SPECIAL PATHOGENS LABORATORY®
THE LEGIONELLA EXPERTS®

Pace®

Controlling Legionella and Waterborne Pathogens In Building Plumbing Systems

Janet E. Stout, PhD
Founder and Exec. V.P., Special Pathogens Laboratory
Research Associate Professor, University of Pittsburgh

My Affiliations – Two Hats

- Founder and Exec. V.P. of Special Pathogens Laboratory (Pace Laboratory).
- More than a laboratory, we offer a comprehensive approach to the detection and control of *Legionella* and waterborne pathogens
- Research Associate Professor in the Dept. of Civil & Environmental Engineering at the University of Pittsburgh

Question: Why did Legionella cross the road?

Answer:

To get away from Dr. Stout!

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.

Legionella Is…

The problem you don't think you have until

you have it.

What Denial Looks Like

Legionella isn't in my water systems

Legionnaires' disease – never seen it so it won't happen to me or my facility

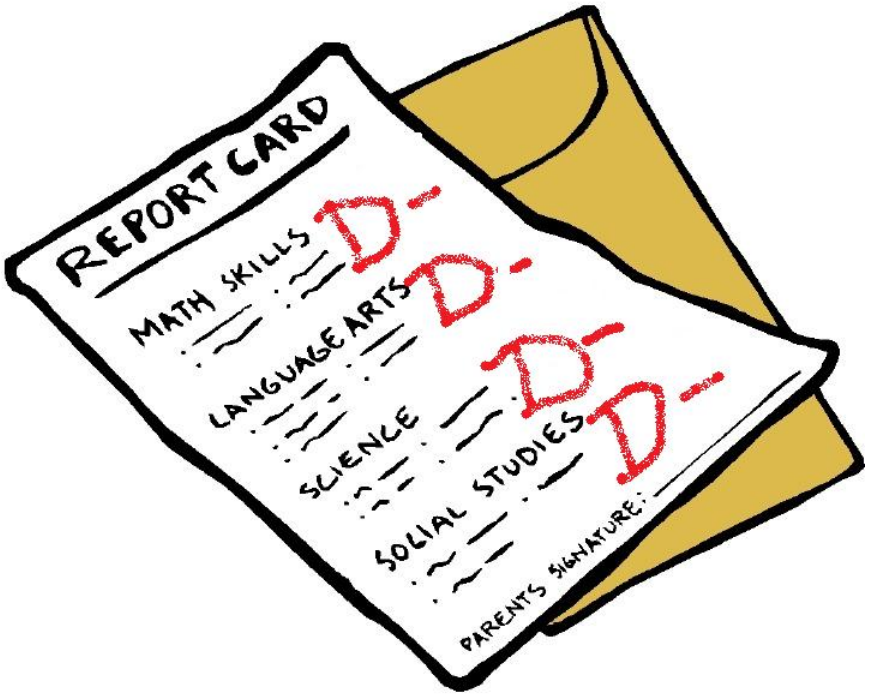
Legionella water safety & management is a waste of money

I won't test for *Legionella* (and know the risk) because I don't have to test

Preventing Legionnaires' Disease

How are we doing?

Report Card



Legionella Control Is Challenging

Safety

Water Conservation

Assessing *Legionella* and Waterborne Pathogen Risks

- Know who occupies the building (risk stratification)
- Have knowledge of the building water system design and water management as related to legionellosis and waterborne pathogens
- Assess risk and implement appropriate control measures

Supplemental Disinfection

NEEDS, BENEFITS AND LIMITATIONS

First - Is Disinfection Needed?

If an outbreak or illness is suspected

Facilities that house or treat individuals at increased risk for Legionnaires' disease (e.g., senior communities, outpatient clinics)

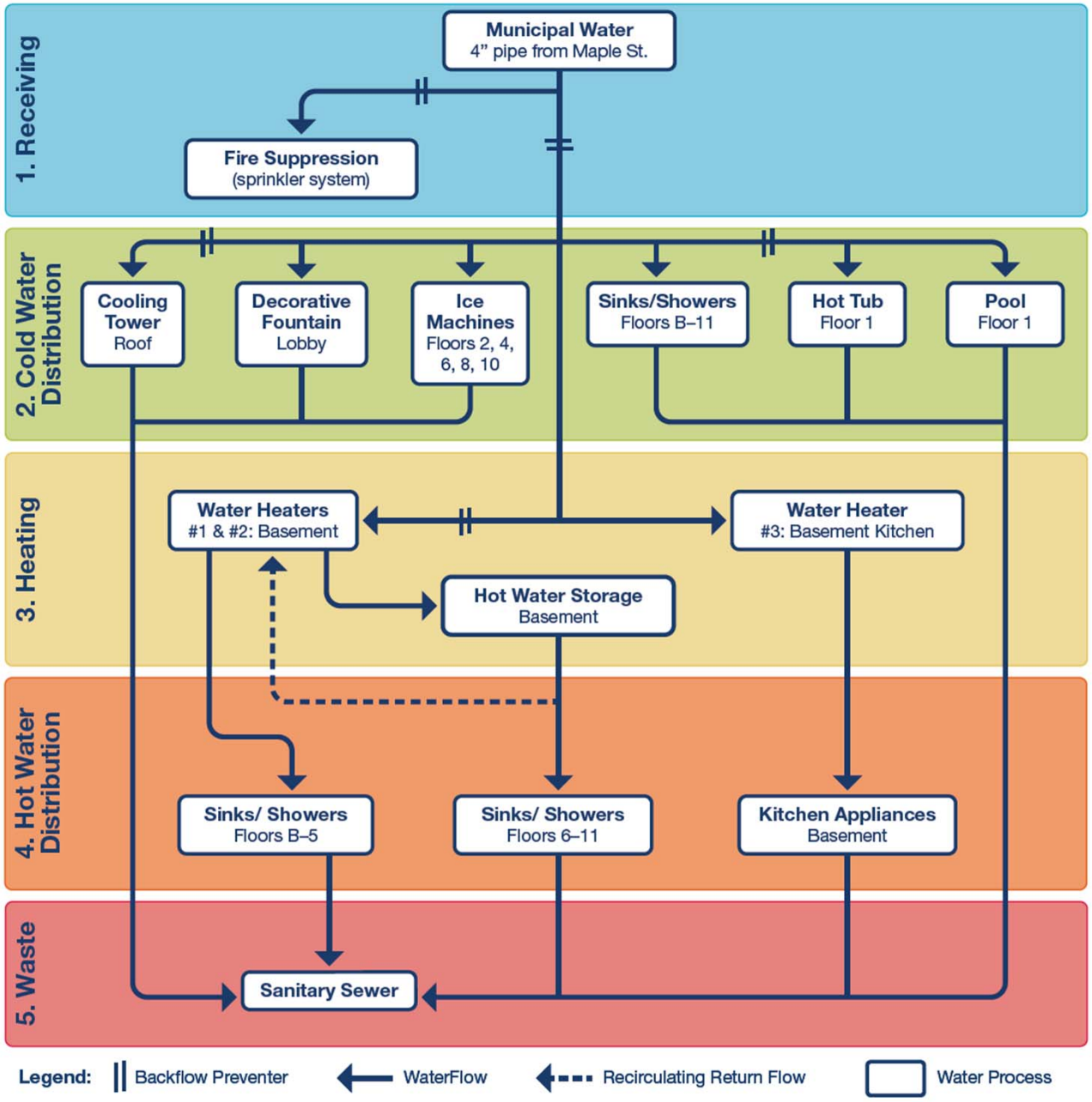
Facilities unable to meet control limits consistently

