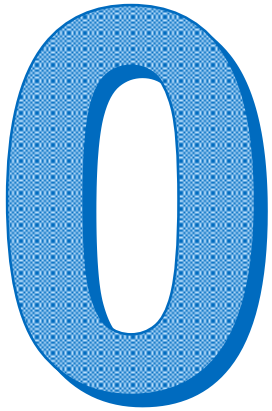
- Grab sample from the basin
- Sample each cell or basin
- Select location from:
  - The basin (not circulating pipe)
  - Away from inlet or drain
  - Away from chemical treatment
  - Just prior to any slug dose of treatment

Why Sample Each Tower Cell?

Tower Cell 1

Tower Cell 2

Tower Cell 3



IS ZERO NEEDED?

Preventing Legionnaires' Disease

Controlling Legionella is about preventing disease, not about reaching zero Legionella in water.

Zero *Legionella* is NOT needed to Prevent Disease

- The *Legionella* dose rate (concentration) for disease to occur has not been established
- Alternate approach supported by peer reviewed publications
  - Percentage of distal hot water outlets positive for *Legionella* as indicator
  - Greater than 30% of outlets positive corresponds with increased risk of disease

Don’t Chase Zero

Zero *Legionella* is virtually impossible to achieve in complex water systems

Calculate Distal Site Positivity

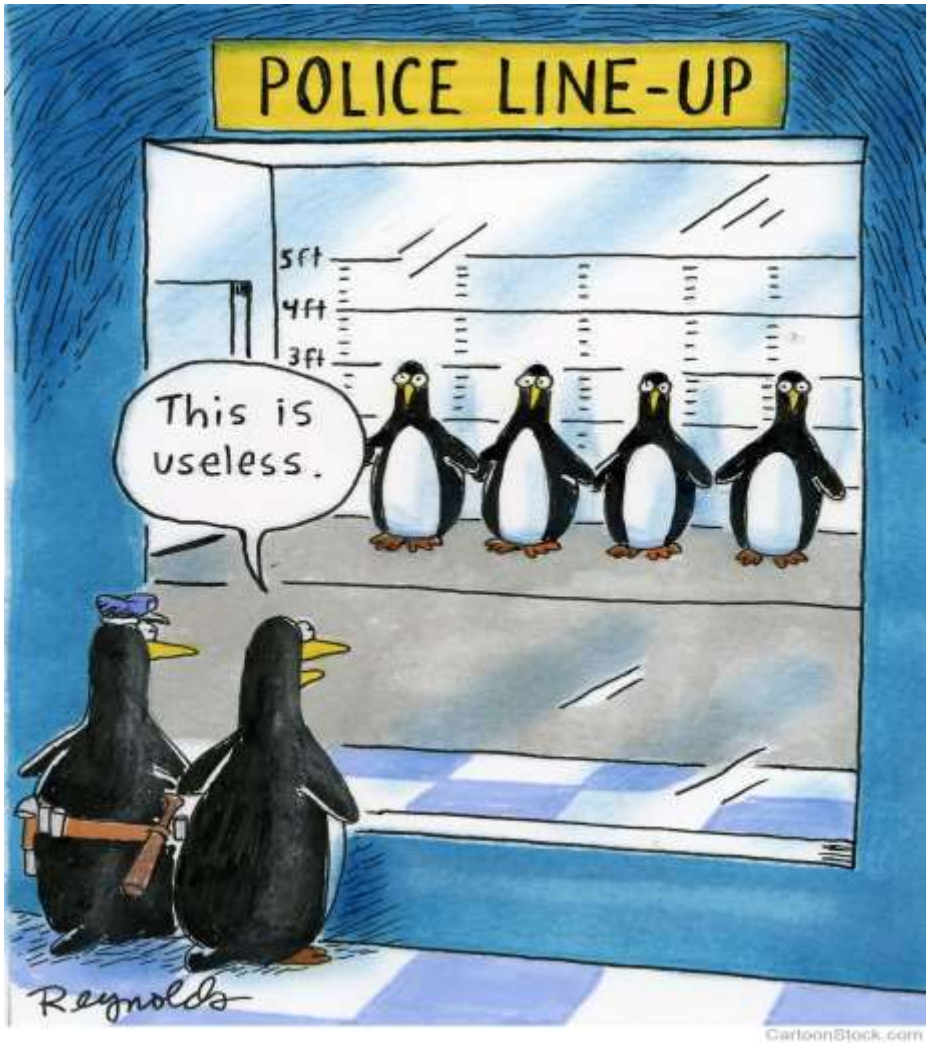
- Number of outlets positive for *Legionella* of 10 distal sites (faucets or showers) that were tested
  - For example 5/10 sites positive = 50% distal site positivity
  - If >30% risk increases, especially if *Legionella pneumophila*, serogroup 1 is present

Evaluating Risk

Risk of Legionnaires' disease was better predicted by the **proportion** of water system sites testing positive for *Legionella* than by the concentration of *Legionella* bacteria.

