IMPORTANT WATER MANAGEMENT CONSIDERATIONS DURING DESIGN AND CONSTRUCTION

BARCLAY
WATER MANAGEMENT

PRESENTER

SPENSER JOHNSON

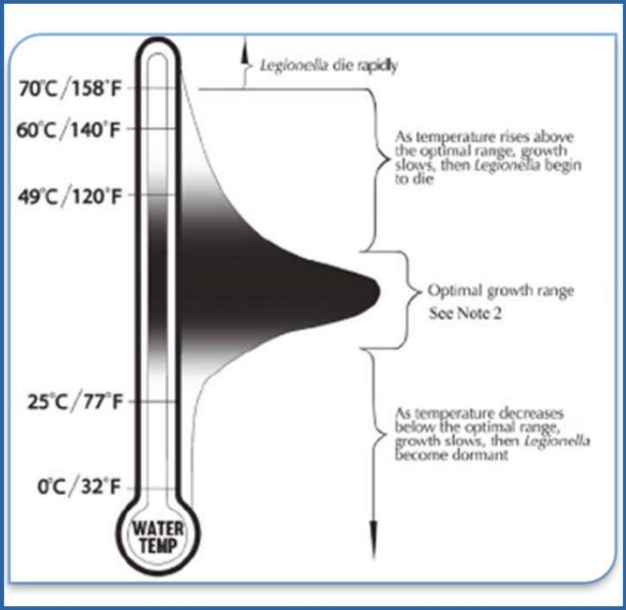
Senior Environmental Group Manager
Certified ASSE 12080 Legionella Water Safety and Management Specialist
Barclay Water Management, Inc.

BARCLAY
WATER MANAGEMENT

AGENDA

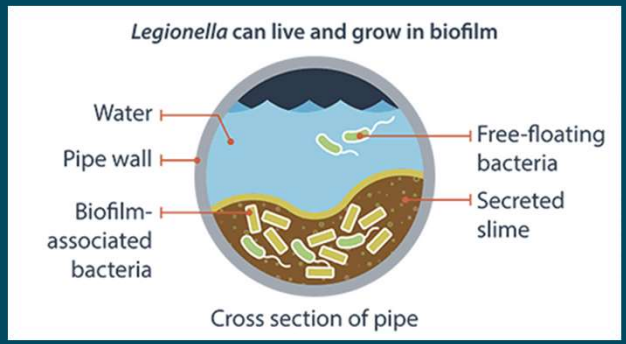
- *Legionella* Bacteria, Standards, and Guidelines Overview
- Design and Construction Considerations
- Water Management for Construction (WMC) Infection Control Risk Assessment (ICRA)
- Start Up and Recommissioning

