



Legionnaires' Disease Update

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Healthcare-Associated Infections (HAI)
Prevention Program
Bureau of Communicable Diseases (BCD)
Division of Public Health

Agenda

- Background and clinical features
- Disease burden and transmission
- Prevention and Water Management Programs



Background



Legionnaires' Disease: Background

- Atypical pneumonia caused by *Legionella* bacteria



Legionnaires' Disease: Background



- Atypical pneumonia caused by *Legionella* bacteria
- Grows and spreads in building water systems

Legionnaires' Disease: Background



- Atypical pneumonia caused by *Legionella* bacteria
- Grows and spreads in building water systems
- Facilities can prevent Legionnaires' disease with a Water Management Program



Clinical Features



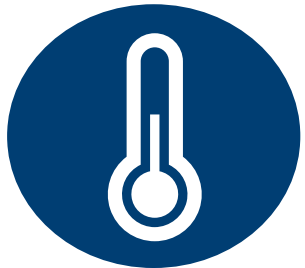
Symptoms: 2023 Data

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74% presented with
cough

65% presented with
shortness of breath



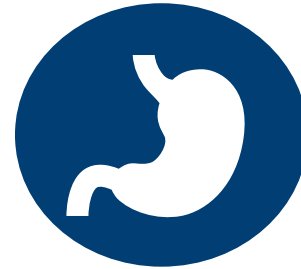
75% presented with
fever

Symptoms: 2023 Data

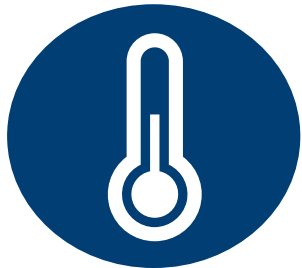


74% presented with **cough**

65% presented with **shortness of breath**



59% presented with **gastrointestinal symptoms**, such as diarrhea



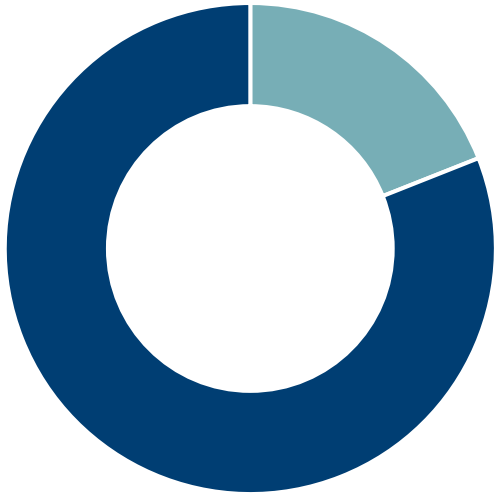
75% presented with **fever**



33% presented with **altered mental status**

22% presented with **chest pain**

Underlying Conditions: 2023 Data



81% of cases were **50 years**
or older

Diagnostic Imaging



Diagnostic imaging (radiographs, CT) alone cannot diagnose Legionnaires' disease, but is **useful for diagnosing and characterizing** pneumonia

Confirmatory Diagnostic Testing



Urine antigen
test (UAT)

This test **only** detects
Legionella pneumophila
serogroup 1.

Confirmatory Diagnostic Testing



Urine antigen
test (UAT)



PCR



Culture

These tests must be resulted from
**sputum or lower respiratory
specimens.**

Diagnostic Testing: *Legionella* Culture



A note on culture:

Legionella does not grow on routine respiratory cultures. It must be specifically ordered.

Treatment



Legionnaires' disease can be treated with antibiotics: **respiratory fluoroquinolones** or **macrolides**

Prognosis



Case fatality rate is approximately **5-10%**.
Prognosis is best with diagnosis and treatment at time of admission.

Source: [National Library of Medicine article](#)

Prognosis: Patients with Underlying Medical Conditions



From 2023 data, Wisconsin patients were more likely to die from their illness if they had **underlying medical conditions.**

Prognosis: Recipients of Health Care



Case fatality rate is higher in cases that had **inpatient** health care or resided in a **long-term care facility** during the exposure period.



Disease Burden and Trends



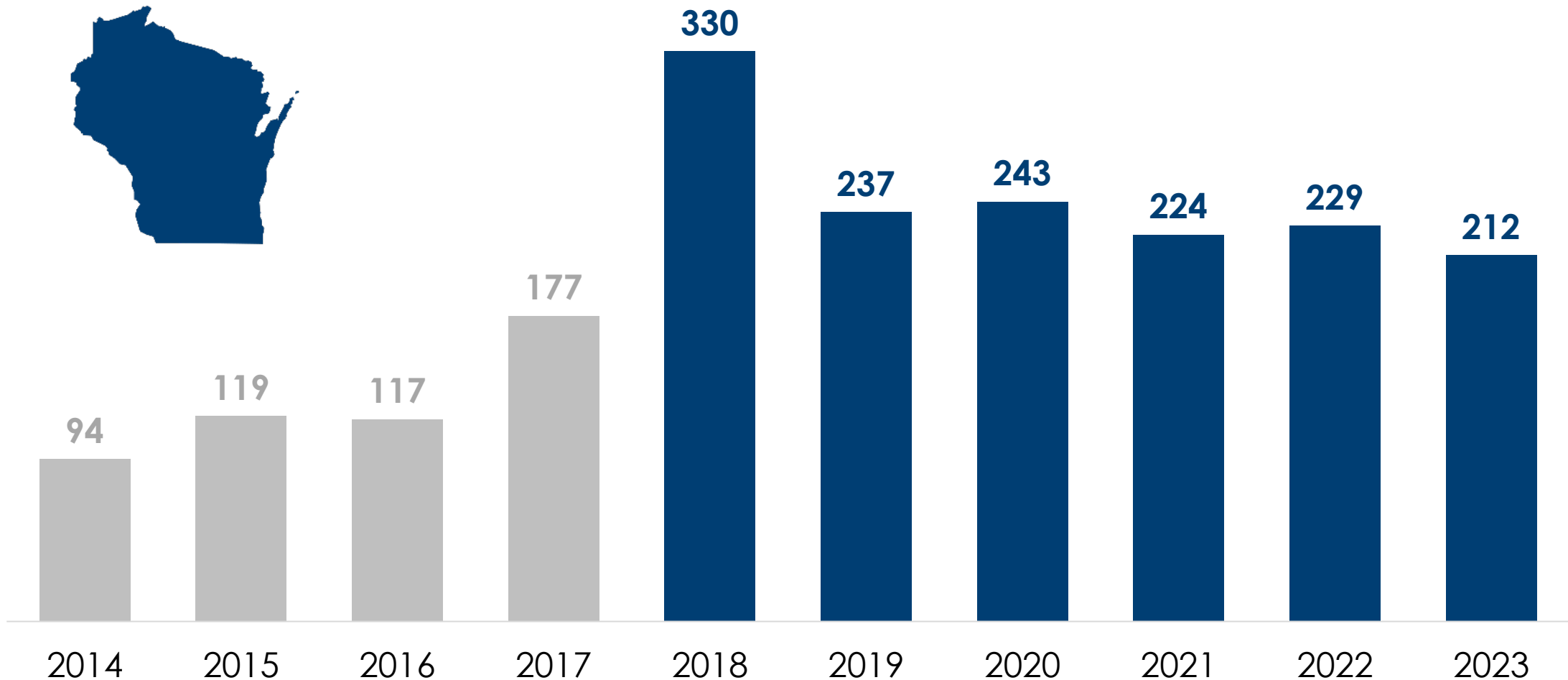
Legionnaires' Disease is Reportable

Health care providers are **required** to report a Legionnaires' disease case to public health **within 72 hours** upon recognition.