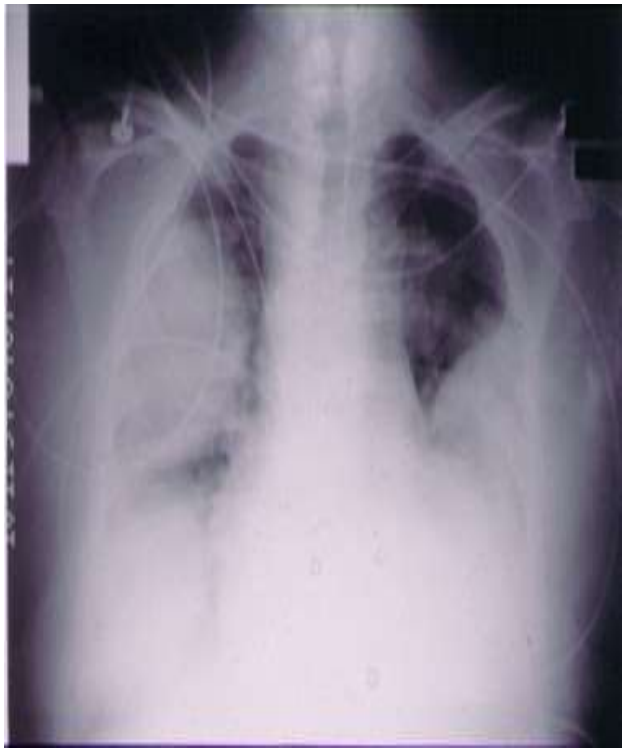
Kool J L, et al. Infect. Control Hosp. Epid. 1999 20:797-805

Are All Legionella Alike?



Not All Legionella Are Pathogenic

- If you find *Legionella* – what type did you find?
- There are over 60 species and serogroups
  - Not all *Legionella* have the same risk
  - *L. pneumophila* serogroup 1 has highest risk for disease
  - Many species common in water, but rarely cause infection (much less risk)



CASE INVESTIGATION TESTING

Clinical Investigation Requirements

- Perform a retrospective review of cases in surveillance database
  - Develop list of cases associated with exposure setting or geographic area
- Work with facility to identify additional cases
  (e.g., through retrospective review of medical or laboratory records)
- Facilitates testing for Legionella using culture of lower respiratory secretions
  - Require patient isolates to compare clinical and environmental isolates

Environmental Investigation Requirements

- Facilitate environmental assessment to evaluate possible environmental exposures
- Submission of environmental sampling plan
  - Typically require 1-L samples and swabs.
  - Sampling should be performed by a third-party consultant
- Make recommendations for remediation of possible environmental source

Additional Requirements

- Retain a consultant to provide services and recommendations
- Restricting water usages
  - Sinks and showers
  - Shut down hot tubs, pools, decorative fountains
- Notification of occupants and employees
- Restricting new admissions
- Developing (or revising) a water safety & management plan
- Continued heightened disease surveillance and environmental sampling

IMPACTS OF A CASE INVESTIGATION

Facility Restrictions

- Restrictions on Occupants
  - No new admissions
  - No new stays
  - Closed-units or floors

Facility Restrictions

- Restriction on water usage
  - No water for personal hygiene, culinary, consumption
  - Bottled water
  - POU filters

Operations Impact

- Management of:
  - Water restrictions
  - Patient/guest notifications
  - Testing and monitoring
  - Corrective action implementation
  - Look-back case review
- Routine interfacing with:
  - Health Department
  - News and social media
  - Employees and staff
  - Guest and patients (and their families)
  - Consultants and water treatment providers

Media Impact

tripadvisor

Google Reviews

FEELING LOST?

First Steps

- Stay calm!
- Get a team together
  - Infection Prevention, Facilities, Administration, Public Relations, Consultants
- Take the time to understand requirements
- Do not remediate or perform corrective actions before sampling

Do Not Disinfect Prior to Investigation

- Fire, Aim, Ready OR Ready, Aim, Fire
- Have you established the baseline?
- What is the criteria for a successful disinfection?

Sampling Plan Tips

- Sampling during a case investigation should answer two questions:
  - Was *Legionella* present in areas where the case patient may have been exposed?
  - Is there a *Legionella* risk throughout the building?
- Develop a sampling plan and present to the health department for approval

Case Patient Locations

- Include:
  - All case patient room outlets (sinks, showers)
  - Distal outlets from common areas such as lounges
  - Consider other transmission sources (CPAP, humidifier)

Building Water Systems

- Include:
  - Minimum of 10 representative hot water outlets per system
  - Minimum of 2 per floor
  - Different risers/loops
  - Different fixture types (sinks/showers)
  - Patient care areas
  - Hot water tanks and returns

Potable Water Sample Collection

- Do not flush!
  - Collect immediately after opening outlet
  - Flushing reduces recovery
- Additional measurements
  - Temperature
  - Disinfectant residual
  - Any other health department requirements?

Cooling Tower, Pool/Spa, Decorative Water Feature Sampling

- Grab sample from each cell/basin
  - Away from chemical treatment, drains, supply
- Additional measurements
  - Temperature
  - Disinfectant residual
  - Any other health department requirements?