Facilities with a history of associated Legionnaires disease cases

nt of Entry

ystemic

int of Use



Where Is Control Needed

lphabet Soup of *Legionella* Control Resource

- ASHRAE
- CDC
- ASSE
- ASDWA
- AWWA
- AWT
- CTI
- EPA
- NASEM
- IAPMO

ASHRAE Standard 188 & Guideline

ANSI/ASHRAE Standard 188-2021
(Supersedes ANSI/ASHRAE Standard 188-2018)
Includes ANSI/ASHRAE addenda listed in Appendix D

Legionellosis: Risk Management for Building Water Systems

See Informative Appendix D for approval dates.

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. Instructions for how to submit a change can be found on the ASHRAE® website (https://www.ashrae.org/continuous-maintenance).

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 ISSN 1041-2336

ASHRAE Guideline 12-2020

Managing the Risk of Legionellosis Associated with Building Water Systems

Approved by the ASHRAE Standards Committee on March 26, 2020, and by the ASHRAE Board of Directors on March 30, 2020.

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 ISSN 1049-894X

Purpose of ASHRAE Standard 188

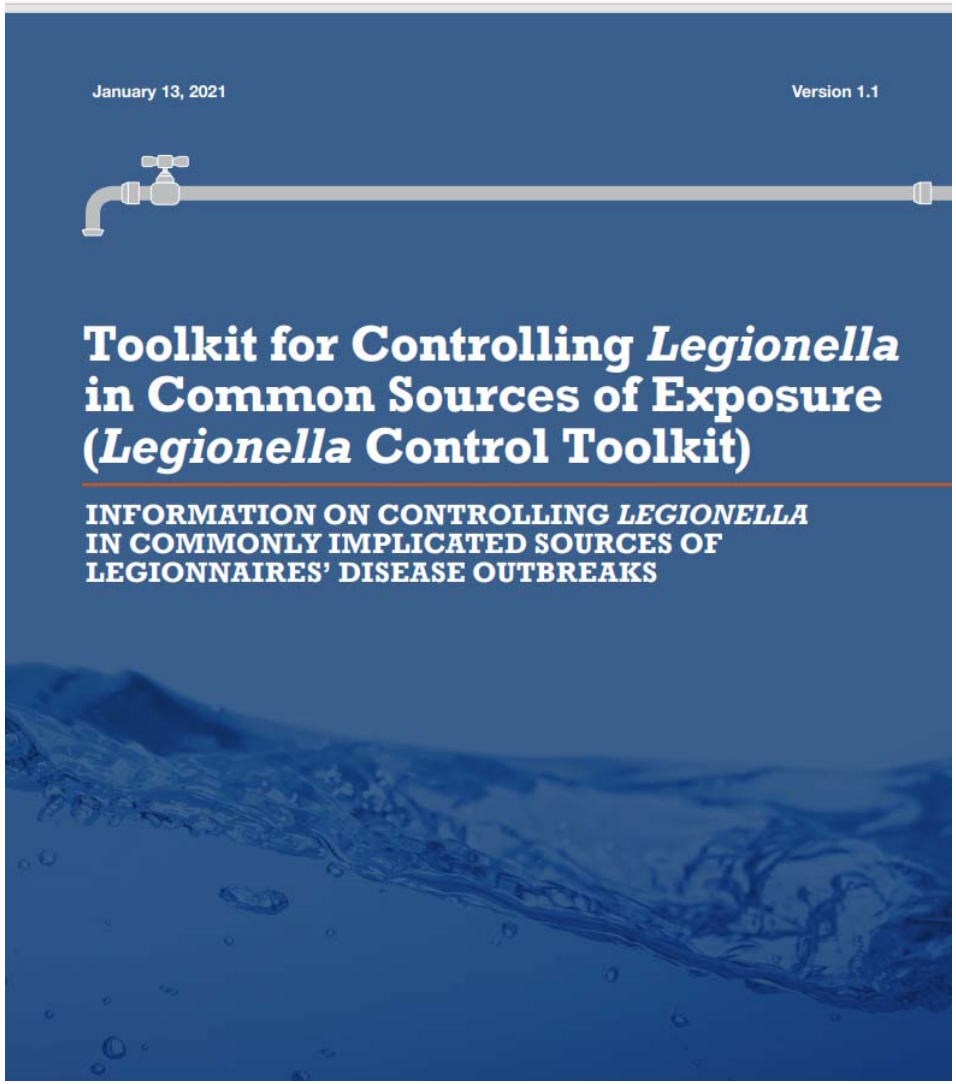
Establish minimum Legionellosis risk management requirements for building water systems.

My Note: More than the minimum is needed to prevent building-associated Legionnaires' disease

ASHRAE Guideline 12-2020

5.3 Legionella Control Measures

- Available control measures include the following:
  - a. Temperature control
  - b. Supplemental disinfection/treatment
  - c. Filtration
  - d. Flushing
  - e. Recirculation
  - f. Cleaning and maintenance