LEGIONELLA BACTERIA



Source: ASHRAE Guideline 12-2020

- *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

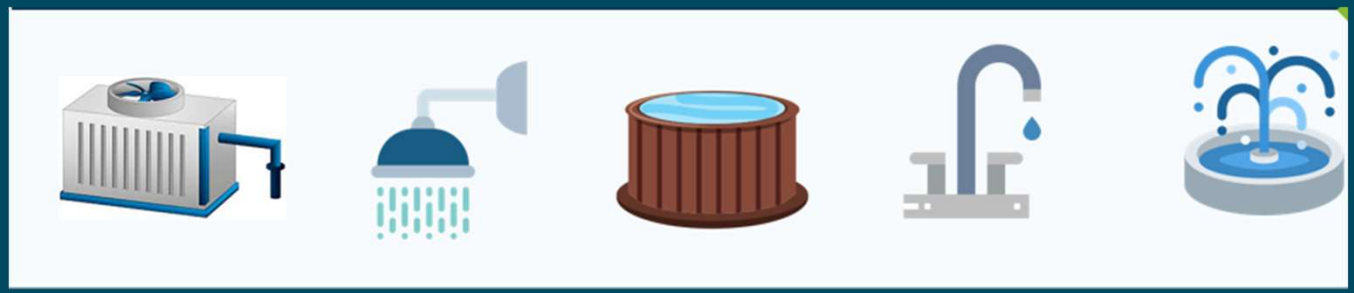


Source: CDC

LEGIONELLA BACTERIA SOUCRES

BARCLAY WATER MANAGEMENT

- 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

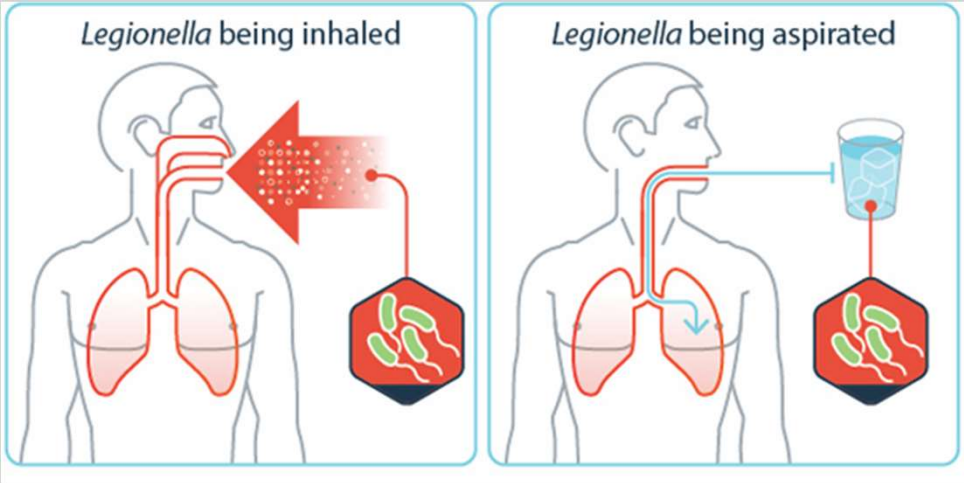


WHAT IS LEGIONELLOSIS?

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

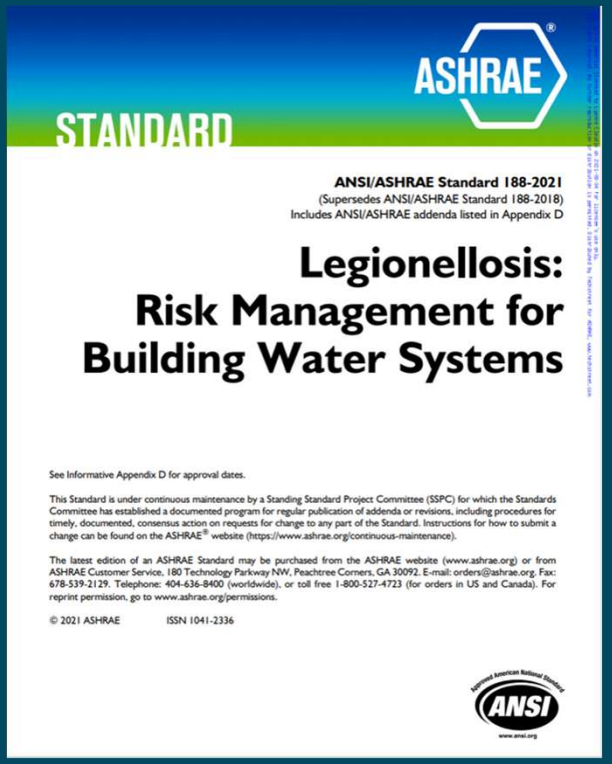


Source: CDC

ASHRAE STANDARD 188-2021 Legionellosis: Risk Management for Building Water Systems