Sample Collection

- Consult the laboratory for instructions on sample collection and transport
- Understand sample collection - differs by type of system sampled
- Prepare for results
  - Communication with health department
  - Have plans for short-term or long-term remediation

Choosing a Laboratory

- Accreditation to a recognized standard for routine *Legionella* test methods
- Capable of detecting all members of the Legionella genus
  - Can provides isolates

Legionella Testing According to CDC

- CDC recommends using a testing method capable of **detecting all members** of the *Legionella* genus but also one that provides material for typing.
- At the moment, this means culture
- Particularly true during an investigation and in the immediate aftermath

Dealing with Water Restrictions

- Prevent exposure to hot tubs, pools, decorative water features
- Consider installing 0.2-micron biological point-of-use filters on showerheads or sink/tub faucets
  - Determine the frequency for replacement
  - Confirm if filters need to be removed during remediation procedures

Interpreting Results

- What you may end up doing…
  - Consulting with health department on next steps
  - Chasing zero Legionella regardless of species, extent of colonization, or concentration
  - Follow up sampling every 2 weeks (or more often)
  - Continued use of point-of-use filters
  - Implementing short-term or long-term remediation

Mitigation Tips

- Be prepared to act when results come back
- Work with a consultant with *Legionella* expertise
  - Base decisions on findings from the assessment, sampling, and epidemiologic findings of the investigation
- Options can include:
  - Superheating and flushing the potable water system
  - Hyperchlorination
  - Flushing unused plumbing outlets
  - Draining and scrubbing devices
  - Long-term supplemental disinfection

Communication Tips

- Have a communication team that address media requests with consistent messaging
- Be transparent with employees, occupants, and family members
  - Consider a “town hall” to answer questions and hear concerns
- Touch base with the health department frequently and update on progress

Legionnaires' Disease and Construction

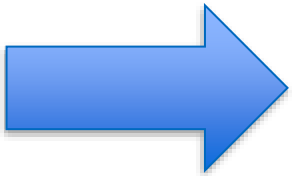
Construction and Renovation Concern for *Legionella*

- *Legionella* risk can be increased with construction or renovation
  - Sediment entry, cross-connections, loss of pressure, loss of disinfectant residual, stagnation**, improper commissioning**, etc.

Construction Impacts Water Quality

- Excavation
- Water main breaks
- Depressurization (pressure changes)
- Disruption of biofilm = brown water events
- Materials of construction
- Dormant periods prior to occupancy
- Ineffective disinfection/commissioning

Construction Dislodges This



Cross section of 4 inch pipe from hospital hot water system

Brown Water Event

Legionella Outbreak University Hospital

Hematology/Oncology Unit

- 10 cases following completion of new hematology-oncology unit
  - *L. pneumophila*, serogroup 1 isolated from 50% (17/34) heme-onc sites
- Cases stopped following shock disinfection and installation of Point-of-Use (POU) filters

Retirement Community

- Newly constructed buildings opened in April
- Two residents diagnosed with Legionnaire's disease in May and June
- Water restrictions, health department, news
- Disinfection measures
  - Short-term (hyperchlorination)
  - Long-term supplemental (monochloramine on the hot water system)

Studies Identifying Construction Related Risk of Disease

Reference	Cases / Deaths	Construction Risk
Haley et al, 1979	49 / 15	Entry of soil into piping
Thacker et al, 1978	81 / 14	Entry of soil into piping
Helms, et al 1983	24 / 11	Hospital Addition - New Hem/Onc Unit
Parry et al, 1985	5 / 0	Entry of soil into piping
Mermel et al, 1995	2 / 2	Re-pressurization of piping
Sharp, 2005	2 / 1	Water system not operated (stagnation)
Stout et al, 2000	6 / 0	Water system not operated (stagnation)
Sutherly, 2011	11 / 1	Water system not operated (stagnation)
Reuters, 2000	4 / 0	Water system not operated (stagnation)
Greig et al, 2004	125 / 4	Improperly treated cooling tower

What Do These Outbreaks Have In Common?

- Construction/renovation
- Delayed occupancy
- High risk occupants
  - elderly, medical conditions that increase risk, hospitalized

