

# How Does Ohio Administrative Code 3701-22-07 Affect Your Water Management Program?

# Today's Presenter



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DIRECTOR OF WATER SAFETY  
AND MANAGEMENT

- **Barclay Water Management**
- **ASSE 12080 *Legionella* Water Safety & Management Specialist**
- **Over 100 facilities surveyed**
- **Provide support during *Legionella outbreak* investigations**

# Today's Content

1. *Legionella* Bacteria and Biofilm Overview & Sources in Building

Water Systems

2. Creating an Effective Water Management Program (WMP)

3. Ohio Code 3701-22-07 Requirements

4. Testing & Monitoring Requirements

5. Response & Remediation Strategies



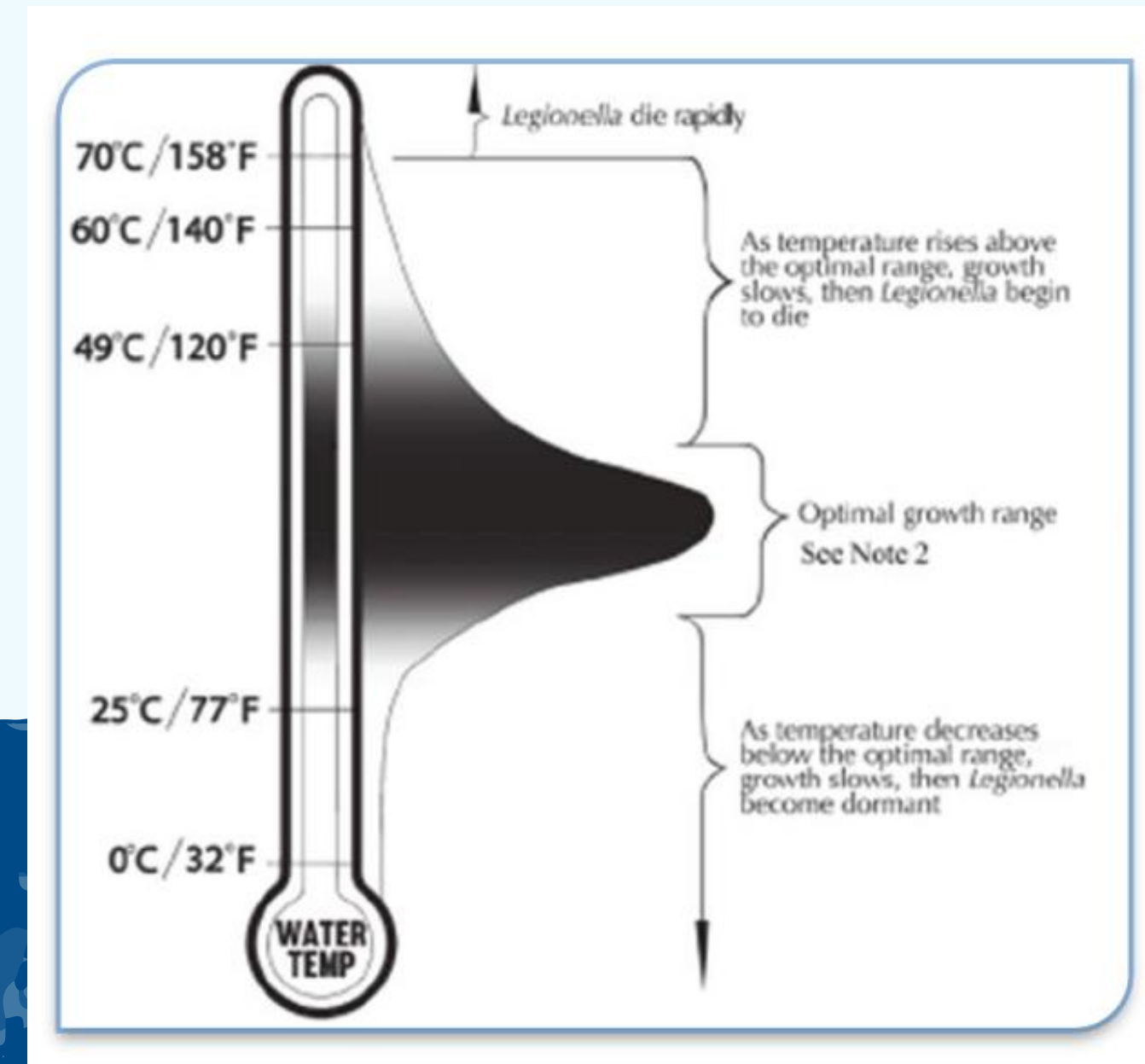
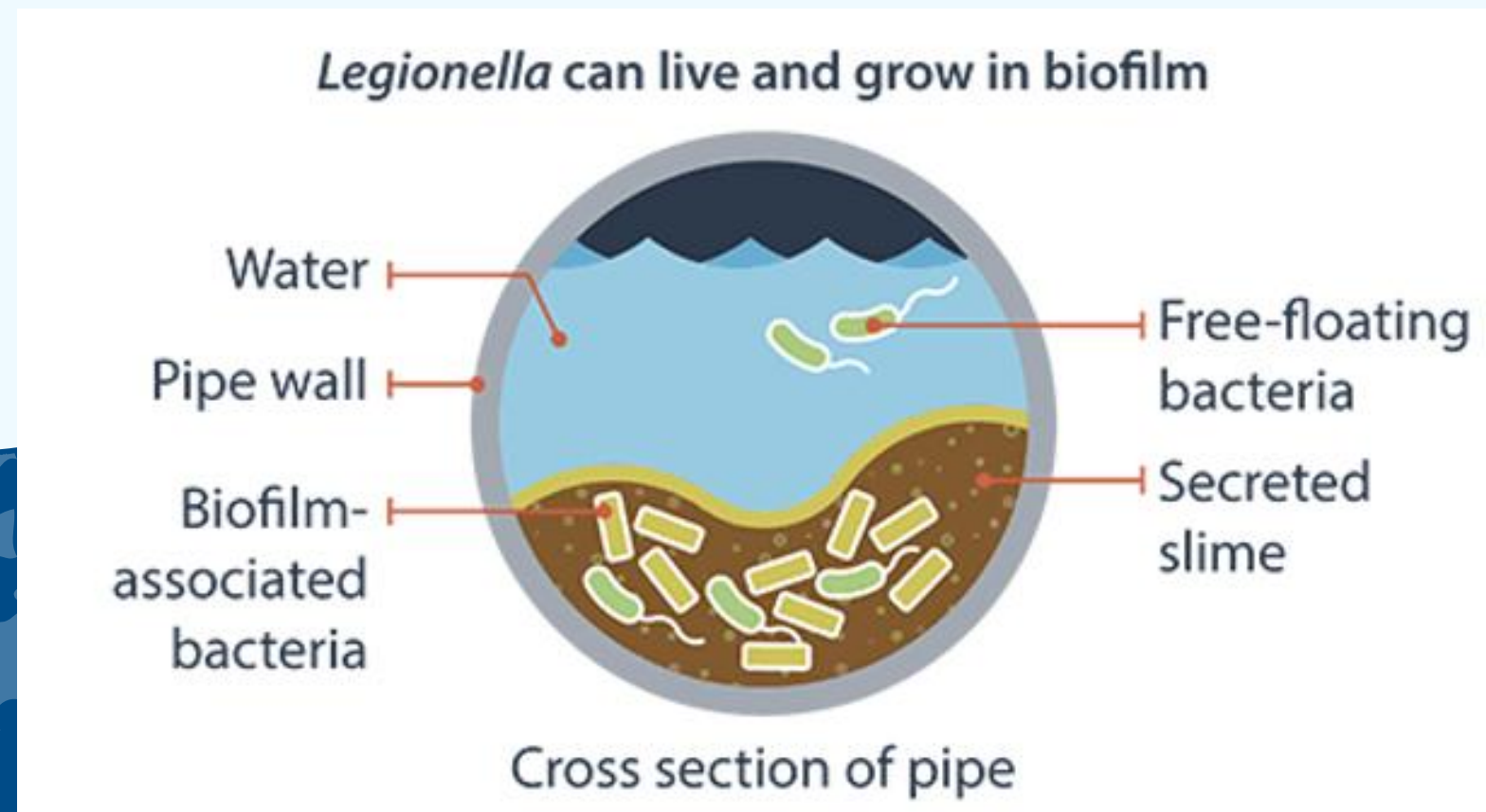
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## Legionella Bacteria and Biofilm Overview