BARCLAY WATER MANAGEMENT

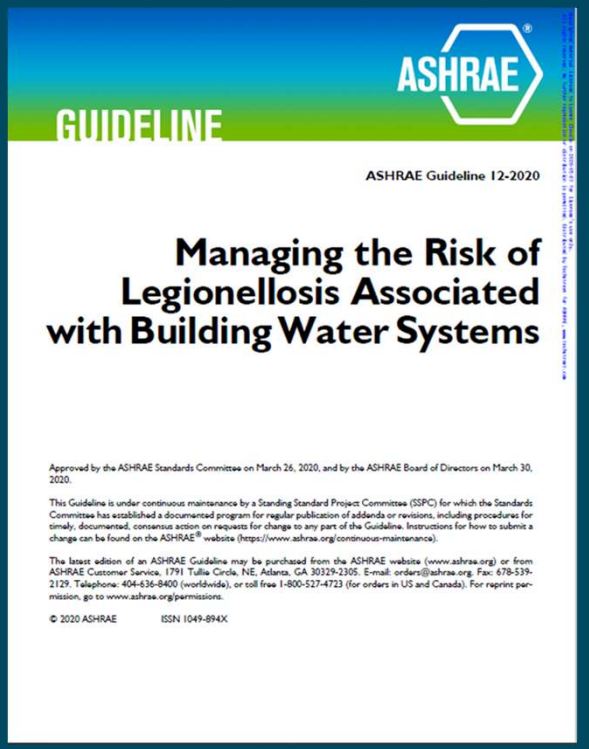
- Approved by ASHRAE Standards Committee May 2015; updated in 2021
- Certain buildings to Create & Implement a Water Management Program (WMP)
- Standard 188 has been written into regulations (NYS, NYC, CMS, The Joint Commission)



ASHRAE GUIDELINE 12-2023
MANAGING THE RISK OF LEGIONELLOSIS ASSOCIATED WITH BUILDING WATER SYSTEMS

BARCLAY WATER MANAGEMENT

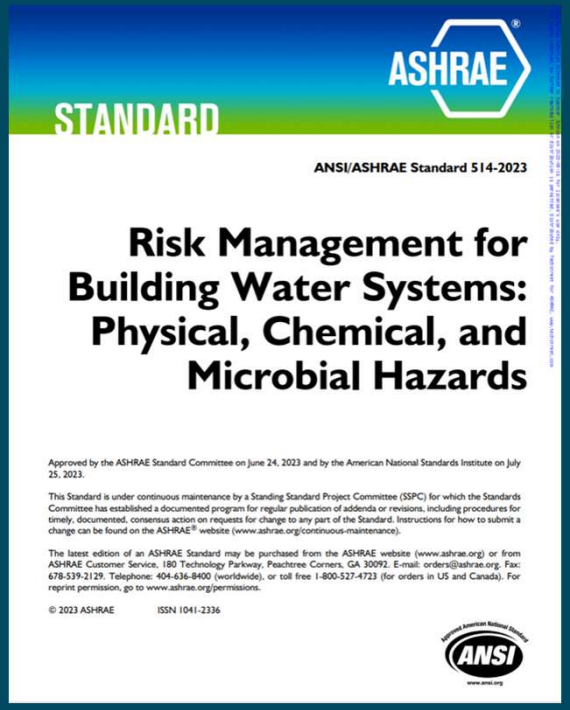
- Released in 2000, updated in 2023
- Provides information and guidance on the control of legionellosis associated with building water systems and provides guidance useful in the implementation of ANSI/ASHRAE Standard 188, Legionellosis: Risk Management for Building Water Systems.
- Outlines best practices and control measures for *Legionella* bacteria