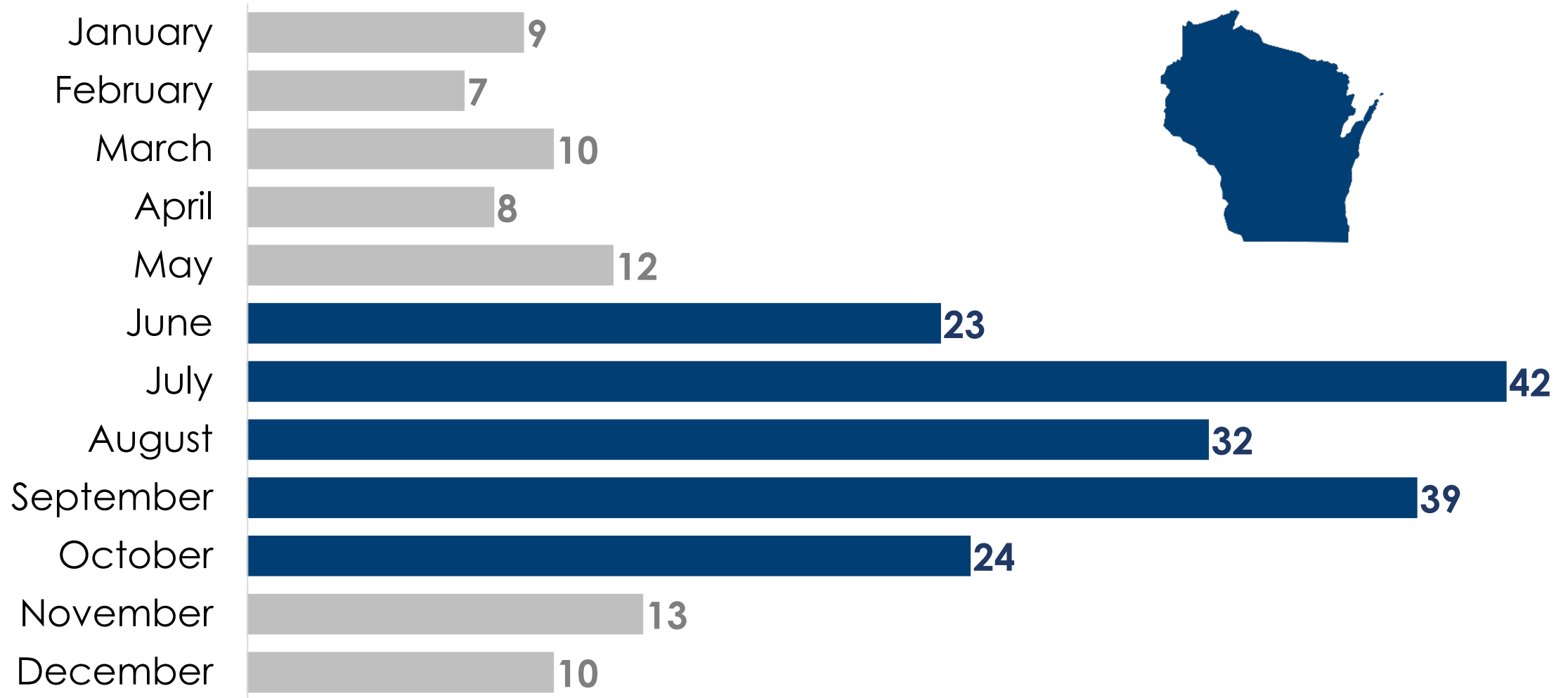
Lab-Confirmed Legionnaires' Disease Cases

From **2019–2023** Wisconsin averaged **227** cases per year.



Seasonality of Legionnaires' Disease

Average confirmed Legionnaires' disease cases by month, 2019–2023



A photograph showing the silhouettes of two children playing in a large public fountain. The fountain has multiple vertical jets of water. In the background, the silhouette of a large building with a dome and spires is visible against a bright sky. The overall scene is captured in a high-contrast, low-key style.

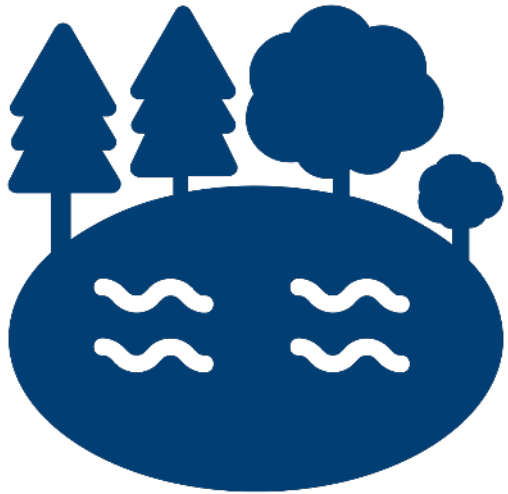
Sporadic cases of Legionnaires' disease are most often reported in the **summer** and **fall**.