CDC 2021 *Legionella* Tool Kit

https://www.cdc.gov/legionella/wmp/control-toolkit/index.html

2021 CDC *Legionella* Control Toolkit

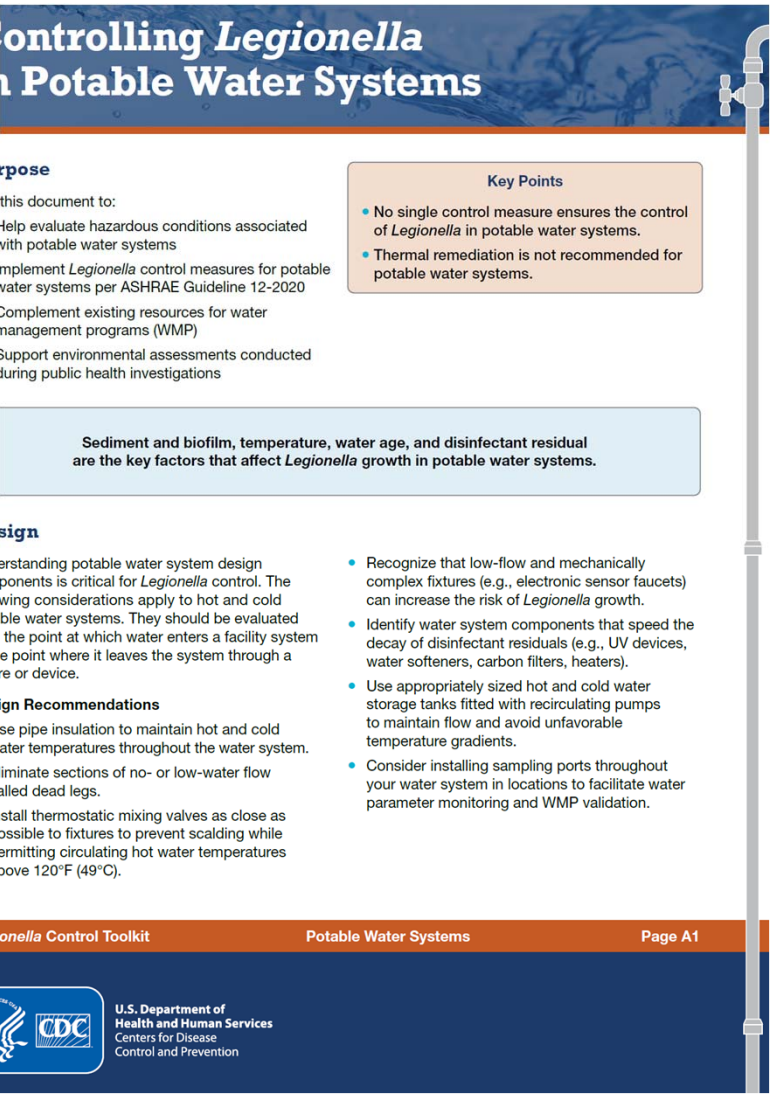
This document is a complement to the CDC toolkit of 2017

- Supports ASHRAE guideline 12/2020
- Referenced by CMS and The Joint Commission

Contents:

- Controlling *Legionella* in Potable Water Systems
- Controlling *Legionella* in Cooling Towers
- Controlling *Legionella* in Hot Tubs
- Controlling *Legionella* in Decorative Fountains
- Controlling *Legionella* in Other Devices
- Routine Testing for *Legionella*

Legionella Control Potable Water



ontrolling *Legionella*
n Potable Water Systems

rpose

this document to:

Help evaluate hazardous conditions associated with potable water systems

mplement *Legionella* control measures for potable water systems per ASHRAE Guideline 12-2020

Complement existing resources for water management programs (WMP)

Support environmental assessments conducted during public health investigations

Key Points

- No single control measure ensures the control of *Legionella* in potable water systems.
- Thermal remediation is not recommended for potable water systems.

Sediment and biofilm, temperature, water age, and disinfectant residual are the key factors that affect *Legionella* growth in potable water systems.

sign

erstanding potable water system design ponents is critical for *Legionella* control. The wing considerations apply to hot and cold ble water systems. They should be evaluated the point at which water enters a facility system e point where it leaves the system through a re or device.

gn Recommendations

se pipe insulation to maintain hot and cold ater temperatures throughout the water system.

iminate sections of no- or low-water flow alled dead legs.

stall thermostatic mixing valves as close as ossible to fixtures to prevent scalding while ermitting circulating hot water temperatures bove 120°F (49°C).

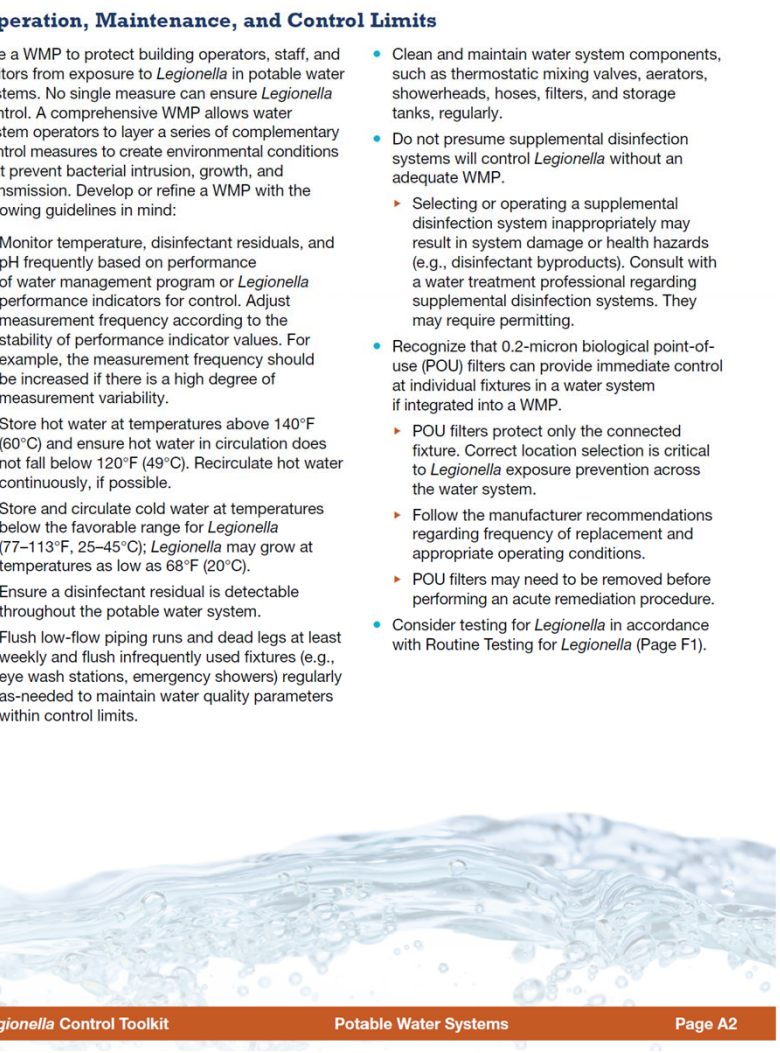
- Recognize that low-flow and mechanically complex fixtures (e.g., electronic sensor faucets) can increase the risk of *Legionella* growth.
- Identify water system components that speed the decay of disinfectant residuals (e.g., UV devices, water softeners, carbon filters, heaters).
- Use appropriately sized hot and cold water storage tanks fitted with recirculating pumps to maintain flow and avoid unfavorable temperature gradients.
- Consider installing sampling ports throughout your water system in locations to facilitate water parameter monitoring and WMP validation.