- *Legionella* bacteria is a waterborne pathogen found in natural water
- More than 60 species of *Legionella*, with *Legionella pneumophila* responsible for 90% of case of human infection
- Growth Factors:

- **Temperature**

- **Nutrients**

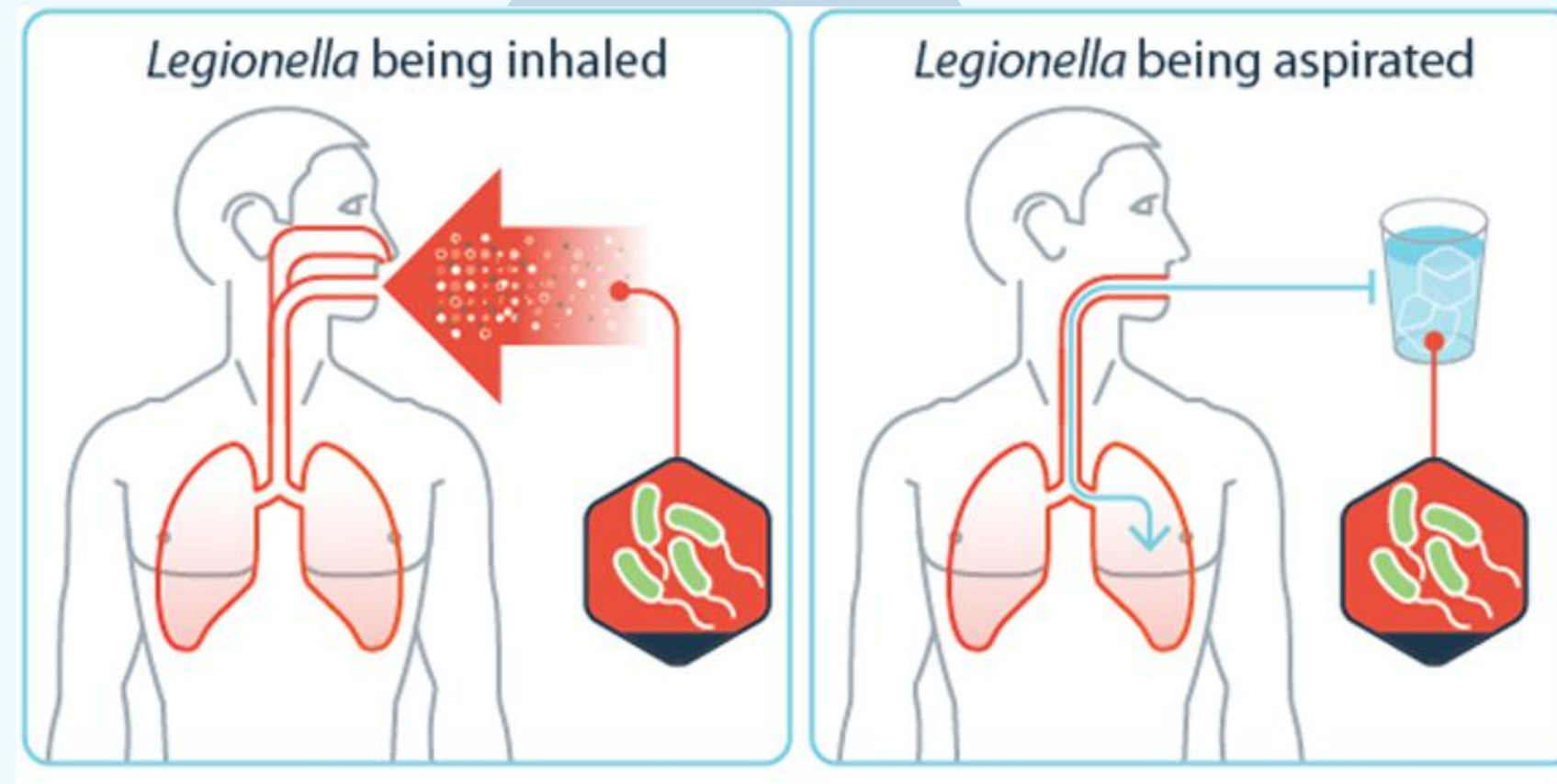


Temperature °F	<i>Legionella</i> bacteria survival
<68	Do not multiply but still viable
90-110	Optimal amplification temperature
>122	90% kill in 2 hours contact time
>140	90% kill in 2 minutes contact time
>158	100% rapid kill

# What is Legionellosis?

## Illnesses caused by *Legionella* bacteria

- **Legionnaires' disease** is a serious type of pneumonia caused by *Legionella* bacteria & requires antibiotics.
- **Pontiac Fever** is a milder infection, clears on its own & does not require antibiotics



# Public Health Impacts

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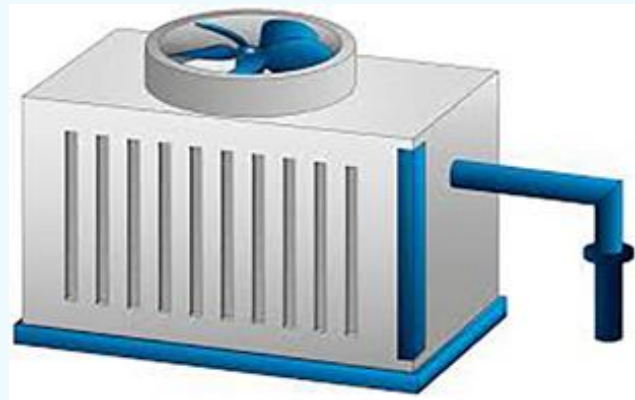
EPA and CDC recognize legionellosis as a significant and growing public health concern:

- 10,000 **reported** cases of Legionnaires' disease in the US in 2018
- An estimated **52,000 to 70,000** cases of Legionnaires' disease **annually**