Transmission

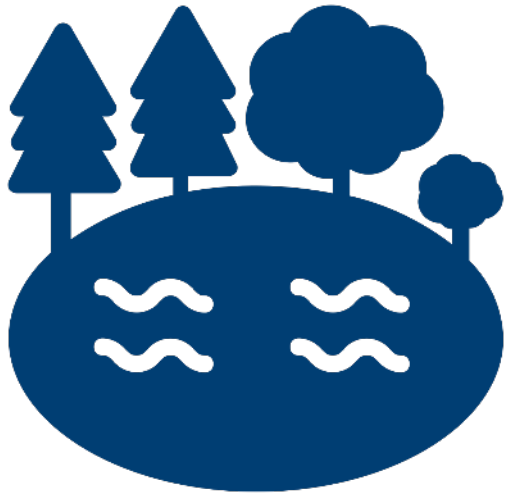


Legionella Bacteria: Growth Conditions

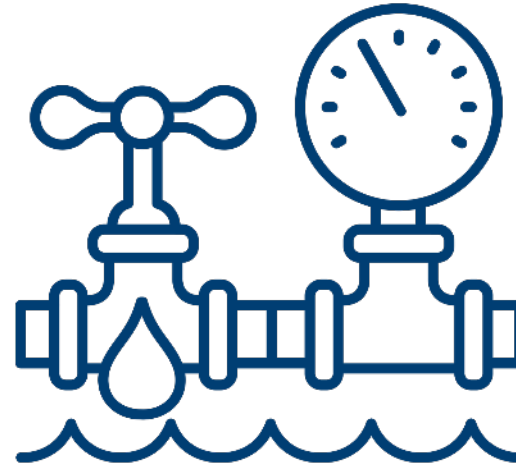


Legionella naturally
occur in fresh water

Legionella Bacteria: Growth Conditions

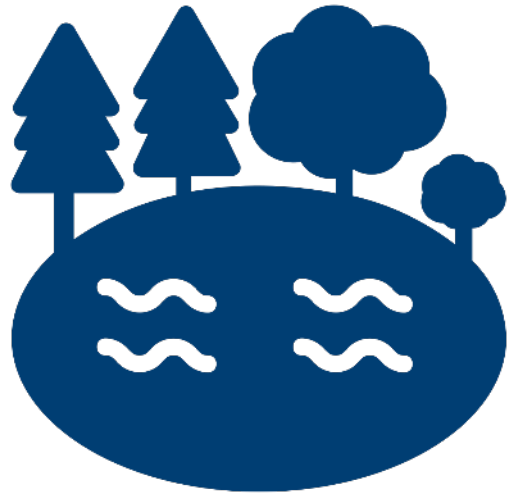


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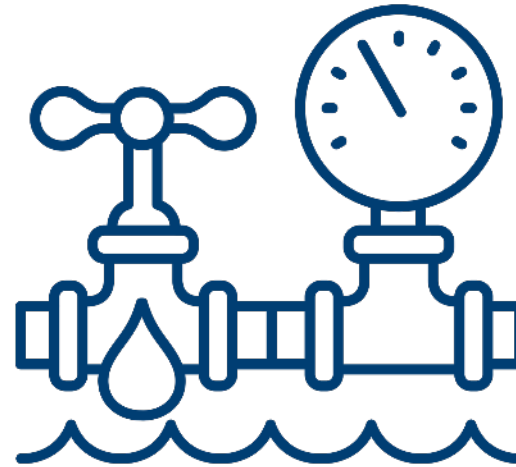


Public water systems or private wells deliver incoming water to buildings

Legionella Bacteria: Growth Conditions



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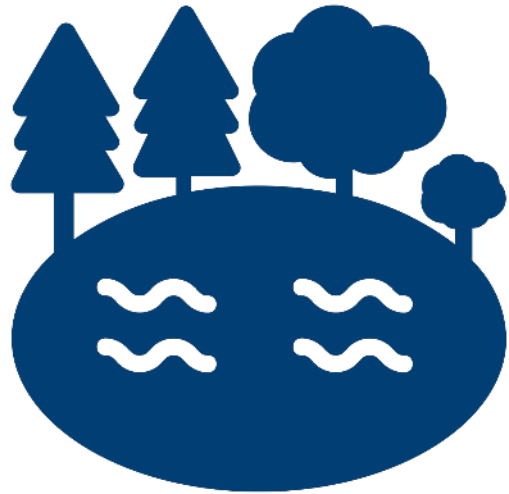


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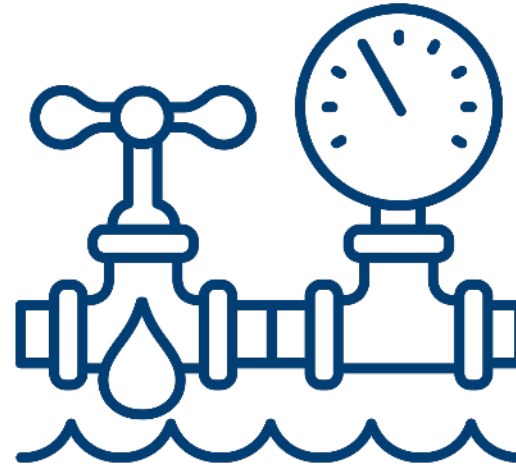


Water is delivered to fixtures and devices for use

Legionella Bacteria: Growth Conditions



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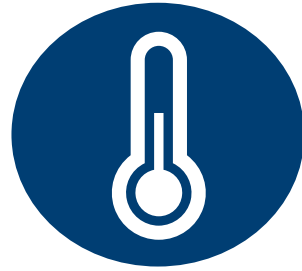


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Water is delivered to fixtures and devices for use

Legionella Bacteria: Growth Conditions



Legionella grow and amplify in water **77°F** to **113°F**

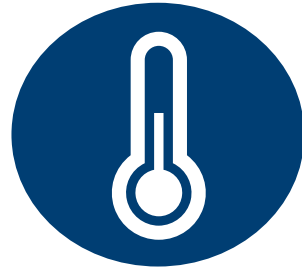
The Hot Water Dilemma

Anti-scald regulations

Prevent *Legionella*

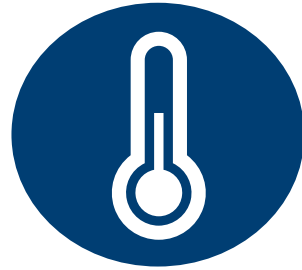


Legionella Bacteria: Growth Conditions



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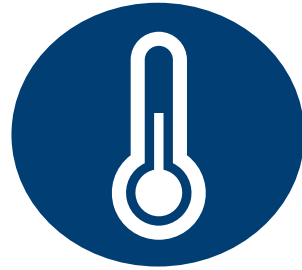


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Stagnation and **biofilm** formation contribute to *Legionella* growth

Legionella Bacteria: Growth Conditions



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Stagnation and **biofilm** formation contribute to *Legionella* growth



Legionella is transmitted by **inhalation** or **aspiration** of contaminated water

Examples of Exposure Sources



Examples of Exposure Sources



Showers and
faucets



Hot tubs

Examples of Exposure Sources



Showers and
faucets



Hot tubs



Cooling towers

Examples of Exposure Sources



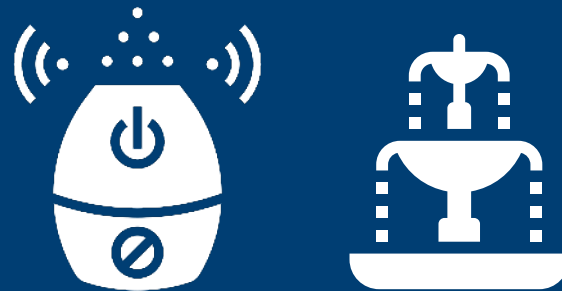
Showers and
faucets



Hot tubs



Cooling towers



Devices



Prevention: Water Management Programs



What is a WMP?

- **Water Management Program (WMP):** the risk management plan for the prevention and control of legionellosis associated with building water systems, including documentation of the plan's implementation and operation.

Requirement for Health Care Facilities



The Centers for Medicare and Medicaid Services (CMS) and the Joint Commission **require hospitals and nursing homes** to have **water management programs**.