onella Control Toolkit | Potable Water Systems | Page A1

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

- Implement Legionella control measures for potable water systems per ASHRAE Guideline 12-2020
- No single control measure ensures control
- Thermal remediation is not recommended

Caution……



peration, Maintenance, and Control Limits

e a WMP to protect building operators, staff, and tors from exposure to *Legionella* in potable water stems. No single measure can ensure *Legionella* ntrol. A comprehensive WMP allows water stem operators to layer a series of complementary ntrol measures to create environmental conditions t prevent bacterial intrusion, growth, and nsmission. Develop or refine a WMP with the owing guidelines in mind:

- Monitor temperature, disinfectant residuals, and pH frequently based on performance of water management program or *Legionella* performance indicators for control. Adjust measurement frequency according to the stability of performance indicator values. For example, the measurement frequency should be increased if there is a high degree of measurement variability.
- Store hot water at temperatures above 140°F (60°C) and ensure hot water in circulation does not fall below 120°F (49°C). Recirculate hot water continuously, if possible.
- Store and circulate cold water at temperatures below the favorable range for *Legionella* (77–113°F, 25–45°C); *Legionella* may grow at temperatures as low as 68°F (20°C).
- Ensure a disinfectant residual is detectable throughout the potable water system.
- Flush low-flow piping runs and dead legs at least weekly and flush infrequently used fixtures (e.g., eye wash stations, emergency showers) regularly as-needed to maintain water quality parameters within control limits.
- Clean and maintain water system components, such as thermostatic mixing valves, aerators, showerheads, hoses, filters, and storage tanks, regularly.
- Do not presume supplemental disinfection systems will control *Legionella* without an adequate WMP.
  - Selecting or operating a supplemental disinfection system inappropriately may result in system damage or health hazards (e.g., disinfectant byproducts). Consult with a water treatment professional regarding supplemental disinfection systems. They may require permitting.
- Recognize that 0.2-micron biological point-of-use (POU) filters can provide immediate control at individual fixtures in a water system if integrated into a WMP.
  - POU filters protect only the connected fixture. Correct location selection is critical to *Legionella* exposure prevention across the water system.
  - Follow the manufacturer recommendations regarding frequency of replacement and appropriate operating conditions.
  - POU filters may need to be removed before performing an acute remediation procedure.
- Consider testing for *Legionella* in accordance with Routine Testing for *Legionella* (Page F1).

gionella Control Toolkit Potable Water Systems Page A2

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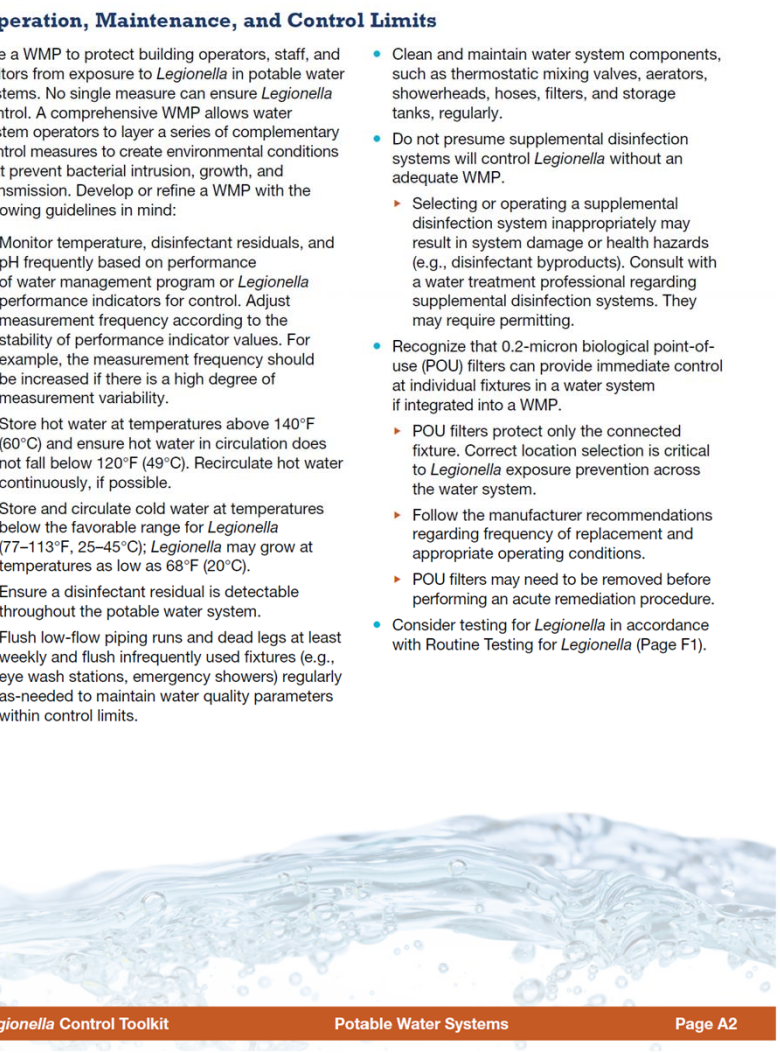
Legionella Control: Point-of-Use (POU)



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gionella Control Toolkit | Potable Water Systems | Page A2

- 0.2-micron biological point-of use (POU) filters can provide immediate control at individual fixtures in a water system.
- Limitation: POU filters protect only the connected fixture.

Legionella Control: Point-of-Use (POU)

Follow the manufacturer recommendations regarding frequency of replacement and appropriate operating conditions.

POU filters may need to be removed before performing an acute remediation procedure.

- Consider testing for *Legionella* in accordance with Routine Testing for Legionella (Page F1).

Review of POU Filters Published in AJIC

American Journal of Infection Control 000 (2019) 1–7

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

or Article

int-of-use filters for prevention of health care–acquired Legionnaires' ease: Field evaluation of a new filter product and literature review

nique Parkinson MS [a], Julianne L. Baron PhD [a], Beth Hall MBA [b], Harrie Bos [b], Patrick Racine PEng, CEM [c], rilyn M. Wagener MS [d], Janet E. Stout PhD [a,e,*]

United States Environmental Protection Agency
Office of Water
4607
EPA 815-R-06-010
April 2006

EPA
United States Environmental Protection Agency

Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems

Point-of-Entry Filtration

Point-of-Entry Filtration - Pros

Validated barrier for microorganisms

Addresses incoming source of *Legionella* and other waterborne pathogens

Significant reduction of particulate load (nutrients)

Point-of-Entry Filtration - Cons

Large footprint

High capital costs

No downstream effects (biofilm)