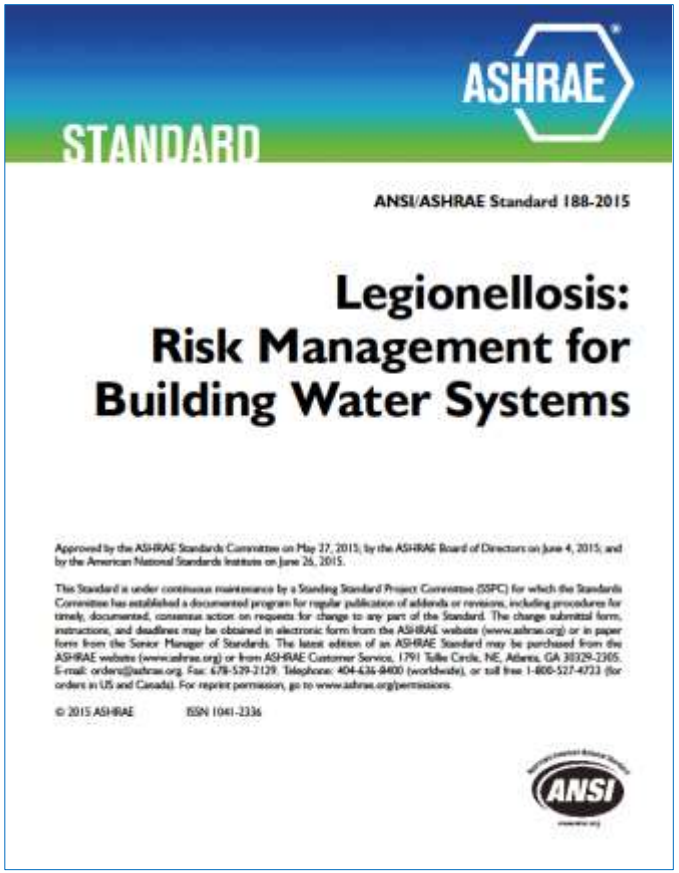
CONSTRUCTION AND WATER MANAGEMENT

ASHRAE 188 Responsibilities

- Building Owners / Facility Managers
  - Implement stronger safeguards to protect against *Legionella*
- Engineers and Planners
  - Consider *Legionella* risk in new designs and construction
- Water Treatment Providers and Consultants
  - Assist with selection and implementing disinfection methods, monitoring and sample collection

ASHRAE Standard 188

- Section 8 provides specific direction and requirements for designing building water systems
- Be aware of these requirements…



Elements of Designing Building Water Systems

- New construction, renovation, refurbishment, replacement or repurposing a facility

Documentation of Design Compliance – Specific items that need to be considered in the design to address potential hazardous conditions.

Final Installation Documents – Deliverables that should be provided to the building owner to document the design and installation.

Balancing – Requirement that all water systems be balanced and a report provided to the owner.

Commissioning – Required post-construction flushing and disinfection prior to beneficial occupancy.

Recommendations

- Culture water system before, during and after construction
- Cultures for Legionella should be carried out, especially if the supply services areas for immunocompromised patients
- Persistent discoloration of potable water should be reported to maintenance personnel and infection control

American Water Works Association

Dedicated to the World's Most Important Resource™

ANSI/AWWA C651-14
(Revision of ANSI/AWWA C651-05)

AWWA Standard

Disinfecting Water Mains

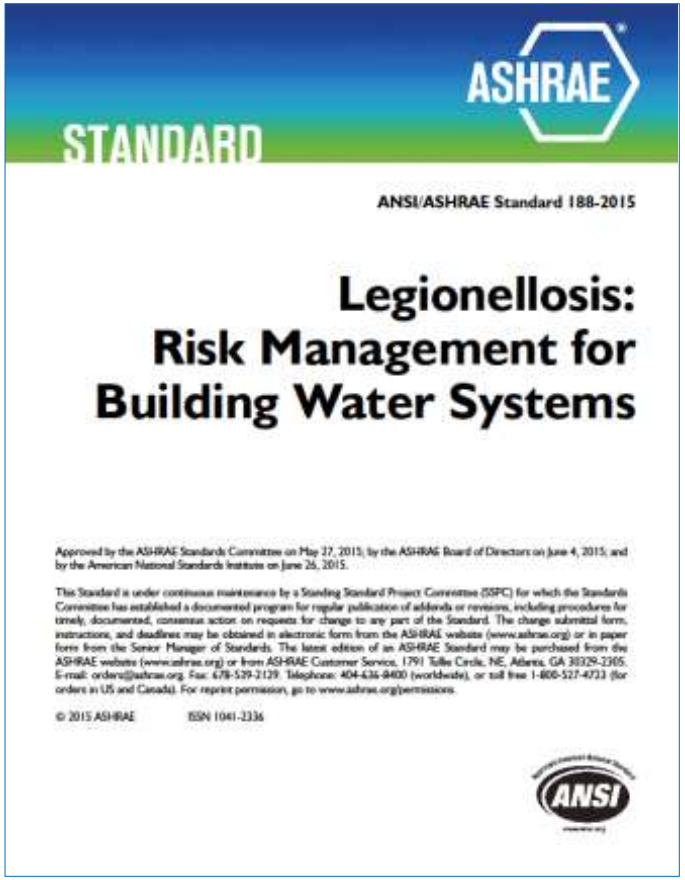
Key takeaways from AWWA

- Standard describes methods for disinfecting newly constructed potable water mains
- Chlorine based products are highlighted
- Presence/absence testing for coliform organisms
- Flushing requires 3.0 ft/s
- Identifies hold times and concentrations
- Verification: coliform testing every 1,200 ft, set at end of the run and one from each branch

WATER MANAGEMENT UPDATES

ASHRAE Standard 188

- First *Legionella* standard in the United States
- Approved June 26, 2015
  - Revised 2021
- Establish minimum Legionellosis risk management requirements for building water systems.



Elements of an ASHRAE 188 Water Management Program

Program Team – Persons responsible for Program development and implementation.