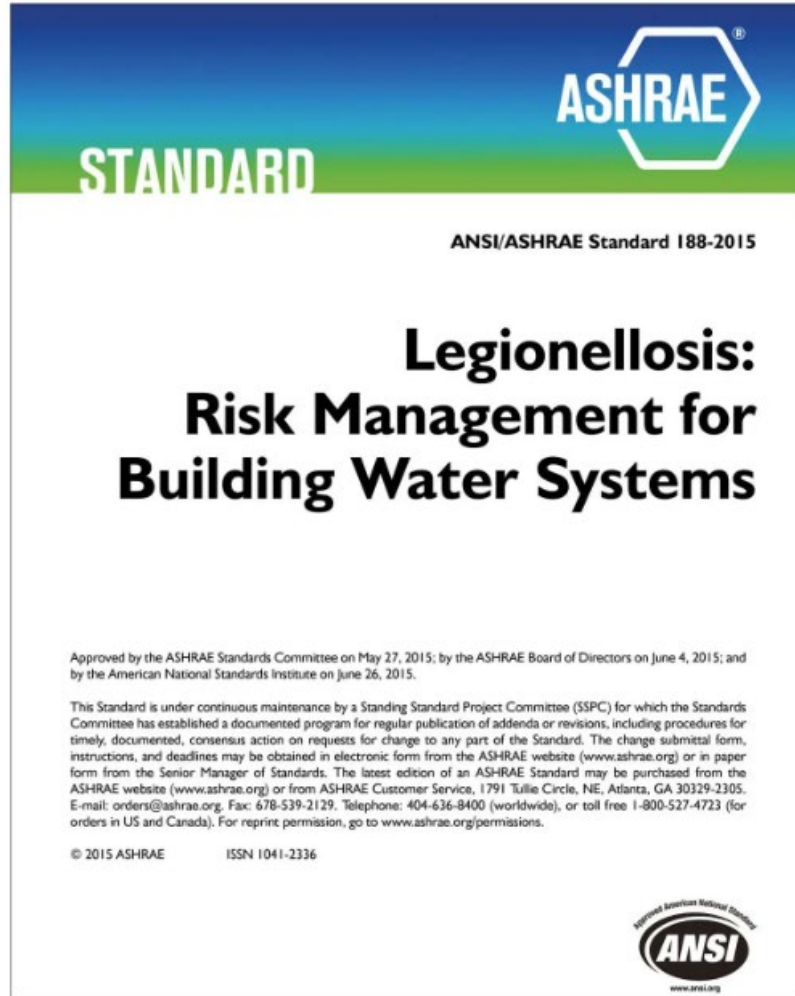
Requirement for Health Care Facilities



The Centers for Medicare and Medicaid Services (CMS) and the Joint Commission **require hospitals and nursing homes** to have **water management programs**.

Note: This does not include assisted living facilities.

National Standards for Water Management Programs



ASHRAE
STANDARD

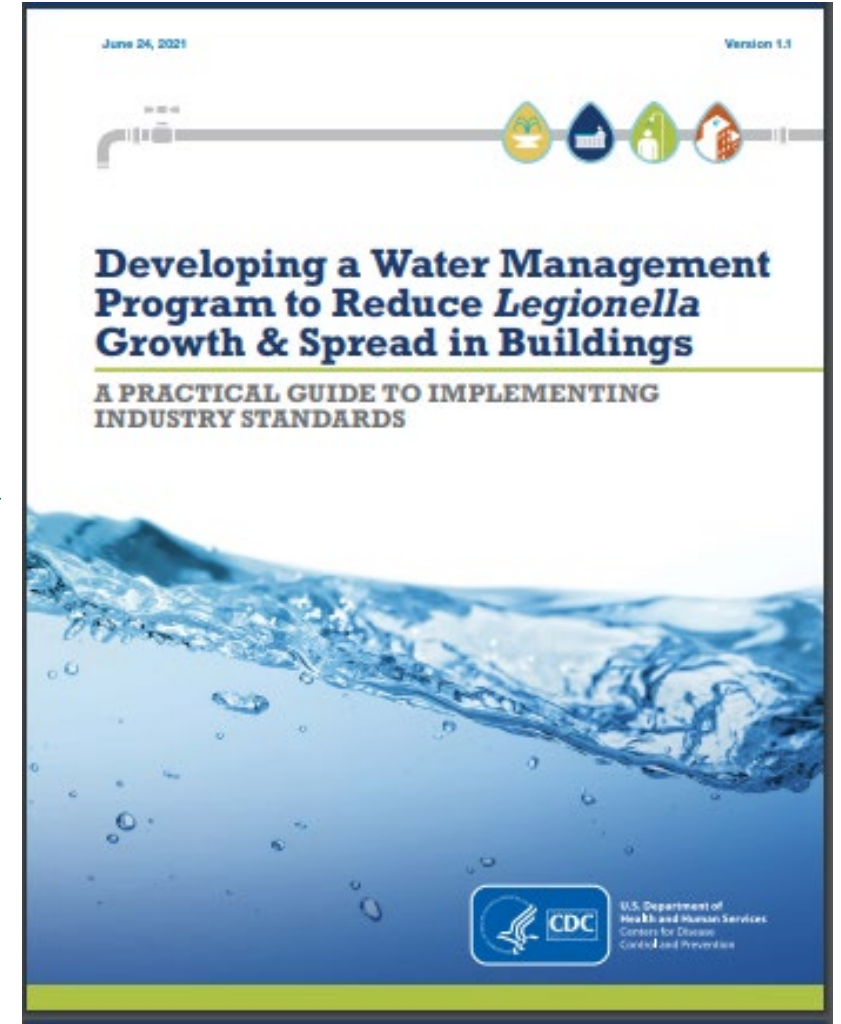

ANSI/ASHRAE Standard 188-2015

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.