Potable Water Disinfection Methods

Shock (Short-Term) Disinfection

- Thermal
- Hyper-Chlorination
- Short Course Copper Silver Ionization

Supplemental (Long-Term) Disinfection

- Supplemental Chlorination
- Chlorine Dioxide
- Copper Silver Ionization
- Monochloramine

Other

- Point of use filtration
- UV
- Ozone

Stay Within Recommended or Required Limit

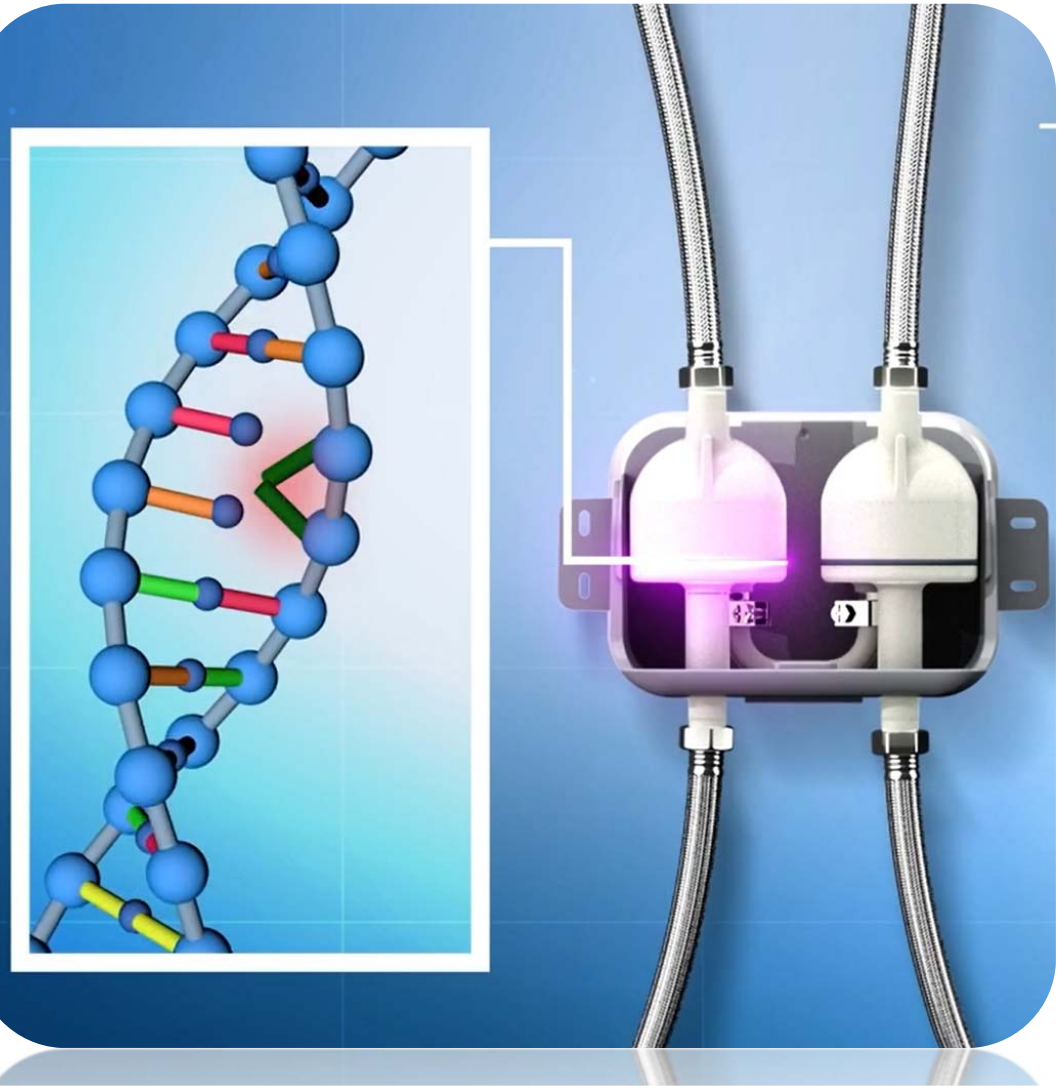
Chemicals	Manufacturers Recommended Target Control Ranges *(mg/L)*	Maximum Regulated Level *(mg/L)*	Regulated Disinfection By-Products *(USEPA, SDWA)*
Chlorine (as Cl_2)	0.5 – 3.0	MRDL = 4.0	THMs, HAA5
Chlorine dioxide (as ClO_2)	0.1 – 0.7	MRDL = 0.8	Chlorite
Monochloramine (as Cl_2)	2.0 – 3.0	MRDL = 4.0	THMs, HAA5
Copper-Silver	Copper = 0.20 – 0.80 Silver = 0.01 – 0.08	Copper, MCL = 1.3 Silver, SMCL = 0.1 *(Non-enforceable)*	Not applicable, Cu/Ag are not EP listed disinfectant

Ability to Maintain a Disinfectant Residual

Disinfectant needs to pass through distal outlets to be effective

If a building can’t deliver hot water, it may struggle to provide an effective supplemental disinfectant

New Innovative Approaches



Other (Innovative) POU Approaches

Temperature and flow control

- Programable touch-free faucets address stagnant wat
  can run unattended when usage is low.

Physical disinfection at the POU

- UV-C LED technology provides water disinfection
  treatment for hand-washing sinks- may be extra
  protection for high-risk patient care units.

Auto Draining Fixtures

Designed to help reduce stagnant water in the valve, pipes, and hoses of the shower system.

Drains integrated into the valve and hand spray hose remove water from the system after each use.

A

Automatic Drain Hand Spray Hose
The valve is integrated into the hose. After each use, water from the spray and hose is drained automatically.

B

Automatic Valve Drain
Available integrated into the trim plate or as a separate drain installed below the valve. When the water is shut off, water drains automatically from the valve.

Remote Drain Op

Bottom Line: Understand Before Selecting

Disinfection Approach

- Disinfection method
- Impact to water quality
- Targeted application

Efficacy

- Evidence-based evaluation
- Ability to maintain effective residual
- Manufacture's operating ranges

Permitting and operation requirements

The New York Times

By Max Horberry

Aug. 27, 2020

Reopened Schools Find Health Risks in Water After Covid-19 Lockdowns

A number of schools found the bacteria that causes Legionnaires' disease in their water, and experts say more should expect to see it.

Experts worry that water was left to stagnate in plumbing during lockdown, and that schools don't have plans or effective guidance for dealing with the effects of prolonged shutdowns. Frederic J. Brown/Agence France-Presse — Getty Images

WHY DO MICROBES LIKE A SHUTDOWN?

What Have We Learned?

WHAT HAPPENS TO WATER QUALITY?

What's Flow Got To Do With It?