Water Systems/Flow Diagrams – Describe potable and non-potable water systems and develop water system-schematics.

Water System Analysis/Control Measures – Evaluate where hazardous conditions may occur and decide where control measures should be applied.

Monitoring/Corrective Actions – Establish procedure for monitoring whether control measures are within operating limits and, if not, take corrective actions.

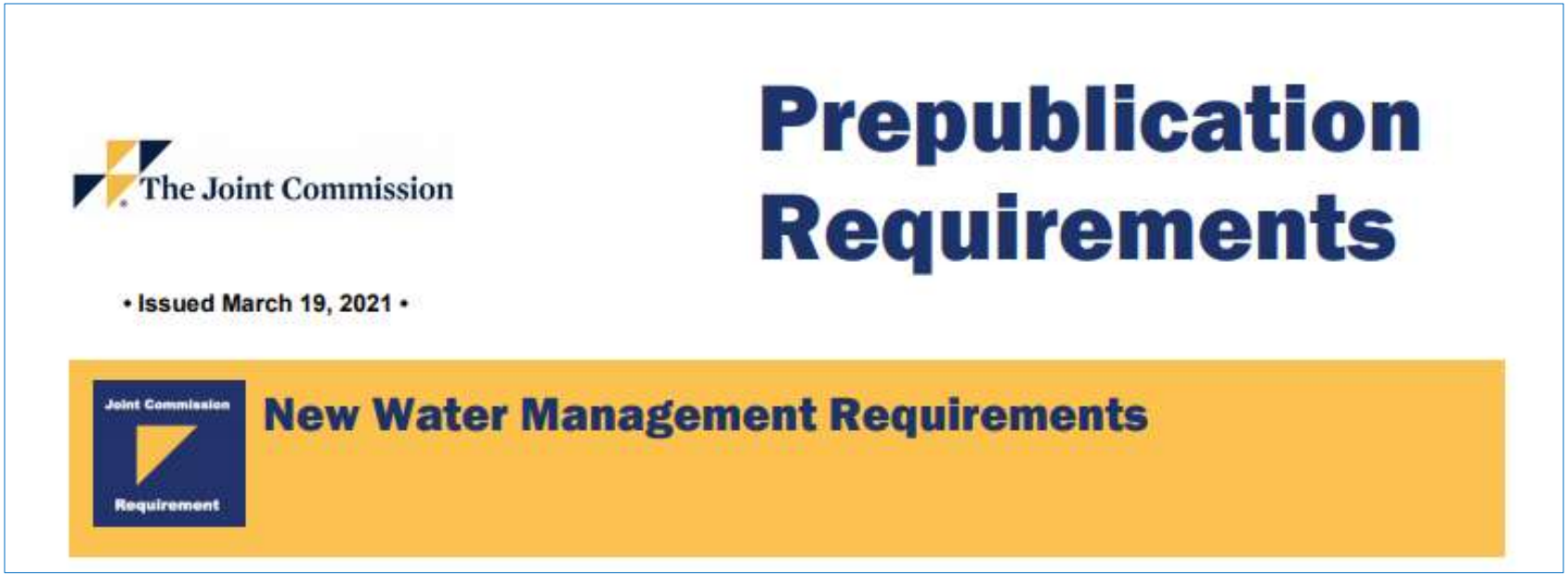
Confirmation – Establish procedure to confirm Program is being implemented as designed (verification) and the Program effectively controls the hazardous conditions (validation).

Documentation – Establish documentation and communication procedures for all activities of the Program.

Compliance Not *Legionella* Control

- The ASHRAE 188 *Legionella* standard tells building owners **what to do but not how to do it**.
- This creates gaps when it comes to *Legionella* control—gaps that could:
  - **cause illness**
  - **make building owners vulnerable to liability claims for failing to prevent disease.**

Joint Commission Strengthens Requirements



Previously Joint Commission Was Vague

The Joint Commission

Environment of Care

Updated | November 24, 2008

Utility System and Acquired Illness

Q. In reviewing the utility management standards, I see that one goal for these standards is to "reduce the potential for organizational acquired illness", but there is no prescriptive standards given as to how this is to be done. What references should I be using?

A. This standard was written globally to take advantage of new technologies as they evolve. It is important to remember that this is a utility equipment standard, not an infection control standard. This addition under utilities was designed to engender communication between plant managers and infection control professionals. Collaboration between the plant managers and infection control professionals most likely will include the review and approval of engineering policies and procedures related to inspections and preventive maintenance, and the culturing guidelines to be used if there is a case of a suspected or known nosocomial infection.