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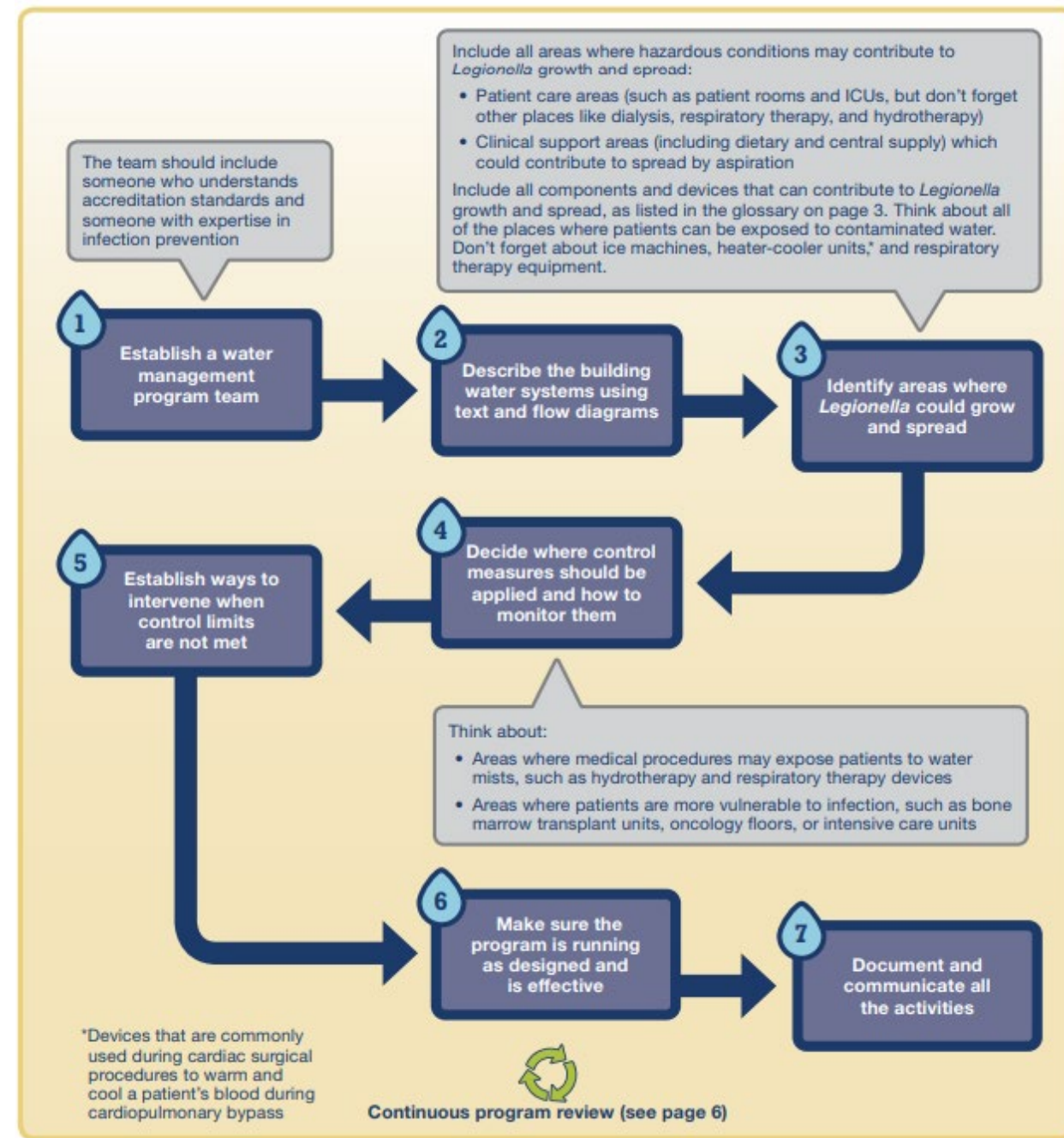
Developing a Water Management Program to Reduce *Legionella* Growth & Spread in Buildings

A PRACTICAL GUIDE TO IMPLEMENTING
INDUSTRY STANDARDS

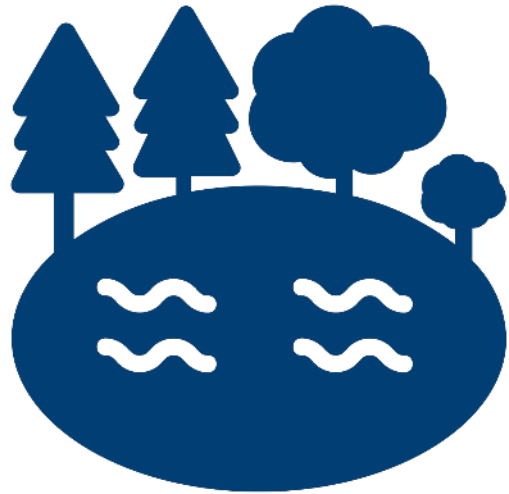


U.S. Department of
Health and Human Services
Centers for Disease
Control and Prevention

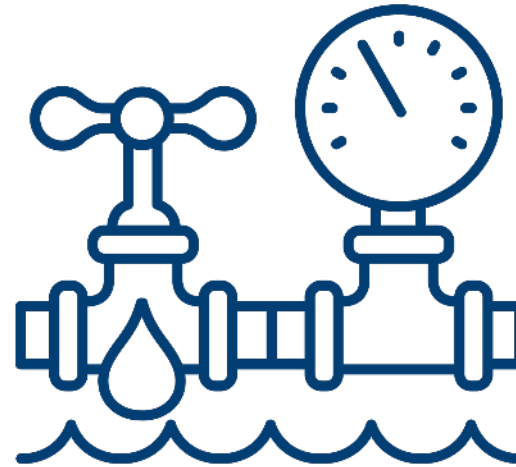
Elements of a Water Management Program (WMP)



Legionella Bacteria: Growth Conditions



Legionella naturally occur in fresh water



Public water systems or private wells deliver incoming water to buildings



Water is delivered to fixtures and devices for use



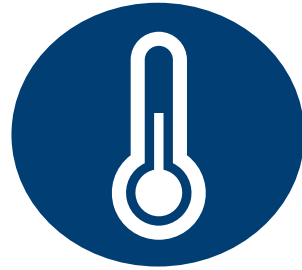
In general, municipal water systems in Wisconsin are **not required** to disinfect water supplied to customers.

*See [DNR Municipal Water Disinfection List](#)



Combined Potable Water and Fire System

Legionella Bacteria: Growth Conditions



Legionella grow and amplify in water
77°F to 113°F



Stagnation and **biofilm** formation
contribute to *Legionella* growth

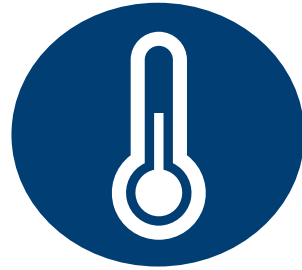


Legionella is transmitted by **inhalation**
or **aspiration** of contaminated water

Main Thermostatic Mixing Valve



Legionella Bacteria: Growth Conditions



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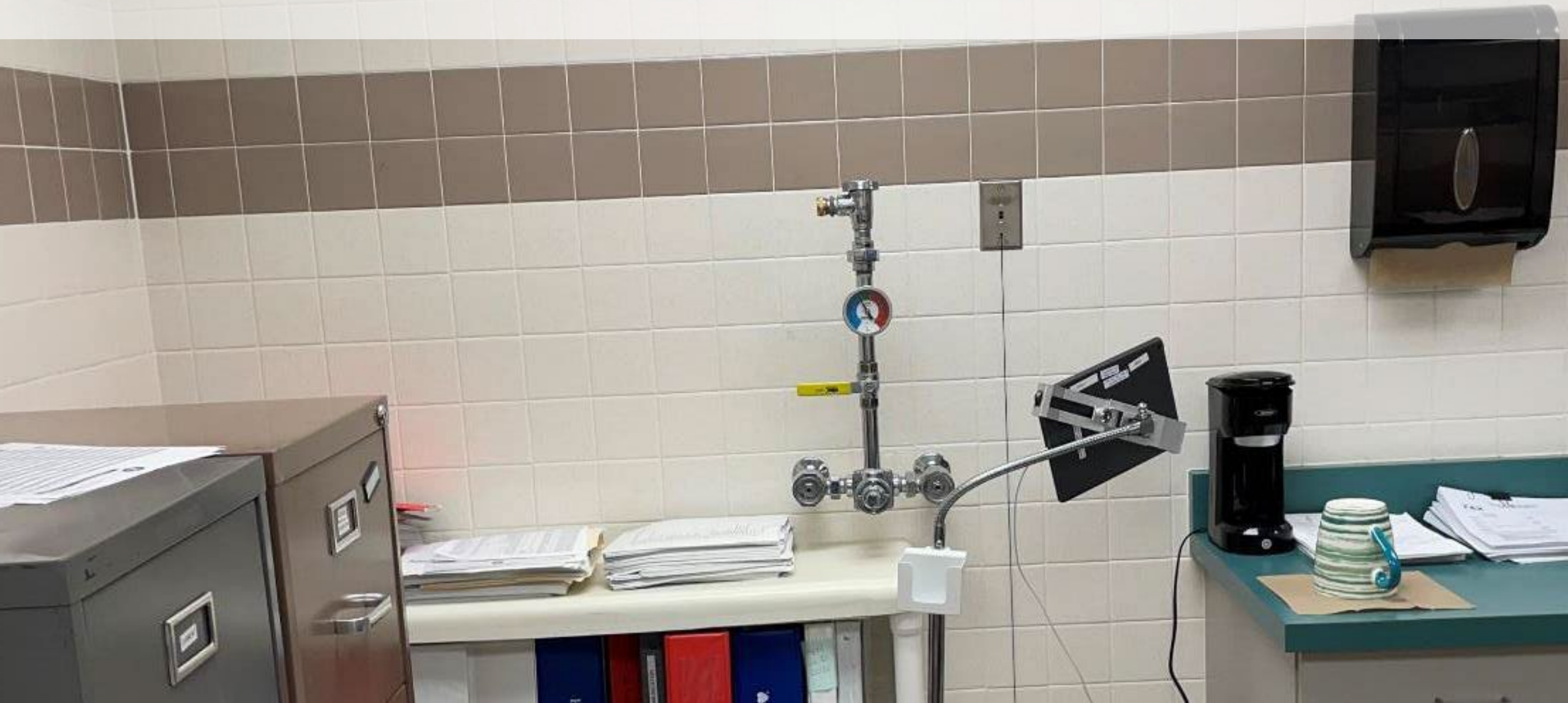