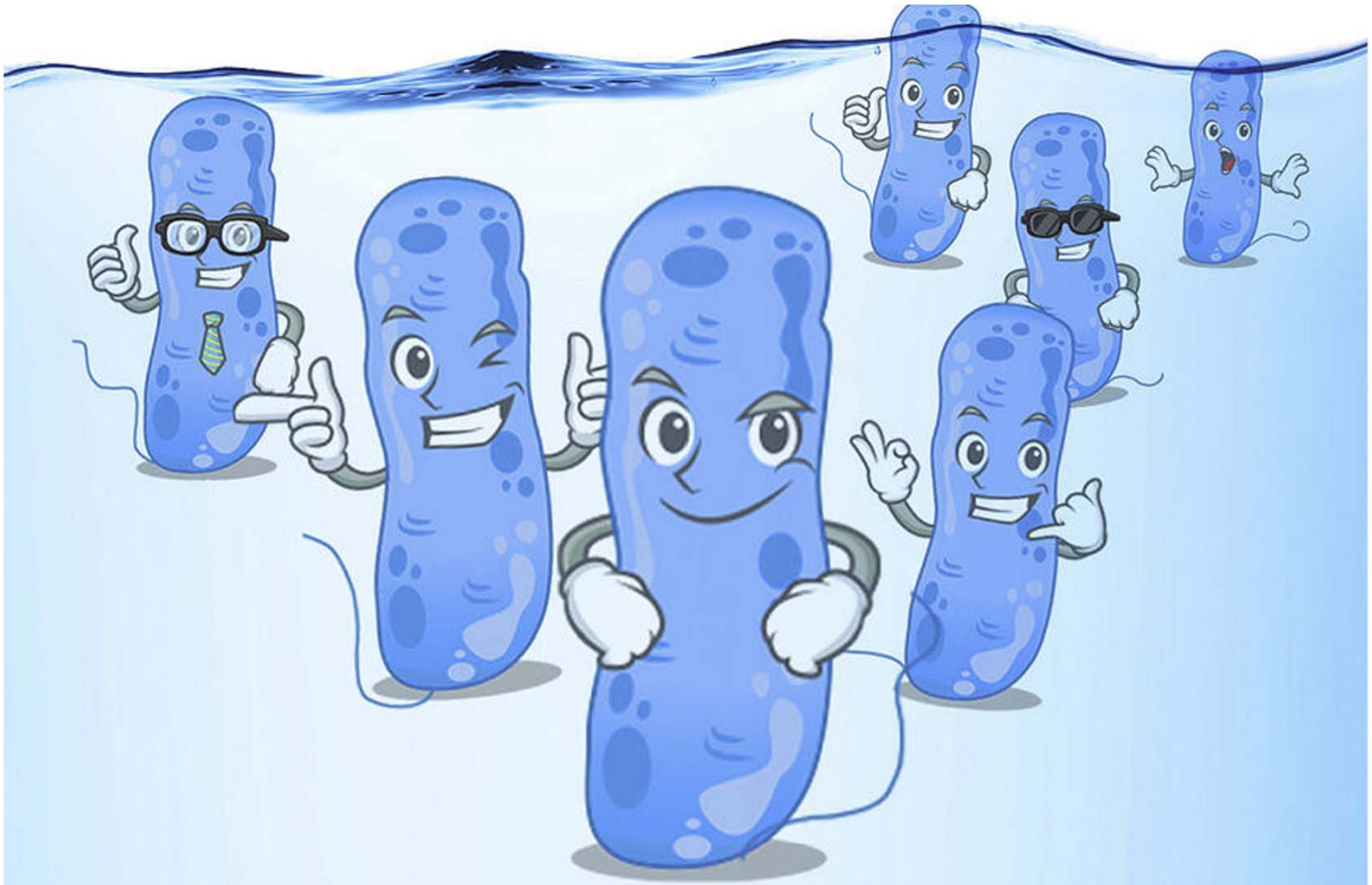
No Flow, They Grow

Closer Look

This experiment shows that bacteria will grow given a nutrient source and stagnant water.

What's in your stagnant pipes?

Microbes in Your Pipes



What makes us grow?

SPECIAL PATHOGENS LABORATORY®

THE LEGIONELLA EXPERTS®

Buildings Designed to Grow Bacteria

- Increased water age
  - Conversion to green/low water use/non-touch
  - Reduction in hand washing for disinfectant gels
- Low disinfection residuals
  - No chemical disinfectant in public water

Green/low water use/non-touch

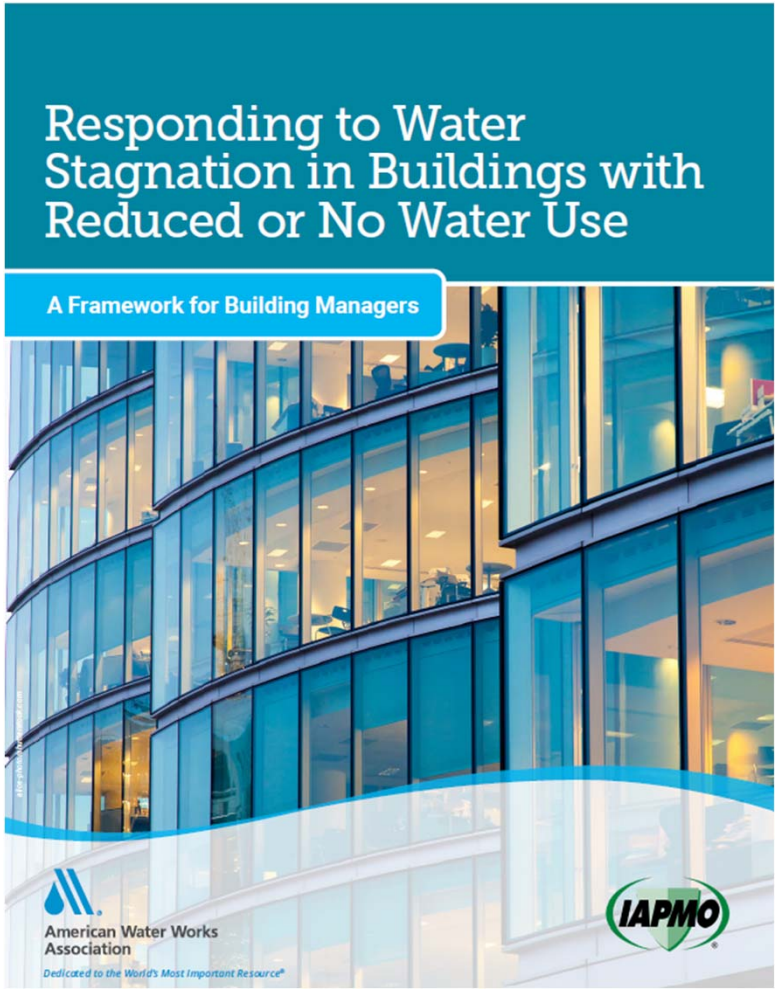
Stagnant or Standing Water

Increase time water is in the pipes (water age) degrades water quality.