- **Death rate is ~33%** of Legionella infections
- 3,000+ annual Emergency Department visits (91% result in hospitalizations)



# What are *Legionella* Bacteria Sources in Buildings?

- Cooling Towers
- Humidifiers
- Showerheads
- Faucets
- Water Fountains
- Whirlpool Baths or Spas
- Decorative Fountains
- Misting Machines at Grocery Stores
- Dental Lines
- Ice Machines
- Water Storage Tanks



# Factors and Events Leading to Legionnaires' Disease

## 1. Entry

Legionella entering building water systems

### Factors

- Disinfectant residual level in water supply to the building
- Water supply disruptions

## 2. Growth

A significant increase in the numbers of Legionella

### Factors

- Temperature
- Disinfectant residual
- System design
- Dirt/sediment
- Nutrients
- Microbial association

## 3. Transmission

Aerosols from faucets, shower heads, cooling towers,ountains, spa, etc.;  
piration; direct  
roduction

### Factors

- Temperature
- Humidity
- Aerosol production
- Distance from source
- Microbial associations

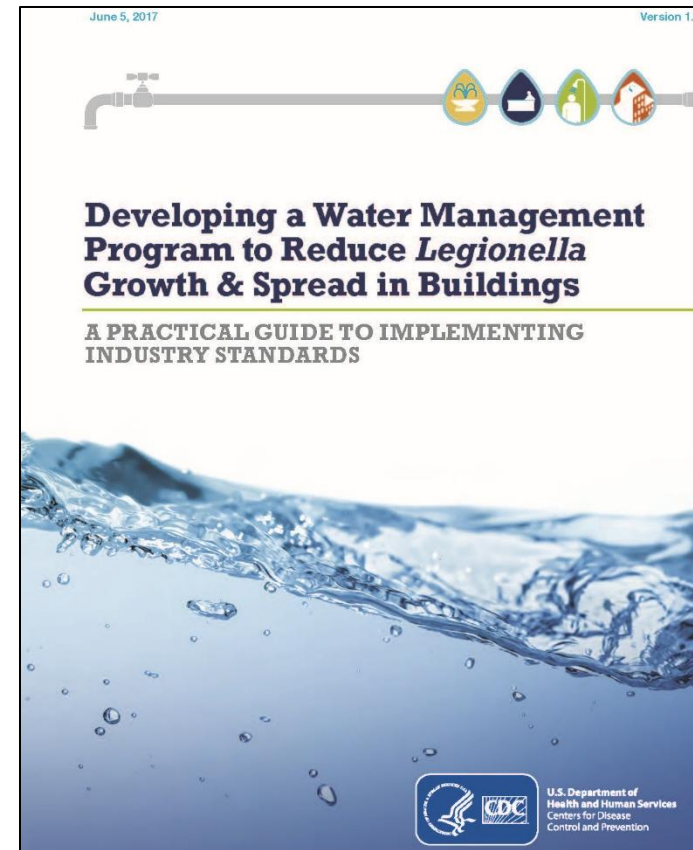
## 4. Exposure of Susceptible Human Host