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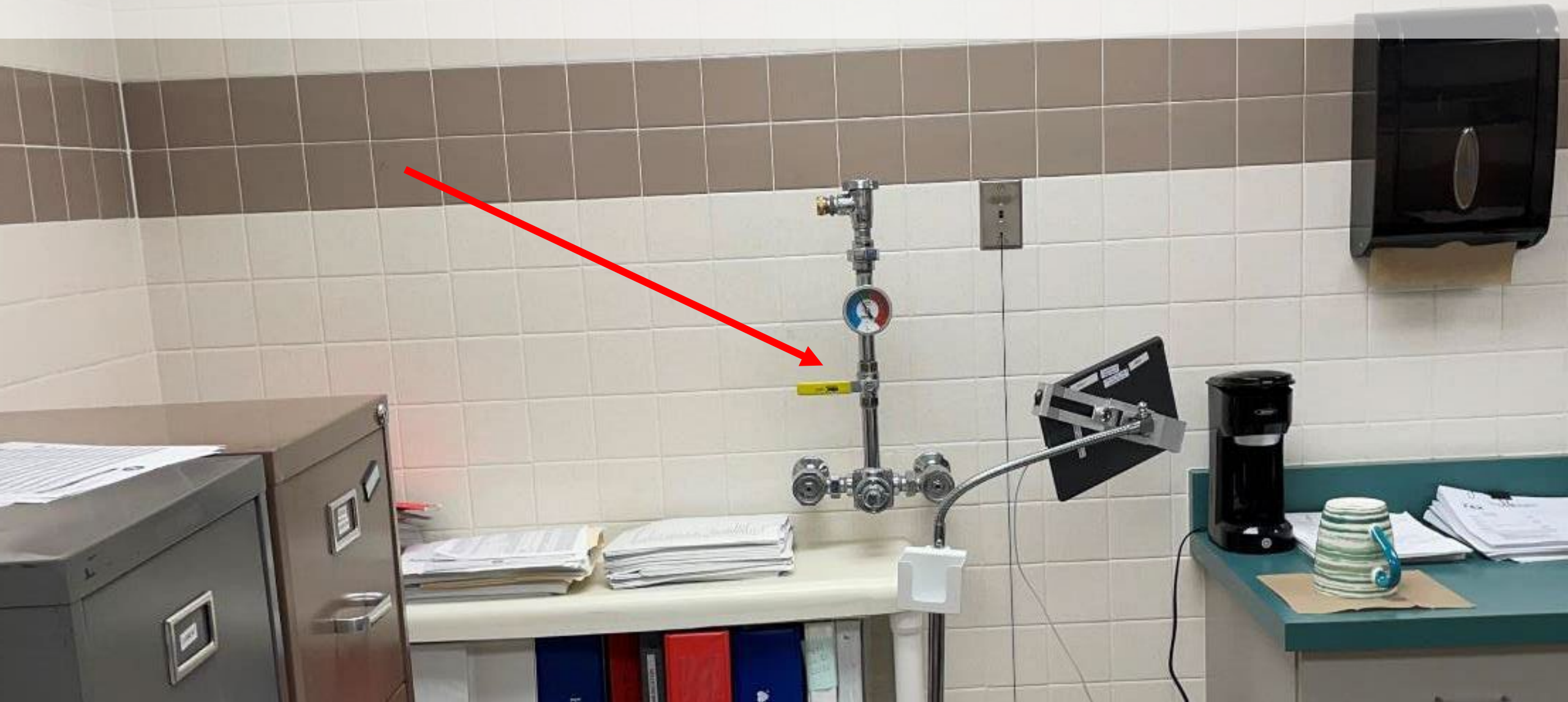


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Dead End/Legs



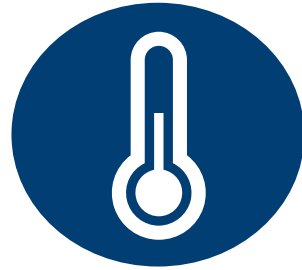
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Ice Machines