Legionella and other bacteria grow well in the company of other microbes (synergy).

May increase the need for disinfection – either short-term or long-term water treatment.

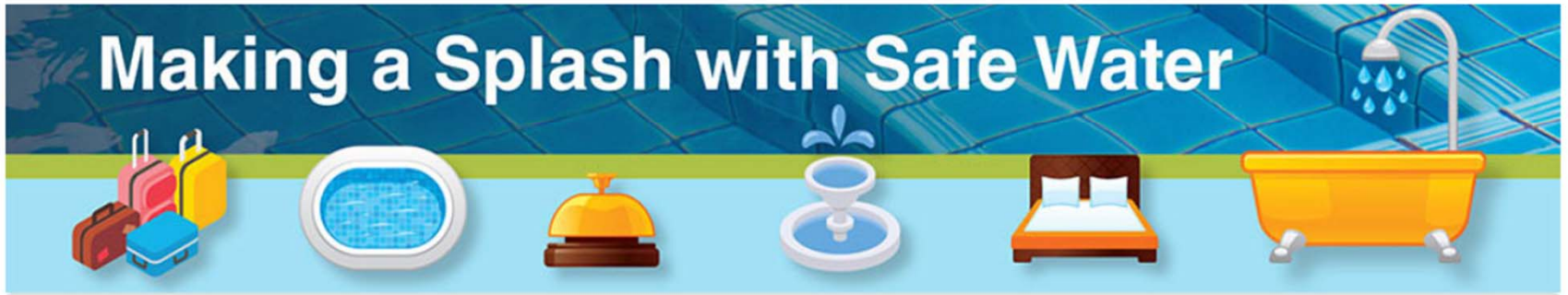
AWWA/IAPMO
Safe Shutdown and Startup of Building Water Systems



CDC: Hotel Outbreaks

Considerations for Hotel Owners and Managers: How to Prevent Legionnaires' Disease

View Page In: PDF [2 pages, 2 MB]



Legionnaires' disease is a serious type of pneumonia (lung infection) caused by *Legionella* bacteria. It can be associated with **hotels and resources**, and may be deadly and costly. Prevention keeps guests and employees healthy — it makes good business sense, too!

https://www.cdc.gov/legionella/wmp/hotel-owners-managers.html

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 building owners and facilities managers know the provider is knowledgeable?

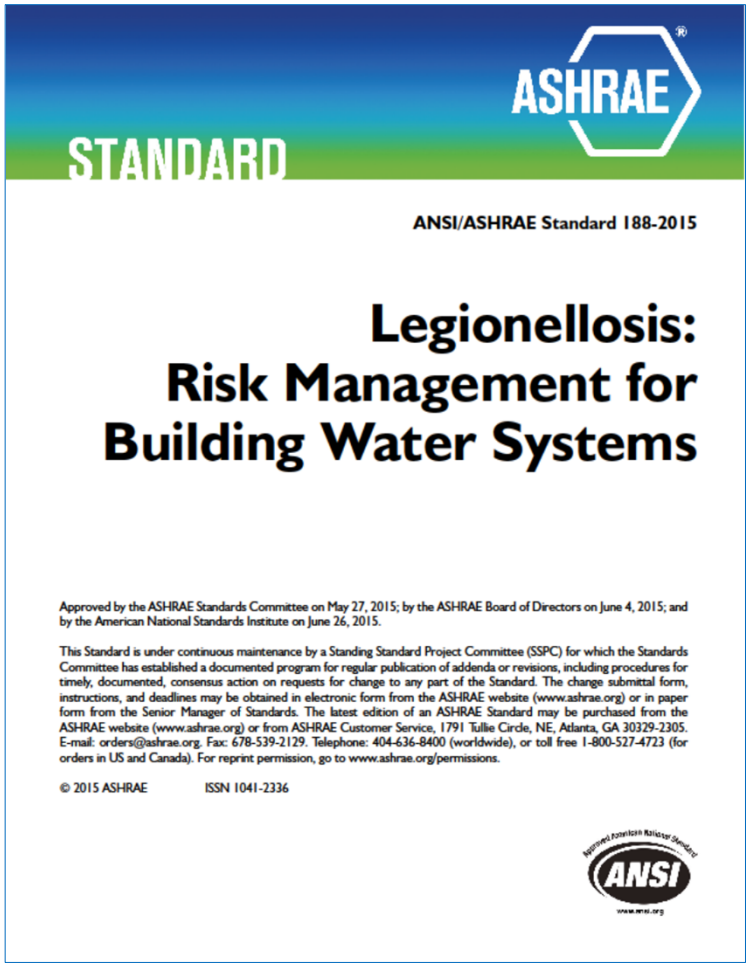
ASHRAE Standard 188 Says…

The program team shall have

knowledge

of the building water system design and water management

as it relates to Legionellosis


STANDARD

ASHRAE

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.

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ANSI

Who Has the Knowledge to Prevent These Infections?

Legionella Water Management

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.

ASSE Standard12080

- Certification to ASSE 12080 gives building owners confidence that the providers of these services possess this critical knowledge and are qualified to serve on facility water management program teams.

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.