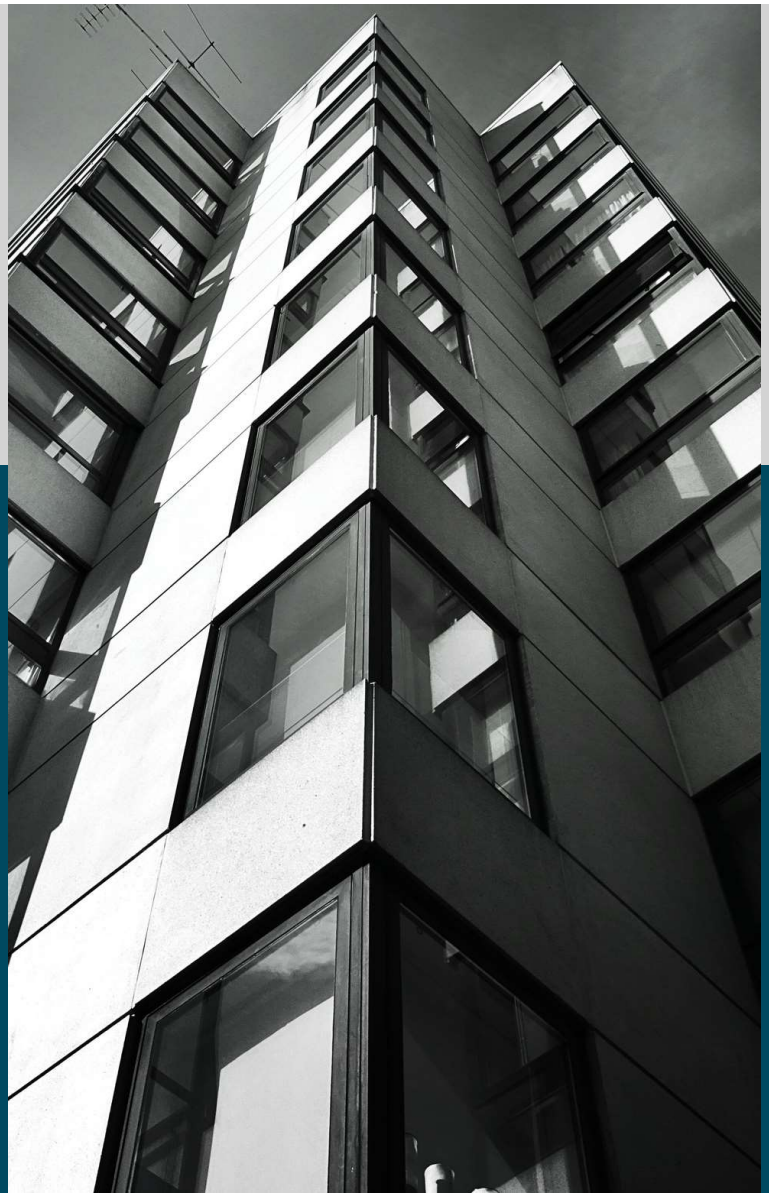


ASHRAE STANDARD 514-2023
RISK MANAGEMENT FOR BUILDING WATER SYSTEMS: PHYSICAL, CHEMICAL, AND MICROBIAL HAZARDS

BARCLAY WATER MANAGEMENT

- Approved by the ASHRAE Standard Committee in June 2023
- Provides information and guidance on the control of other waterborne pathogens such as Nontuberculous Mycobacterium (NTM), Pseudomonas aeruginosa, Legionella, Acanthamoeba, and Naegleria fowleri, all of which can lead to negative human health effects.
- Outlines three hazard types and ways to mitigate the risks of each including guidance on water temperature, water quality, system design and maintenance, and risk assessments





BARCLAY
WATER MANAGEMENT

DESIGN AND CONSTRUCTION

BARCLAY
WATER MANAGEMENT

IMPORTANT SYSTEM DESIGN CONSIDERATIONS

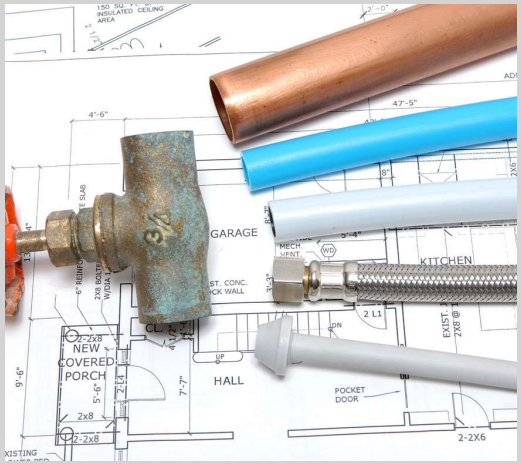
- Insulation
- Piping Size
- Dead Legs
- Purge and Drain Valves/Recirculation
- Water Pressure
- Sampling Points

BARCLAY
WATER MANAGEMENT

PLUMBING COMPONENTS

A number of physical, chemical, and operational *Legionella* control measures can be affected by choices made when selecting plumbing components:

- Mixing Valves
- Water Storage Tanks
- Eye wash and safety showers
- Faucets with flow restrictors
- Electronic or sensor faucets