Multiply in human host

### Factors

- Ability of bacteria to cause disease
- Virulence
- Age
- Disease
- Immunodeficiency

Legionnaires' Disease



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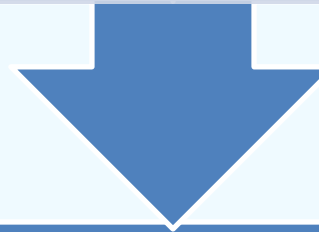
## Creating an Effective Water Management Program (WMP)



## **Guidelines (Recommendations/Best Practices)**

**ASHRAE Guideline 12-2023**

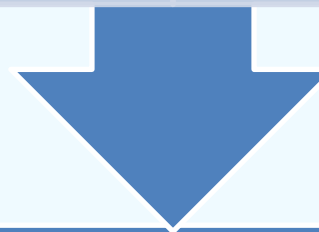
**CDC Practical Guide**



## **Standards: Specific Mandatory Controls**

**ASHRAE Standard 188-2021**

**ASHRAE Standard 514-2023,  
ANSI/AAMI ST108:2023**



## **Regulations: Informed by Standards & Guidelines**

**NYS, NYC, OH, NJ, IL, CMS, TJC**

# ASHRAE Standard 188

The pioneer of Legionella risk management in the US

- Describes environmental conditions that promote Legionella growth
- Provides a WMP framework
- Informative annexes



All roads lead back to ASHRAE 188...

ASHRAE Standard 514-2023

Outlines physical, chemical, and microbial hazards in a healthcare facility.

The Joint Commission Standard EC.02.05.02

Requires accredited facilities to implement a WMP that meets their criteria, in alignment with ASHRAE Standard 188.

CMS Memorandum

Requires CMS funded facilities to implement a WMP in accordance with ASHRAE Standard 188 and the CDC. Must also address other waterborne pathogens - primarily in biofilm.

CDC Guideline & Toolkit

General guide on creating a WMP, endorsing the ASHRAE Standard 188 approach.

ASHRAE Guideline 12-2023

Best practices, how tos, and control measures.

ANSI/AAMI ST.108:2023

Best practices on sterile processing equipment, including routine and baseline testing parameters and ranges.

## New York Regulations

Requires healthcare facilities and cooling tower owners to implement WMPs and MPPs, along with required *Legionella* testing

## New Jersey Senate Bill 2188

Passed September 12, 2024, will require a large array of facilities to implement WMPs

## Ohio Administrative Code 3701-22-07

Passed June 2024 and went into effect September 10, 2024, and requires hospitals to implement a WMP and requires *Legionella* testing

## Illinois Section 300.700

Effective as of June 2, 2022, Skilled Nursing and Intermediate Care Facilities shall develop a policy for testing for *Legionella* with a specified frequency based on ASHRAE and CDC Guidelines

# Ohio Code 3701-22-07 Requirements

- Water Management Program
- Legionella Sampling
- Outbreak Response



# Ohio Code 3701-22-07 Requirements- WMPs

- Water Management Program
  - Identify Hazardous Conditions
  - Manage Risk of Waterborne Pathogens
  - CDC WMP Toolkit

# Ohio Code 3701-22-07 Requirements- Legionella Sampling

- Validation Testing
  - Representative Samples from Hot Potable Loops
  - Point of Entry
  - Free or Total Chlorine Residuals and Temperatures
- Accredited Laboratory

# Ohio Code 3701-22-07 Requirements- Outbreak

- Water Use Restrictions or POU Filters
- Environmental Facility Assessment
- Water Management Program
- Sample Collection
- Corrective Actions

# Creating a Water Management Program Adapted from ASHRAE Standard 188-2021

Conduct RISK ASSESSMENT (by conducting a Water Systems Survey)

Form PROGRAM TEAM

Create FLOW DIAGRAMS

Determine CONTROL LOCATIONS. These are points in which *Legionella* bacteria growth and transmission can be minimized

Construct PROCEDURES FOR VERIFICATION AND VALIDATION to confirm Water Management Program is working effectively.