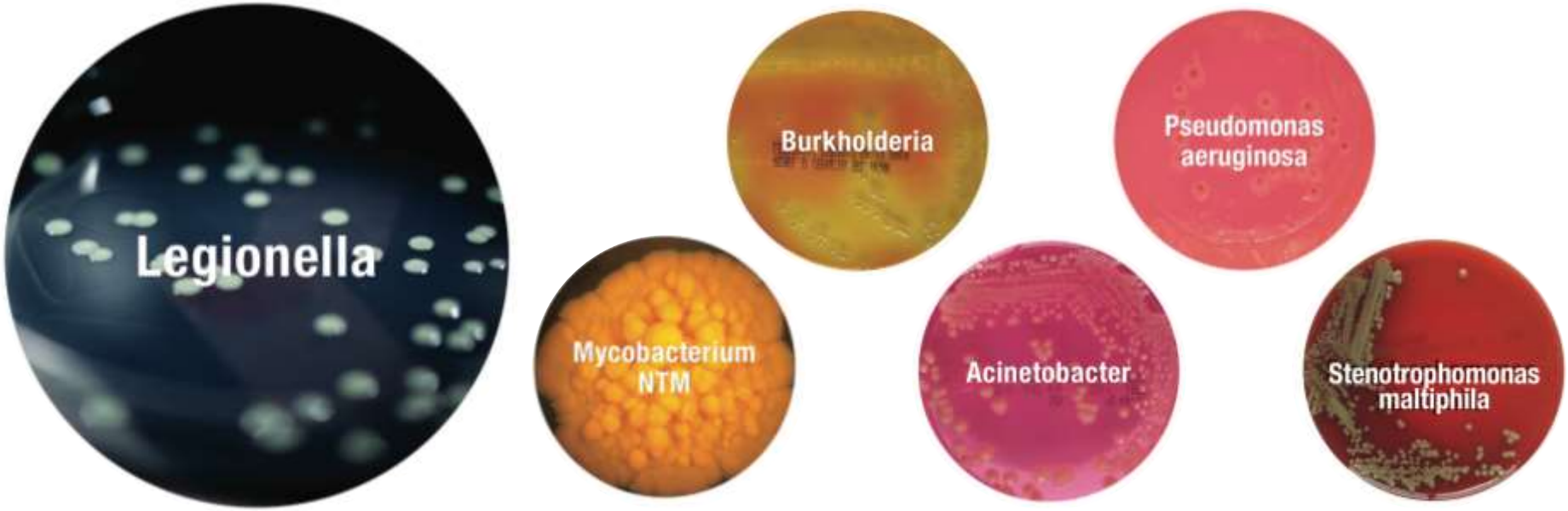
Regarding water based systems, guidance for how this may be accomplished can be found in ASHRAE 12-2000 (see www.ashrae.org) or in the CDC Guidelines for Environmental Infection Control in Healthcare Facilities. (See www.cdc.gov.)

EC.02.05.02

- Effective January 1, 2022
- The Joint Commission is issuing a new water management program standard for the Hospital (HAP), Critical Access Hospital (CAH), and Nursing Care Center (NCC) accreditation programs.
- Based on CMS guidance as well as that of the CDC and ASHRAE.

It’s not just *Legionella* anymore

- Researching other opportunistic waterborne pathogens



The Joint Commission

- The new water management standard aims to strengthen Joint Commission requirements by helping health care organization reduce the number of cases related to waterborne pathogens that occur in their facilities through the implementation of a comprehensive water management program.

Key Elements of TJC Requirements

- WMP Team
- Process Flow Diagrams
- Hazard Analysis
- Plans for Stagnation
- Patient Risk Identification
- Control Measures
- Documentation
- Updates

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TJC Water Management Programs

- A WMP team is responsible for oversight and implementation of the program
- The team is tasked with developing a program which includes:
  - Development of a flow diagrams and risk assessment that addresses at-risk populations.
  - Procedures for addressing stagnant or low use area.
  - Ensuring that results of all monitoring activities are documented, including corrective actions and any subsequent monitoring and reporting.

TJC Water Management Programs

- The team is tasked with developing a program which includes:
  - Specific procedures in the event of waterborne pathogen cases should also be in place.
  - A program for updating the plan anytime there is a change in risk or components added to the water systems that have an effect on at-risk populations and control locations.

Successfully Implementing Water Management Plans

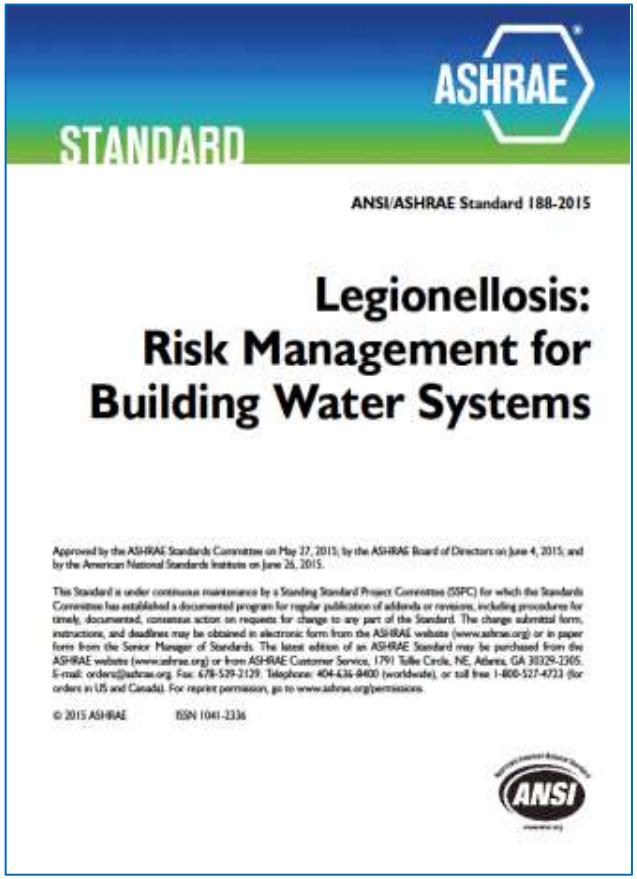
If there is a 50-50 chance that something can go wrong, then 9 times out of 10 it will.