BARCLAY
WATER MANAGEMENT

PLUMBING COMPONENTS

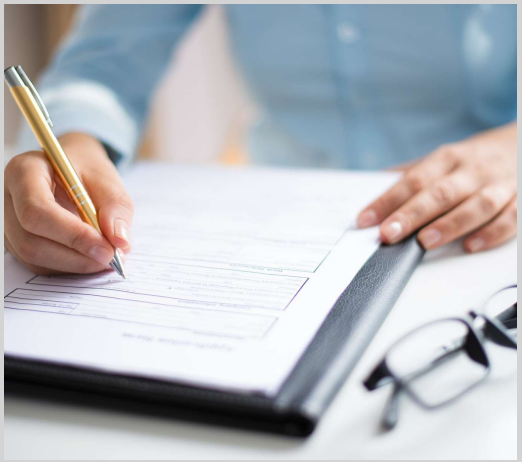
- Floor Drains
- Expansion Tanks
- Maintenance Access
- Reduction of Stagnant Conditions
- Cross Connection/Backflow Prevention
- Nutrients
- Water Processing Equipment

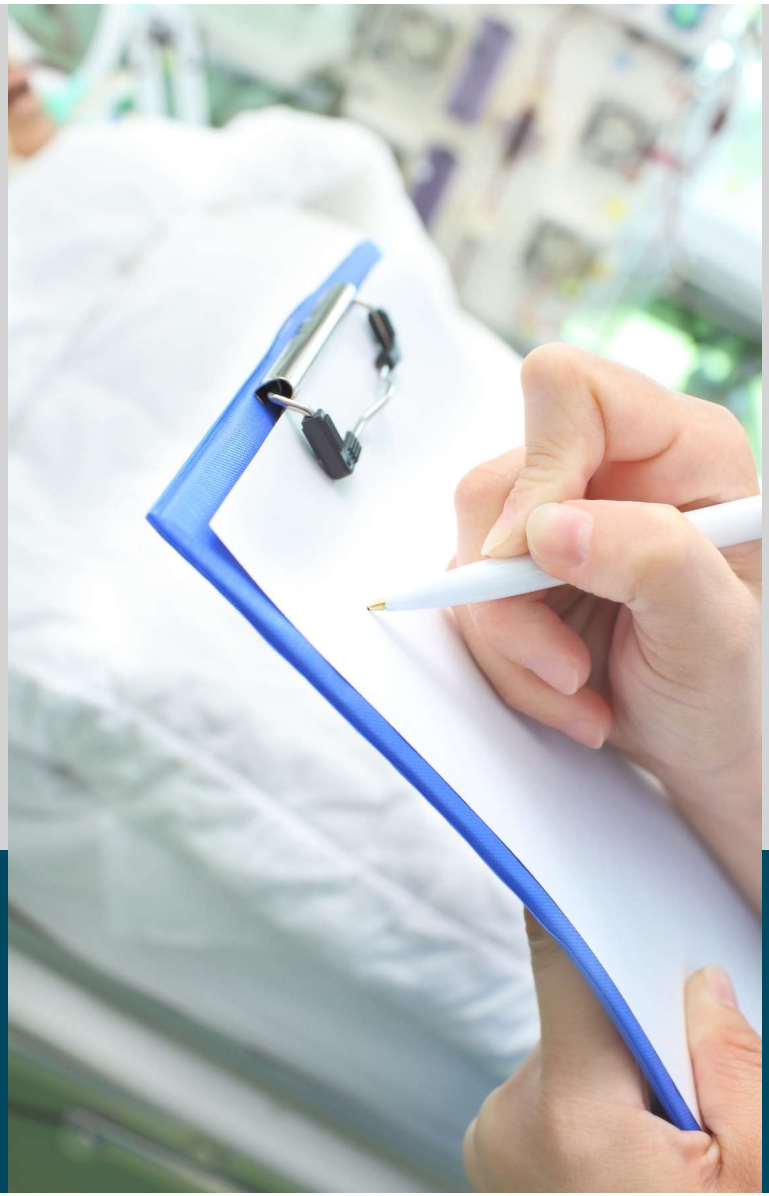
BARCLAY
WATER MANAGEMENT

DOCUMENTATION

When designing for new construction, renovations, refurbishment, replacement, or repurposing of a facility, the following shall be documented:

- System Overview
- Schematic Drawings of Water System
- Local, Regional, and National Code Compliance
- Outdoor Air Intakes
- Maintenance Schedules
- Access to Water System Components





BARCLAY
WATER MANAGEMENT

WATER MANAGEMENT FOR CONSTRUCTION (WMC) - INFECTION CONTROL RISK ASSESSMENT (ICRA)

WATER MANAGEMENT FOR CONSTRUCTION (WMC) - INFECTION CONTROL RISK ASSESSMENT (ICRA)

BARCLAY WATER MANAGEMENT

Construction Project Categories

Category A

BWDS (Building Water Distribution System) Inspection, maintenance/repair and non-invasive activities of brief duration, and low water age. Water by fixture or area is shut down for < 24 hours (minimal water age/stagnation)

Category B

Small scale BWDS, short duration activities which create minimal water disruption, and modest water age. Water by fixture or area is shut down for < 7 calendar days (1 work week for water age)

Category C

Work generates moderate to high BWDS disruption or removal of any fixed BWDS components or assemblies with medium water age. Water by fixture, component, or area is shut down < 30 days.

Category D

Major BWDS demolition, renovation, infrastructure, and/or new construction projects with high water age. Water by fixture or area is not active (new start-up) or was shut down (> 30 days)

WATER MANAGEMENT FOR CONSTRUCTION (WMC) - INFECTION CONTROL RISK ASSESSMENT (ICRA)

BARCLAY WATER MANAGEMENT

Building Occupant Risk Group

Low

Office areas
Conference Rooms
Administration
Medical Records

Modest

Cafeteria areas
Psychiatry
Family waiting areas
Lobbies
Some outpatient modalities

High

Emergency Department
Pediatrics Unit
Pharmacy
High-risk Maternity
Maternal newborn
Post-anesthesia care unit
Cardio interventional unit
Cardiac care unit
Acute care Medical Unit
Acute care surgical unit

Severe

Intensive Care Units, including Pediatric Intensive Care Units and Neonatal Intensive Care Units
Hemo-oncology Units
Burn Units
Bone Marrow Transplant Units
Oncology Units
Labor & Delivery Units
Operating Rooms/Suites
Sterile Processing
Cardiac Cath Labs
Interventional Radiology
Infusion Centers
Dialysis Centers

Water Management for Construction (WMC) Decision Matrix

<table>
<tr><th></th><th>Minimally invasive BWDS, brief duration, and low water age (< 24 hours)</th><th>Small scale BWDS, shortduration, and modest water age (< 7 days)</th><th>Moderate to high levels of BWDS construction, and medium water age (< 30 days)</th><th>Major BWDS demolition, renovation, infrastructure, and/or new construction with high water age (> 30 days)</th></tr>
<tr><td>Building Occupant Risk Group</td><td>Category A</td><td>Category B</td><td>Category C</td><td>Category D</td></tr>
<tr><td>Low Risk</td><td rowspan="2">WMC-1</td><td rowspan="2">WMC-2</td><td rowspan="2">WMC-3</td><td>WMC-3 or 4</td></tr>
<tr><td>Modest Risk</td><td rowspan="3">WMC-4</td></tr>
<tr><td>High Risk</td><td rowspan="2">WMC-2</td><td>WMC-3</td><td rowspan="2">WMC-3 or 4</td></tr>
<tr><td>Severe Risk</td><td>WMC-3 or 4</td></tr>
</table>

BARCLAY
WATER MANAGEMENT

RISK MITIGATION LEVELS- WMC-1

- Prior to construction perform baseline measurements for temperature, oxidant residual, and pH.
- Following construction flush hot and cold water.
- Confirm measures are the same or better than baseline levels.
- Document all activities

BARCLAY
WATER MANAGEMENT

RISK MITIGATION LEVELS- WMC-2

- Perform all tasks for WMC-1
- Establish enclosure to prevent aerosolized water from dispersing into facility
- Leave barrier in place until all work is completed including flushing activities