Establish DOCUMENTATION concerning all procedures and records

# Conduct RISK ASSESSMENT (by conducting a Water Systems Survey)



Conduct **RISK ASSESSMENT** (by conducting a Water Systems Survey)

**Immunocompromised  
Individuals**

**Respiratory Therapy**

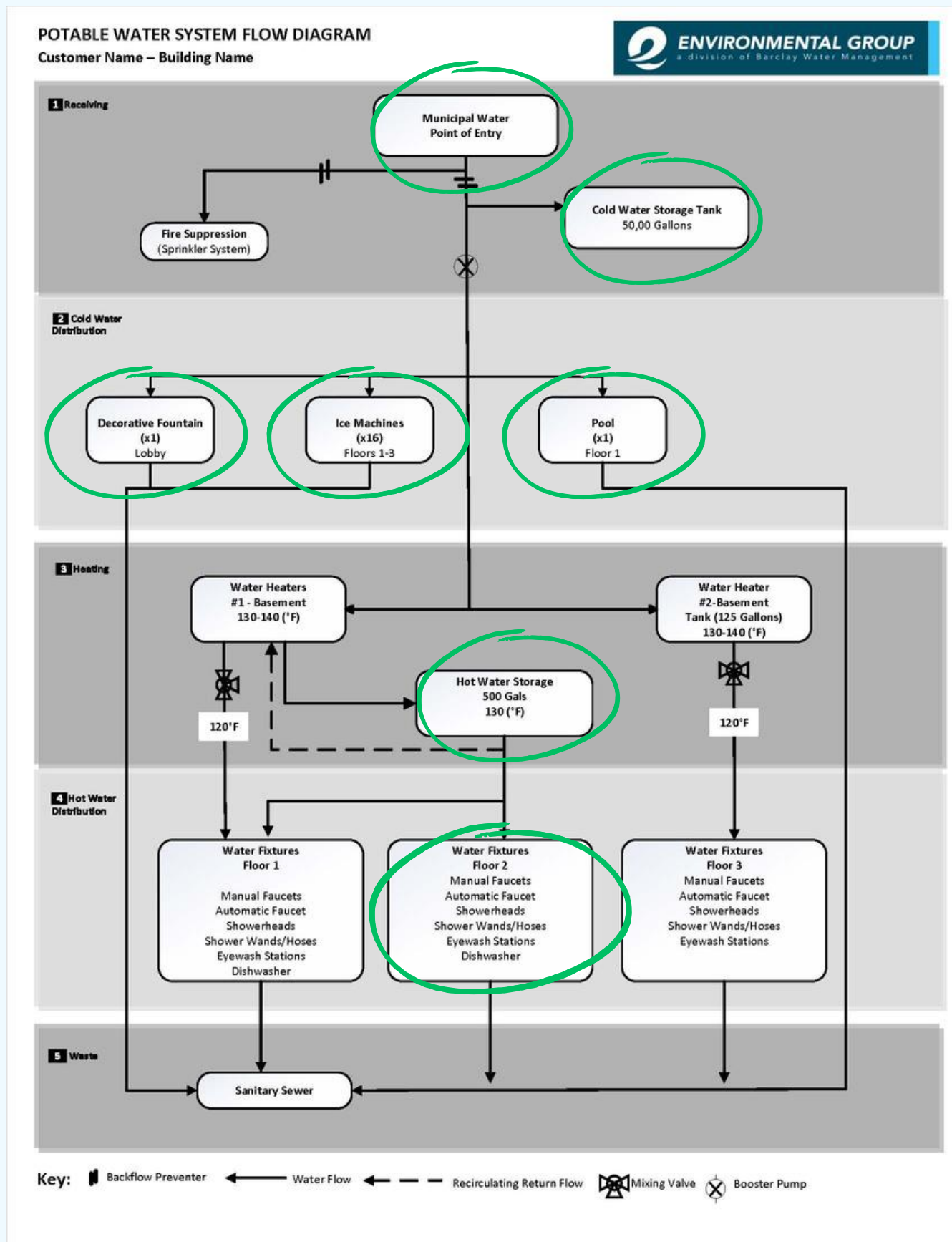
**High Risk Units  
(ICU, NICU, Dialysis,  
etc.)**

**High Exposure Areas**

## Form PROGRAM TEAM

Name	Job Title	Email Address	Role on WMP Team
	Senior Manager		Coordinates Team's actions. Understands principles of the WMP
	HVAC		Understands Buildings' utility water systems
	Plumbing		Understands the Buildings' domestic/potable water systems
	Safety		Helps with decision making in area of expertise
	Infection Disease		Helps with decision making in area of expertise
	Nursing		Helps with decision making in area of expertise
	Consultant		Helps with decision making in area of expertise

# Create FLOW DIAGRAMS



- Basic diagram that maps water supply through the facility
- High risk areas may be marked as sampling locations

# Determine **CONTROL LOCATIONS**. These are points in which *Legionella* bacteria growth and transmission can be minimized



CUSTOMER NAME  
**CONTROL LOCATIONS MANAGEMENT LOG**  
 DATE  
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## Domestic: Receiving/Cold Water Distribution/Heating/Hot Water Distribution

DOMESTIC WATER						
	Action Item	Control Measures	Minimum Frequency	Responsible	Location of Records	Corrective Action
1.	Check outflow and return temperatures of domestic water heaters <sup>1</sup>	130°-140°F	Monthly			Check piping insulation; increase recirculation rate; heat tracing of lines if temperatures cannot be maintained
2.	If there are no mixing valves to operate domestic hot water temperature at above 140°F or there is no secondary disinfection of domestic water system, disinfect hot distribution system <sup>1</sup>	Hyperchlorination: maintain 2ppm for 2-24 hours	Twice a year			
3.	Check hot water temperatures of faucets to ensure proper heating <sup>2</sup>	110°F-115°F within 1 minute	Monthly			Check piping insulation; check temperature of circulating water
4.	Clean domestic cold water tanks <sup>3</sup>	Clean with 200ppm bleach and maintain 10ppm free chlorine for 2 hours	Yearly			Implement procedure for domestic water tank cleaning
5.	Clean domestic hot water tanks <sup>4</sup>	Clean with 200ppm bleach and maintain 10ppm free chlorine for 2 hours	Yearly			Implement procedure for domestic water tank cleaning
6.	Remove faucet aerators completely. If not removed, clean yearly <sup>2</sup>	Clean with 500 ppm chlorine and inspect annually	Yearly			If cleaning, ensure appropriate cleaning procedure; consider removing or using laminar flow faucet aerators
7.	Clean showerheads and hoses (critical care) <sup>2</sup>	Clean with 500ppm chlorine or replace twice a year	Twice a year			Ensure cleaning procedure with chlorine-based product