Maintenance and cleaning
per manufacturer
instructions





Cooling Towers

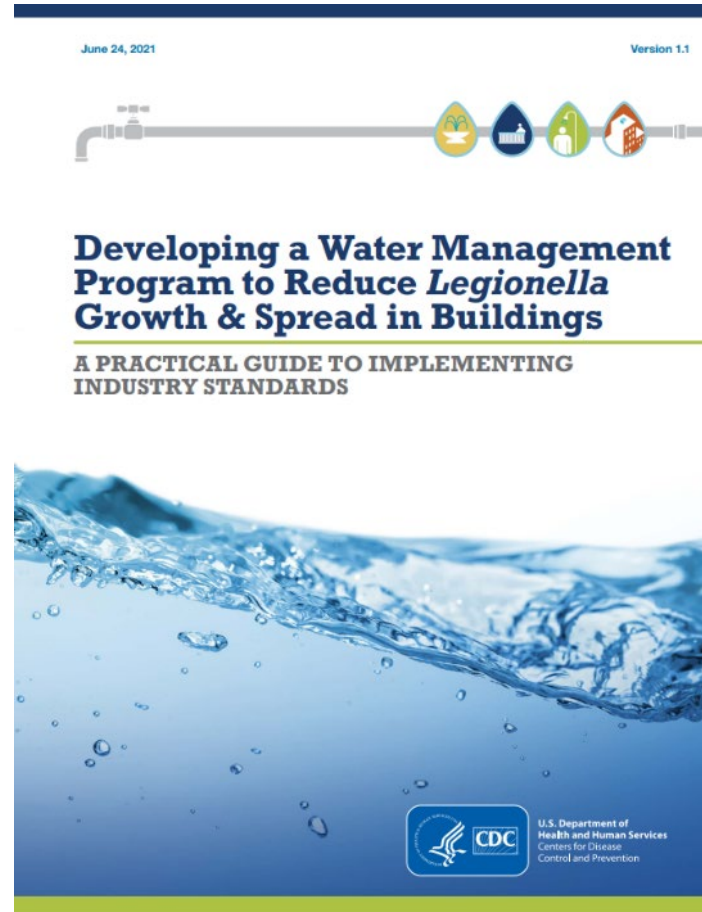
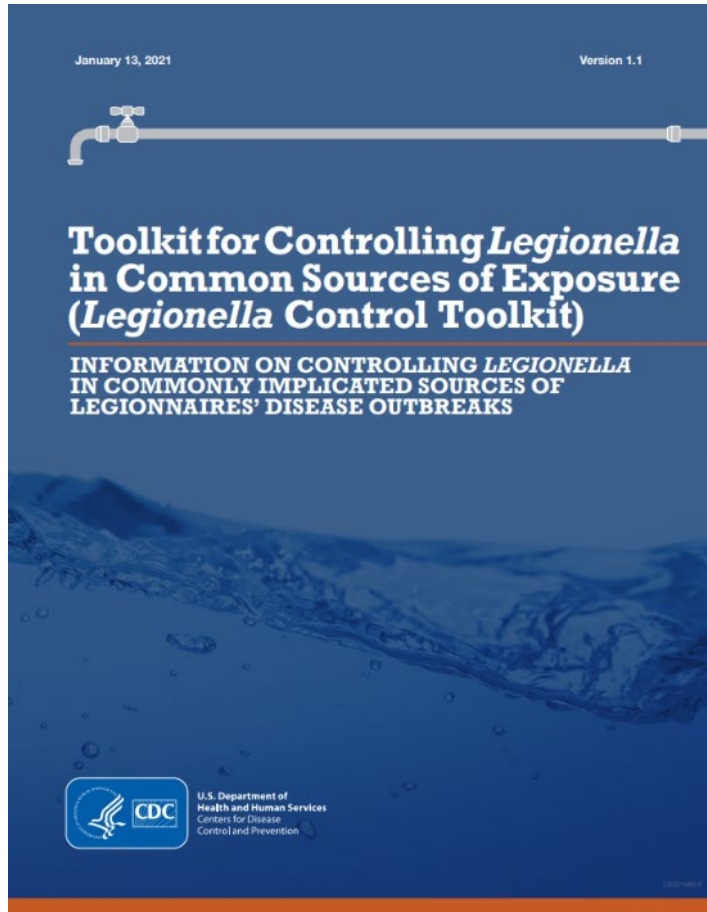
Helpful Water Management Program Resources

[CDC Water Infection Control Risk Assessment Form](#)



**Water Infection Control Risk Assessment (WICRA)
for Healthcare Settings**

Helpful Water Management Program Resources



[CDC Legionella Control Toolkit](#)

and

[CDC Water Management Program Toolkit](#)

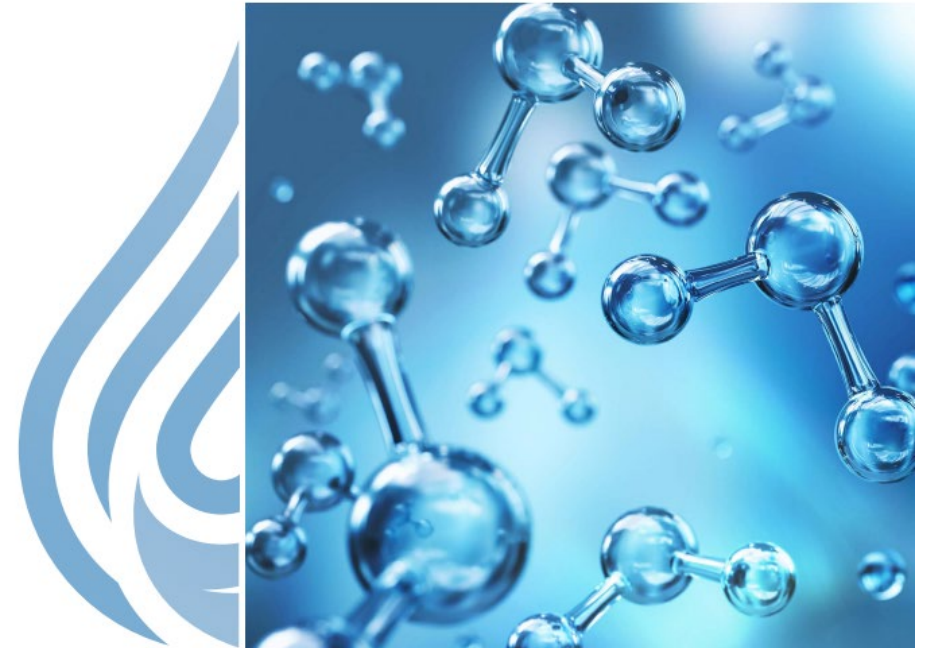
Helpful Water Management Program Resources



Water Management
Program (WMP)

Evaluation Tool

[CDC Water Management
Program Evaluation Tool](#)



Questions?