-Paul Harvey

We Need Better *Legionella* Water Management

- More and more people are providing *Legionella* prevention and water management services
- How can facilities know the provider is knowledgeable?

No Training Requirement



ASHRAE

STANDARD

ANSI/ASHRAE Standard 188-2015

Legionellosis: Risk Management for Building Water Systems

Approved by the ASHRAE Standards Committee on May 27, 2015; by the ASHRAE Board of Directors on June 4, 2015; and by the American National Standards Institute on June 26, 2015.

This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE website (www.ashrae.org) or in paper form from the Senior Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

 ISSN 1041-2336

ANSI

4. COMPLIANCE

The results of each Section 4 compliance determination and the associated building survey in Section 5 shall be documented and shall be physically or electronically on site for review by the *authority having jurisdiction* (*AHJ*). This standard does not use or require compliance, training, or certification in any additional *hazard* analysis, *risk* assessment, or *risk management* methodologies.

ASHRAE Knowledge Requirement

The program team shall have

knowledge

of the building water system design and water management

as it relates to Legionellosis

Who Has the Knowledge to Prevent These Infections?

New ASSE Standard Offers Help

ASSE/IAPMO/ANSI 12080 for Legionella Water Safety and Management Personnel Now Available

Posted 27 Apr 2020
Tagged on ASSE

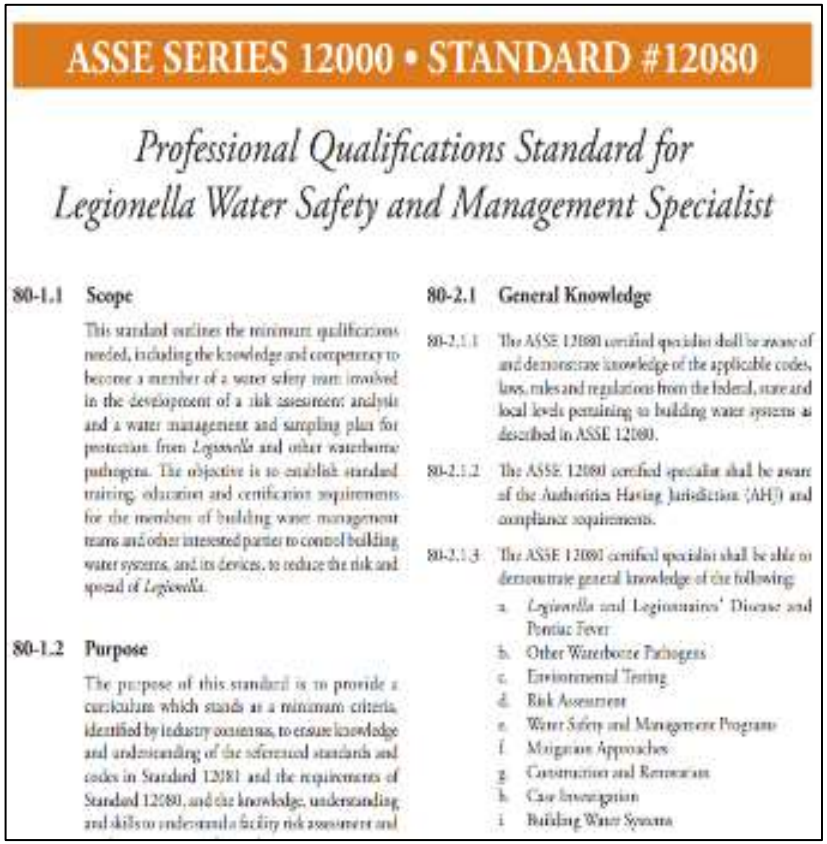
ASSE/IAPMO/ANSI 12080, Professional Qualifications Standard for Legionella Water Safety and Management Personnel, has been designated as an American National Standard by the American National Standards Institute (ANSI) and is now available for purchase.

New ASSE Professional Qualifications Standard

- Sets minimum criteria for the training and certification of persons involved in:
  - Development, administration, and execution of risk assessment and water safety management programs for *Legionella* in building water systems.