Establish **DOCUMENTATION** concerning all procedures and records

- Ex. Documentation for biannual cooling tower cleaning
- Ex. Cooling tower disinfection due to high levels of Legionella bacteria
- Ex. Documentation for quarterly ice machine cleaning
- Ex. Documentation (ex. log book) of weekly faucet temperature readings

**Control Locations, Control Measures, & Ranges should only consist of what the facility will commit to doing - These tasks often change/are updated as time goes on!**

Establish **DOCUMENTATION** concerning all procedures and records



### Water Management Program History

Meeting Type	Date	Changes Made to WMP
Implementation	2019	N/A
Annual	2020	Updates made to WMP template to ensure compliance with EC.02.05.02, ASHRAE Standard 188, and local and state guidance.
Annual	2021	Updates to: Executive Summary, Control Locations Management Log, Flow Diagrams, Building System Details Forms
Annual	2022	Updates to: WMP Team
Annual	2022	Updates to: Control Locations Management Log
Annual	2023	Risk Assessments Updated
Annual	2024	An Annual Assessment was performed. The Control Log, Team, and Templates were updated with the information from the annual assessment questions

Construct PROCEDURES FOR VERIFICATION AND VALIDATION to confirm Water Management Program is working effectively.

- Meet Regularly as a WMP Team
- Actions are being taken
- Results being documented
- Clear responsibilities
- Changes in system

**Update WMP annually**

**Have a system in place to validate that the hazards are being controlled**

# Why create a WMP for your facility?

Compliance with regulations

Improve building water system operations

**SAFETY OF OCCUPANTS, VISITORS,  
AND STAFF**

# Validation Testing

Validate water management with testing:

- Disinfectant residuals in representative outlets  
– measured on-site while taking samples
- *Legionella* bacteria in representative outlets, ice machines, water heaters, etc.
- Lead levels in areas where people may consume the water
- Total bacteria (HPC) and Coliform bacteria



# Recognized Legionella Testing Method

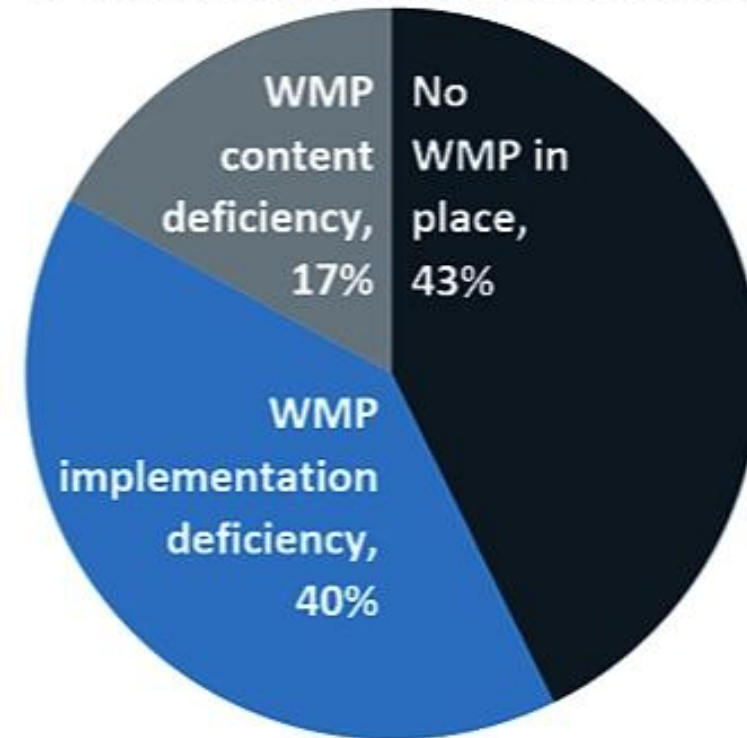
Live Culture Method is the gold standard - buffered charcoal yeast extract (BCYE) agar. Takes 10-14 days. Serotype if there are positive results.

Other methods are not recognized by CDC but could be useful in other ways-Polymerase Chain Reaction (PCR), Rapid Tests