BARCLAY
WATER MANAGEMENT

RISK MITIGATION LEVELS- WMC-3

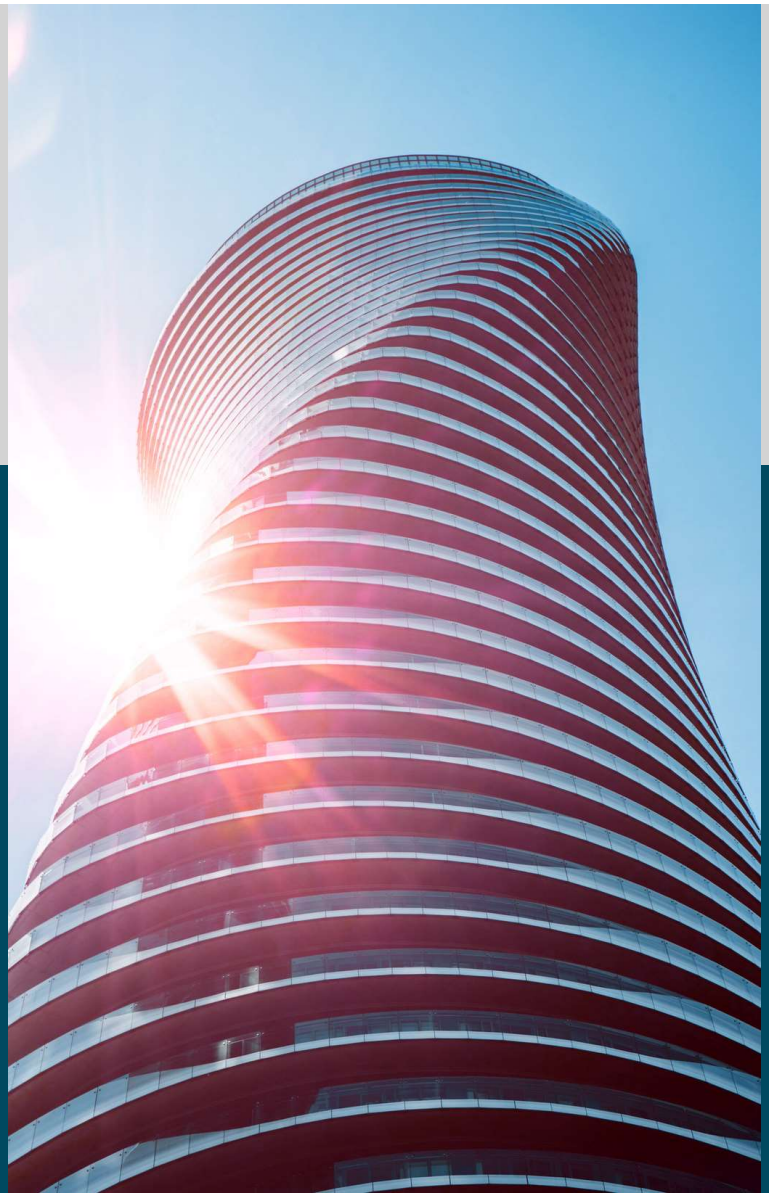
- Perform all tasks for WMC-1 and 2
- Calculate water volumes for area under going construction
- Perform regular flushing in occupied and unoccupied areas adjacent and within the construction zone. Document flushing.
- Review disinfection procedures to be performed.

BARCLAY
WATER MANAGEMENT

RISK MITIGATION LEVELS- WMC-4

- Perform all tasks for WMC-1, 2, and 3
- Conduct a project specific pre-construction risk assessment
- Prepare a project specific WMC plan for commissioning the building water system(s) per ASHRAE Standard 188

BARCLAY
WATER MANAGEMENT



COMMISSIONING

BARCLAY
WATER MANAGEMENT

SYSTEM START-UP AND SHUTDOWN

Water Management Programs shall include procedures for:

- Flushing and Disinfection of new systems
- Shutdown
- Restarting
- Unplanned Loss of Operating Energy
- Reestablishing temperatures

BARCLAY
WATER MANAGEMENT

LEGIONELLA OUTBREAK

- Hospital in Ohio
- New Facility, Opening Delayed Several Times
- At least 16 Patients Diagnosed, One Passed Away
- Outbreak was likely the result of inadequate disinfection