ASSE 12080 Certified Specialist: General Knowledge Requirements

- *Legionella* and Legionnaires' disease
- Waterborne pathogens
- Environmental testing
- Risk assessment
- Water safety & management programs
- Mitigation approaches
- Construction and renovation
- Case Investigation
- Building water systems



ASSE SERIES 12000 • STANDARD #12080

Professional Qualifications Standard for Legionella Water Safety and Management Specialist

80-1.1 Scope

This standard outlines the minimum qualifications needed, including the knowledge and competency to become a member of a water safety team involved in the development of a risk assessment analysis and a water management and sampling plan for protection from *Legionella* and other waterborne pathogens. The objective is to establish standard training, education and certification requirements for the members of building water management teams and other interested parties to control building water systems, and its devices, to reduce the risk and spread of *Legionella*.

80-1.2 Purpose

The purpose of this standard is to provide a curriculum which stands as a minimum criteria, identified by industry consensus, to ensure knowledge and understanding of the referenced standards and codes in Standard 12081 and the requirements of Standard 12080, and the knowledge, understanding and skills to understand a facility risk assessment and

80-2.1 General Knowledge

80-2.1.1 The ASSE 12080 certified specialist shall be aware of and demonstrate knowledge of the applicable codes, laws, rules and regulations from the federal, state and local levels pertaining to building water systems as described in ASSE 12080.

80-2.1.2 The ASSE 12080 certified specialist shall be aware of the Authorities Having Jurisdiction (AHJ) and compliance requirements.

80-2.1.3 The ASSE 12080 certified specialist shall be able to demonstrate general knowledge of the following:

a. *Legionella* and Legionnaires' Disease and Pontiac Fever
b. Other Waterborne Pathogens
c. Environmental Testing
d. Risk Assessment
e. Water Safety and Management Programs
f. Mitigation Approaches
g. Construction and Renovation
h. Case Investigation
i. Building Water Systems

Certification Requirements

- Completion of a minimum 24-hour training course that includes all aspects of Standard 12080
- Successfully pass written (and proctored) exam with minimum of 100 questions.
- Passing score of 80% or higher

Who Should Get Certified?

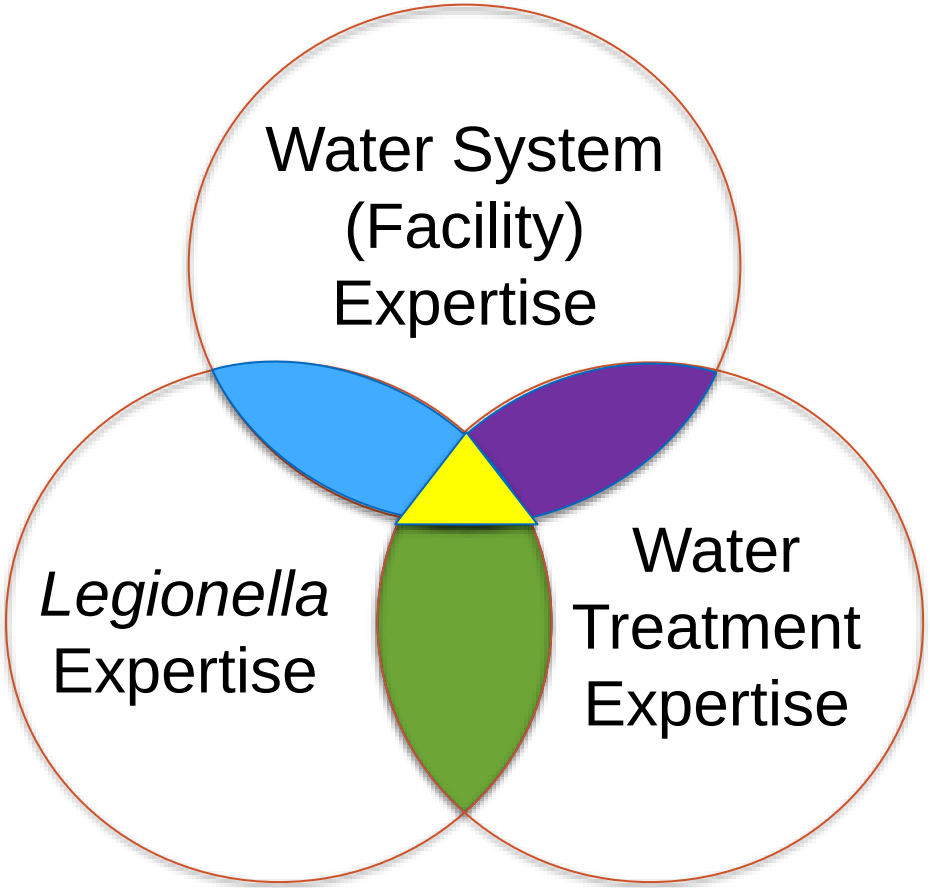
- Anyone on the water safety team
  - Facility managers
  - Healthcare engineers
  - Infection preventionists
  - Plumbers
  - Risk managers
  - Water treatment professionals
  - Consultants

In Conclusion

- Legionellosis is not going away
  - Outbreaks continue to occur (potable water, cooling towers, fountains)
- Be proactive and advocate for better water management
  - Implement water safety plans
  - Test for Legionella!

It's Not the Plan…
It's the Partnership™

- Our integrated platform of solutions designed to end Legionnaires' disease.
- Collaboration with The Legionella Experts.



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QUESTIONS