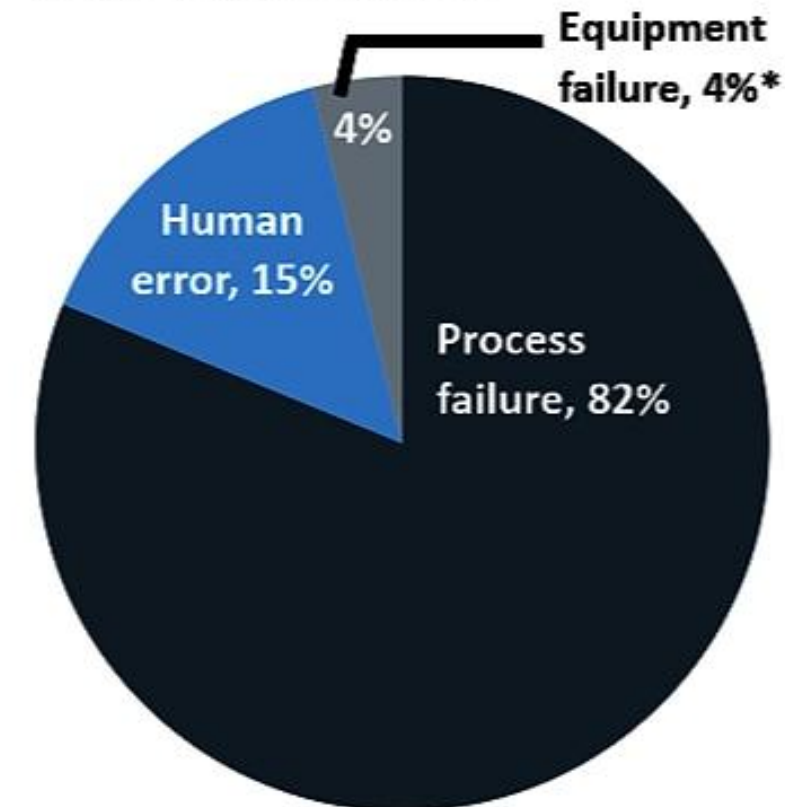


# Why verify and validate?

Most WMP deficiencies associated with outbreaks were due to missing or improperly implemented WMPs.



Most environmental deficiencies were due to process failure.



“All of the deficiencies associated with outbreaks could have been prevented by comprehensive, properly implemented water management programs (WMPs).”

# ASHRAE Guideline 12-2023

**Table C-1 Performance Indicators for Water Management Programs for Potable Water Systems<sup>a</sup>**

Calculated <i>Legionella</i> , CFU/mL <sup>b</sup>	Program Performance	Suggested Response
≤1 or not detected	<i>Legionella</i> growth appears well controlled.	Continue Program.
>1	Conditions may allow <i>Legionella</i> growth.	Implement the guidance in Section C5 <sup>d</sup> .
Trending of Test Results over Time <sup>c</sup>	Program Performance	Suggested Response
10 to 100 fold increase	<i>Legionella</i> growth appears to be poorly controlled.	Implement the guidance in Section C5 <sup>d</sup> .
>100 fold increase	<i>Legionella</i> growth appears to be uncontrolled.	Implement the guidance in Section C5 <sup>d</sup> .

- a. This table provides guidelines that may be used to evaluate the performance of Programs and provides responses to the *Legionella* test results. The information in this table does not necessarily correlate with health risk and is not predictive of disease. Results of testing for *Legionella* have been interpreted based on concentration, extent of colonization, and type of *Legionella*.
- b. If test results are expressed in units other than CFU/mL, consult the testing laboratory or test manufacturer for the appropriate interpretation of results.
- c. A tenfold (1 Log) increase in the number of *Legionella* previously detected, even when the increase results in values that, taken alone, indicate *Legionella* growth appears well controlled. An example of a tenfold increase is from 1 to 10 CFU/mL. An example of a 100-fold (2 Log) increase is from 1 to 100 CFU/mL.
- d. In health care facilities where at-risk persons are housed or treated and where *Legionella* growth does not appear well controlled, consider implementing measures from the health care facility's water management plan to protect patients from exposure to water aerosols while implementing the guidance in Section C1.

**Table C-2 Performance Indicators for Water Management Programs for Cooling Towers and Evaporative Heat Exchangers<sup>a</sup>**

Calculated <i>Legionella</i> , CFU/mL <sup>b</sup>	Program Performance	Suggested Response
≤10 or not detected	<i>Legionella</i> growth appears well controlled.	Continue Program.
>10	Conditions may allow <i>Legionella</i> growth.	Implement the guidance in Section C5.
Trending of Test Results over Time	Program Performance	Suggested Response
10 to 100 fold increase <sup>c</sup>	<i>Legionella</i> growth appears to be poorly controlled.	Implement the guidance in Section C5.
>100 fold increase <sup>c</sup>	<i>Legionella</i> growth appears to be uncontrolled.	Implement the guidance in Section C5.

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# CDC Guidelines and Toolkit

**Figure 1. Routine *Legionella* testing: A multifactorial approach to performance indicator interpretation\*<sup>oΔ</sup>**

Concentration indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled	
≥10 CFU/mL <sup>†</sup> in potable water <b>OR</b> ≥100 CFU/mL in non-potable water	1.0–9.9 CFU/mL in potable water <b>OR</b> 10–99 CFU/mL in non-potable water	Detectable to 0.9 CFU/mL in potable water <b>OR</b> Detectable to 9 CFU/mL in non-potable water	No <i>Legionella</i> detected in a single round of testing  No <i>Legionella</i> detected in multiple rounds of testing  No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species

Change in concentration over time indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled	
100-fold or greater increase in concentration (e.g., 0.05 to 5 CFU/mL)	10-fold increase in concentration (e.g., 0.05 to 0.5 CFU/mL)	<i>Legionella</i> concentration steady (e.g., 0.5 CFU/mL for two consecutive sampling rounds)	No <i>Legionella</i> detected in a single round of testing  No <i>Legionella</i> detected in multiple rounds of testing  No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species

Extent indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled	
Detection in multiple locations AND a common source location <sup>‡</sup> <b>OR</b> Detection across many locations within a water system	Detection in a common source location that serves multiple areas <b>OR</b> Detection in more than one location within a water system	Detection in a few of many tested locations within a water system	No <i>Legionella</i> detected in a single round of testing  No <i>Legionella</i> detected in multiple rounds of testing  No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species

Type<sup>§</sup> of *Legionella* (species and serogroup) associated with Legionnaires' disease:

Highly Associated	Less Associated
<i>L. pneumophila</i> serogroup 1; Non-Lp1 <i>L. pneumophila</i> ; Presence of multiple different <i>Legionella</i> species or serogroups	Any non- <i>pneumophila</i> <i>Legionella</i> species including "blue-white" fluorescent <i>Legionella</i>

\*This figure is intended for use during routine testing only. Test results are performance indicators and are not a measure of risk of human illness. This figure is not intended for use if a building or device is associated with Legionnaires' disease (LD) cases or an outbreak.