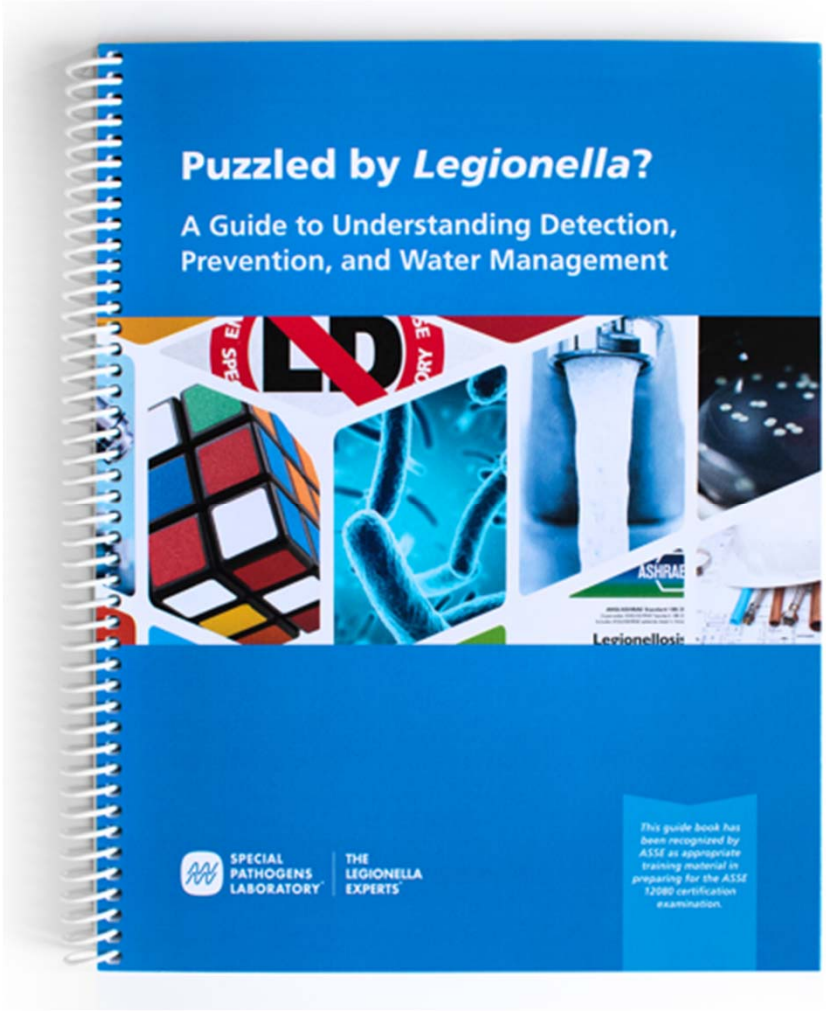
Passing score of 80% or higher

Learn more at www.specialpathogenslab.com under Solutions

Live Training

https://specialpathogenslab.com/asse-12080-certification/

Knowledge Transfer



MORE EDUCATION For You

Wednesday Webinar Series

https://specialpathogenslab.com/legionella-education/

PUZZLED BY WEDNESDAY WEBINARS

Puzzled by Legionella? Update from The Joint Commission

Diane Cullen, RN, MSN, MBA, CIC

The Joint Commission

This special hour-long presentation featured guest speaker Diane Cullen, RN, MSN, MBA, CIC. Cullen is Associate Director in the Standards Interpretation Group in the Division of Healthcare Improvement at The Joint Commission. She is responsible for working closely with accredited and certified organizations to interpret The Joint Commission standards, identify vulnerabilities, and improve their performance.

Subscribe - It’s Free!

SPECIAL PATHOGENS LABORATORY

Subscribe

Got 20 minutes? Learn more about Legionella and other waterborne pathogens! Attend our free Puzzled by Legionella? Wednesday Webinar series. Held every other Wednesday at noon EDT!

First name*

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Company name

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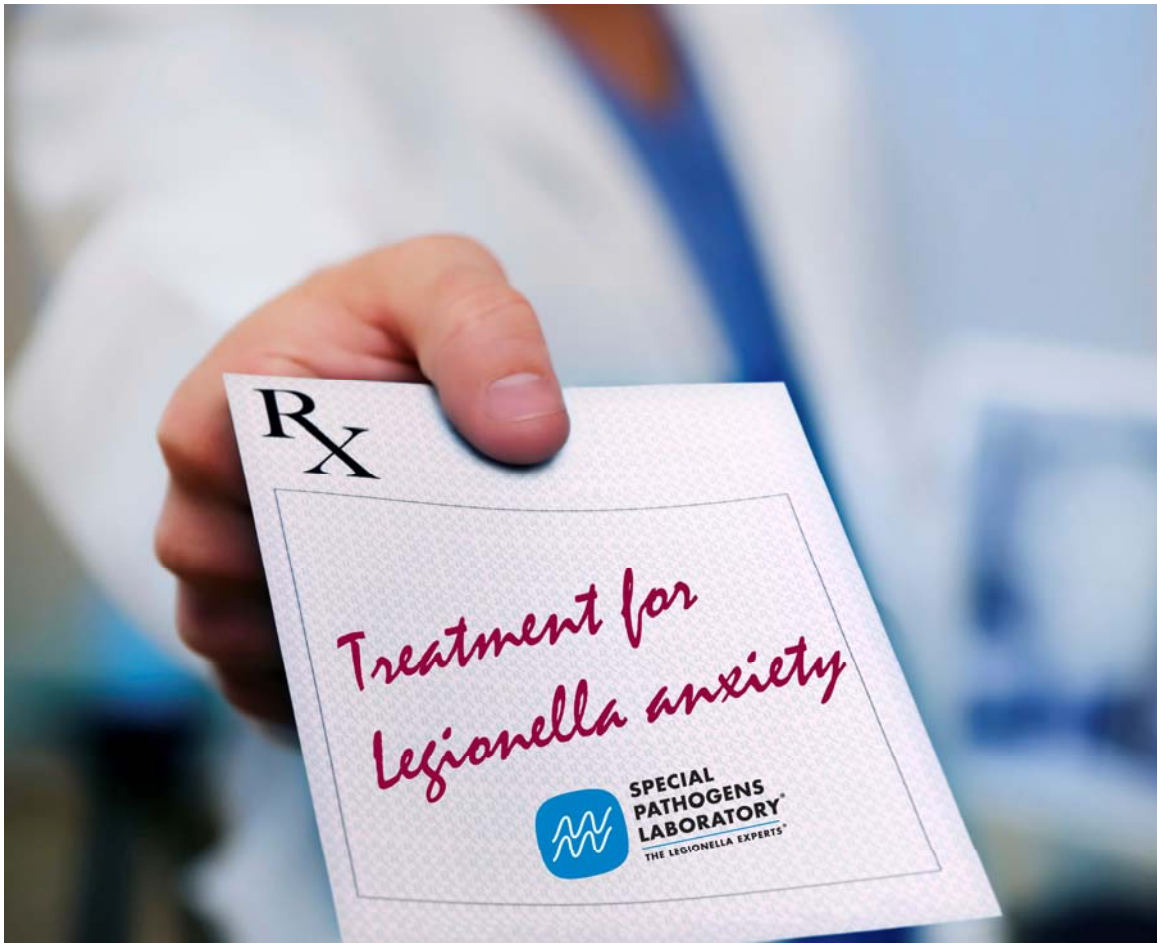
https://specialpathogenslab.com/legionella-education/

Legionella Anxiety?



MEDICATION

Dr. Stout's *Legionella* Chill Pills

For treatment of *Legionella*-related anxiety.

Take 2 tablets 1 hour before testing or starting your ASHRAE 188 Water Management Program

Crash The Party!

- Our Mission:
  - Stop the growth and spread of *Legionella* and waterborne pathogens

ce

SPECIAL PATHOGENS LABORATORY®
THE LEGIONELLA EXPERTS®

THANK YOU!
STAY SAFE!

WWW.SPECIALPATHOGENSLAB.COM

JANET.STOUT@PACELABS.COM

Dr. Janet E. Stout, Legionellologist