COMMISSIONING BUILDING WATER SYSTEMS

BARCLAY WATER MANAGEMENT

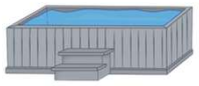
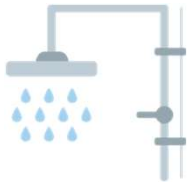
Commissioning shall include the following:

- Procedures for flushing and disinfection
- Compliance with all applicable national, regional, and local regulations.
- Disinfection and flushing shall be completed no more than three weeks before whole or partial beneficial occupancy.
  - If occupancy is delayed more than two weeks but less than four weeks after disinfection, flushing of all fixtures shall again be completed.
  - If occupancy is delayed four weeks or more after disinfection, the need for disinfection, flushing, or both disinfection and flushing of unoccupied areas shall be determined by the WMP Team.
- Confirm that building water system meets design performance parameters

BARCLAY
WATER MANAGEMENT





REOPENING WATER SYSTEMS

- Develop a comprehensive Water Management Program (WMP) for your water system
- Confirm your water heater is properly maintained and the temperature is set to at least 140°F
- Flush your water system
- Clean all decorative water features
- Maintain hot tubs/spas per local, state or CDC guidelines
- Confirm cooling towers are clean and well-maintained
- Ensure safety equipment including fire sprinkler systems, eye wash stations, and safety showers are clean and well-maintained
- Maintain your water system. Regularly check water quality parameters such as temperature, pH, and disinfectant levels

BARCLAY
WATER MANAGEMENT

VALIDATION TESTING

Validate commissioning with testing:

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

BARCLAY
WATER MANAGEMENT

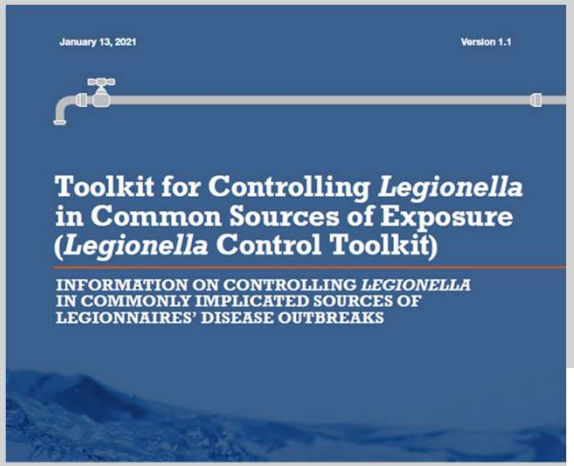
CDC *LEGIONELLA* CONTROL TOOLKIT

CDC released a *Legionella* Control Toolkit

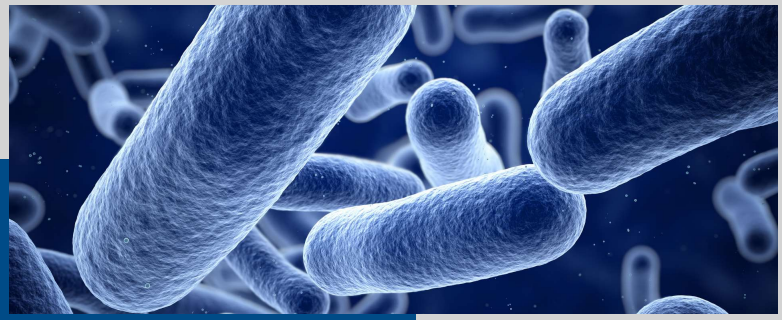
•Outlines the usefulness of routine sampling for Legionella

•Establishes performance indicators

•Endorses ASHRAE Guideline 12-2023



BARCLAY
WATER MANAGEMENT



TAKEAWAYS

- Consider the risks associated with water system elements and features and decide what should be used during the design phase.
- The importance of a WMC (Water Management for Construction) ICRA (Infection Control Risk Assessment) and how to use them during construction.
- How to properly recommission a building water system following construction. The steps to take and documentation that's needed.

BARCLAY
WATER MANAGEMENT

THANK YOU