<sup>o</sup>See "Routine testing for *Legionella*" for guidance regarding suggested response activities. Comparable results may lead to different suggested response activities when other factors are considered (e.g., if there is evidence of poorly controlled growth at a healthcare facility).

<sup>Δ</sup>Considering the type of *Legionella* identified along with other *Legionella* testing performance indicators provides a clearer picture of water system control than the results of any single indicator. For example, facility owners and operators may consider implementing immediate interventions for a healthcare facility with: A. detectable but <10

colony-forming units per milliliter (CFU/mL), B. non-Lp1 *Legionella pneumophila*, C. observed at steady concentrations, but D. detected at multiple distal locations including a central water heater.

<sup>†</sup>Concentrations expressed as CFU/mL are for test results generated by traditional spread plate culture methods. If other test methods are used, consult testing lab or manufacturer instructions for appropriate interpretation.

<sup>‡</sup>Common source location examples include water heaters, hot water returns, storage tanks, and cooling tower basins.

<sup>§</sup>If a facility has a history of associated LD cases, then sequencing isolates obtained during routine testing may provide performance indicators regarding outbreak strain persistence (if that strain is detected).



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

# Suggested Responses

Concentration of Legionella Bacteria (CFU/mL)	Suggested Response Actions
<1	<ul style="list-style-type: none"><li>• Review sample collection, handling, and testing for potential errors.</li><li>• Confirm that system equipment is in good working order and functioning as intended.</li></ul>
>1	<ul style="list-style-type: none"><li>• Review records to confirm that the WMP was implemented as designed (verification).</li><li>• Review assumptions about operating conditions, such as physical and chemical characteristics of incoming water.</li><li>• Re-evaluate fundamental aspects of the WMP, including analysis of hazardous conditions, cleaning, maintenance procedures, chemical treatment, and other aspects that could affect Legionella testing.</li><li>• Adjust WMP as necessary to address any deficiencies identified.</li><li>• Consider whether remedial treatment is needed only after completion of the above.</li><li>• If remedial treatment was performed, wait at least 48 hours after the system returns to normal operating conditions and retest a set of representative samples to confirm the effectiveness of the response.</li></ul>

# Responding to Positive Legionella Bacteria Results

In the absence of an outbreak:

- NYS Protection Against Legionella, Subpart 4-2
- ASHRAE 188 says Program Team should decide what to do
- OSHA and CDC have general guidelines (based on number of Legionella bacteria, CFU/mL)
- To protect the population exposed to potential risk, installation of 0.2 micron Point of Use filters is recommended until a remediation is implemented

In the presence of an outbreak: follow the directions of corresponding Department of Health

# Short-Term Remediation

Short-Term Disinfection Type	Notes
Chemical Shock / Hyperhalogenation	<ul style="list-style-type: none"><li>• Extremely corrosive</li><li>• Disruptive to patients</li><li>• Costly – labor intensive</li><li>• Temporary</li></ul>
Point-of-Use 0.2 Micron Filters	<ul style="list-style-type: none"><li>• Effective at filtering out <i>Legionella</i> bacteria</li><li>• Must be changed on a routine basis</li><li>• No carrying disinfectant (no oxidant use)</li></ul>
Thermal Disinfection	<ul style="list-style-type: none"><li>• <b>CDC no longer recommends thermal disinfection for short-term remediation in building water systems.</b></li><li>• Temporary – does not protect against re-colonization of the system</li><li>• Disruptive to patients</li><li>• Employee &amp; patient safety concerns (scalding)</li><li>• Costly – labor intensive</li><li>• Costly on infrastructure (piping, valves, pump seals)</li></ul>
Flushing	<ul style="list-style-type: none"><li>• Can help minimize sediments &amp; biofilms</li><li>• Decreases water age</li><li>• Increases disinfectant residual</li></ul>

# Long-Term Remediation

Long-Term Disinfection Type	Notes
Sodium Hypochlorite (chlorine)	<ul style="list-style-type: none"><li>• Not as effective as monochloramine or chlorine dioxide</li><li>• Extremely corrosive</li><li>• EPA-regulated disinfection byproducts</li><li>• Taste &amp; odor</li></ul>
Copper/Silver Ionization	<ul style="list-style-type: none"><li>• Highly corrosive</li><li>• pH restriction of 8.0</li><li>• Must be cleaned with acid</li><li>• Dosage limits (1.0 ppm copper, 0.1 ppm silver)</li></ul>
Chlorine Dioxide	<ul style="list-style-type: none"><li>• Chlorite must be measured daily</li><li>• Decomposes rapidly, does not carry into hot water well</li></ul>
Monochloramine	<ul style="list-style-type: none"><li>• Has been used as drinking water disinfectant for &gt;90 years</li><li>• Lower levels of disinfectant byproducts than chlorine</li><li>• Longer system hold times, superior in complex systems</li><li>• Less corrosive than chlorine or chlorine dioxide</li></ul>

# Content Recap

1. *Legionella* Bacteria and Biofilm Overview & Sources in Building

Water Systems

2. Ohio Code 3701-22-07

3. Creating an Effective Water Management Program (WMP)

4. Response & Remediation Strategies



# Thank you