Bonus Slides





Example B: Main Thermostatic Mixing Valve Failure





The Hot Water Dilemma

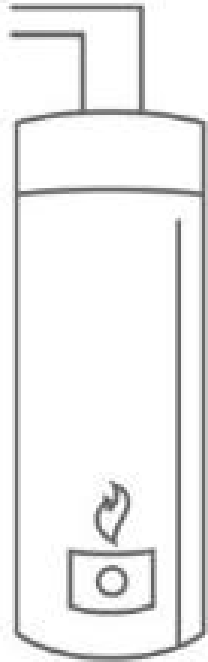
Anti-scald regulations

Prevent *Legionella*



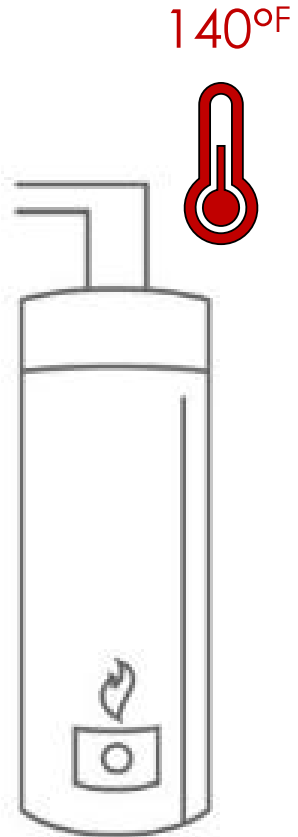


Typical Flow Diagram of Hot Water Distribution System in The Three Facilities



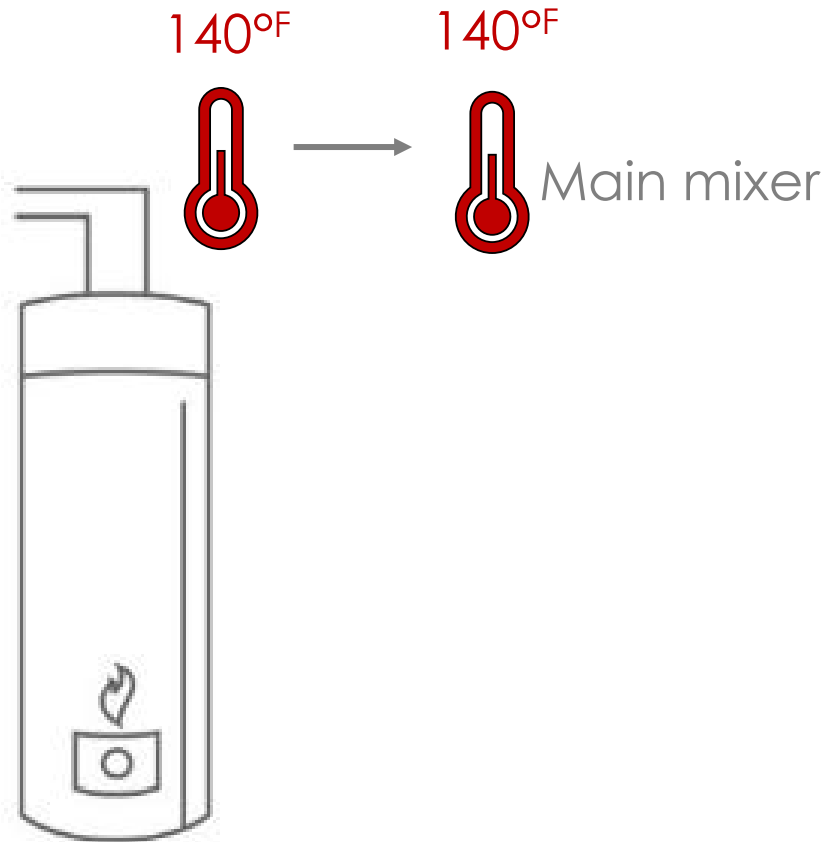


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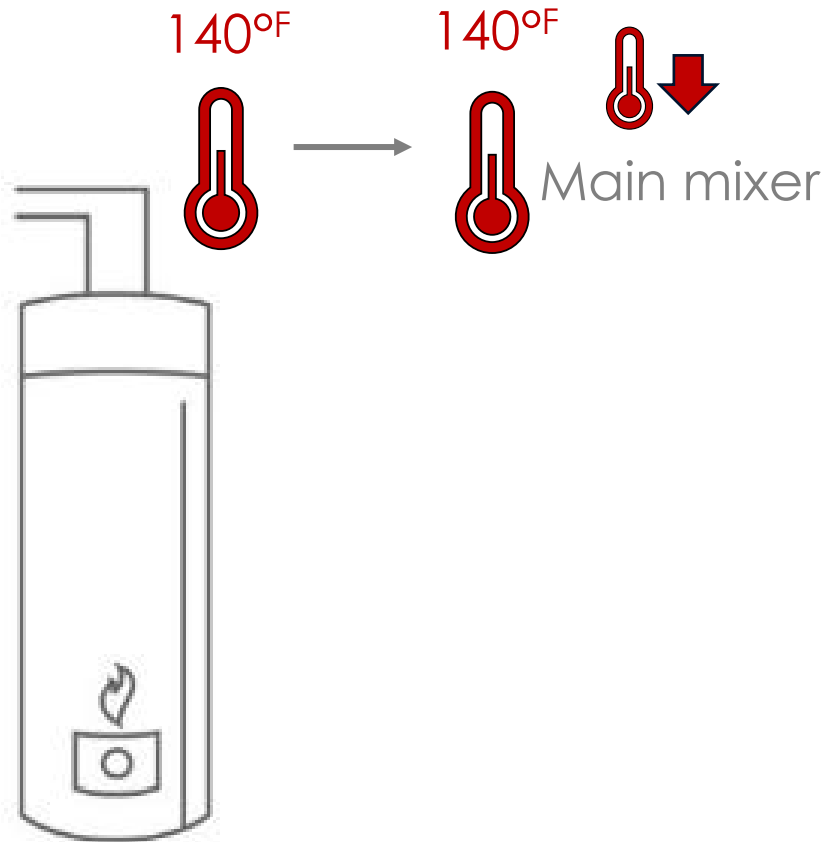


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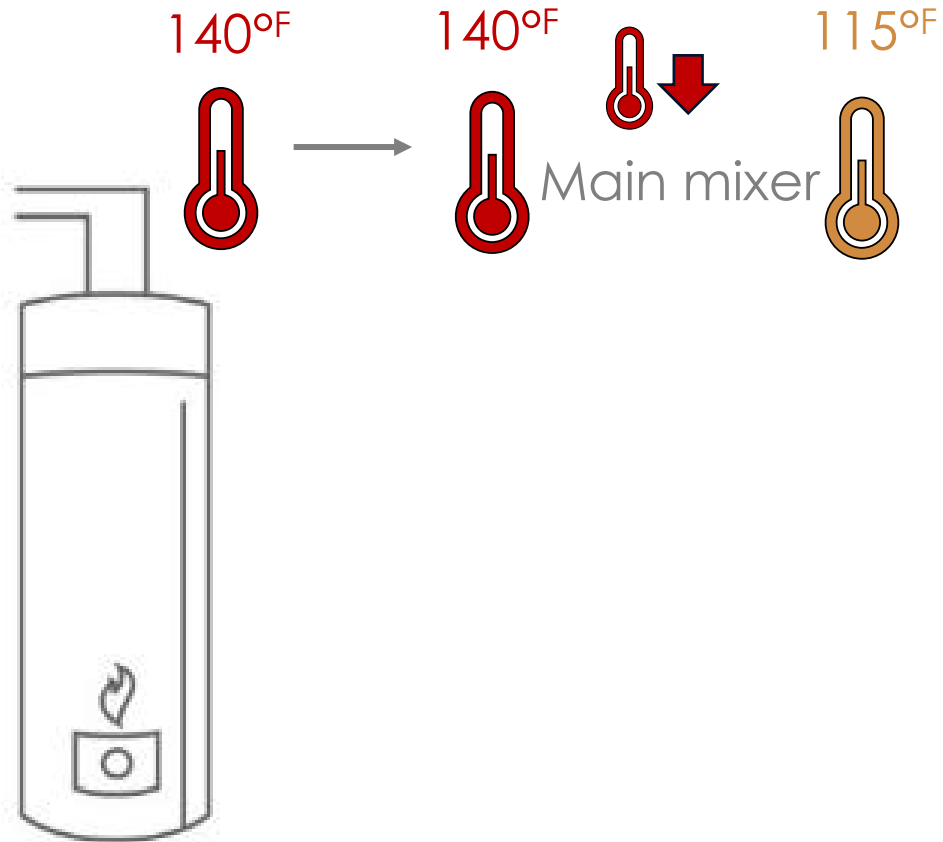


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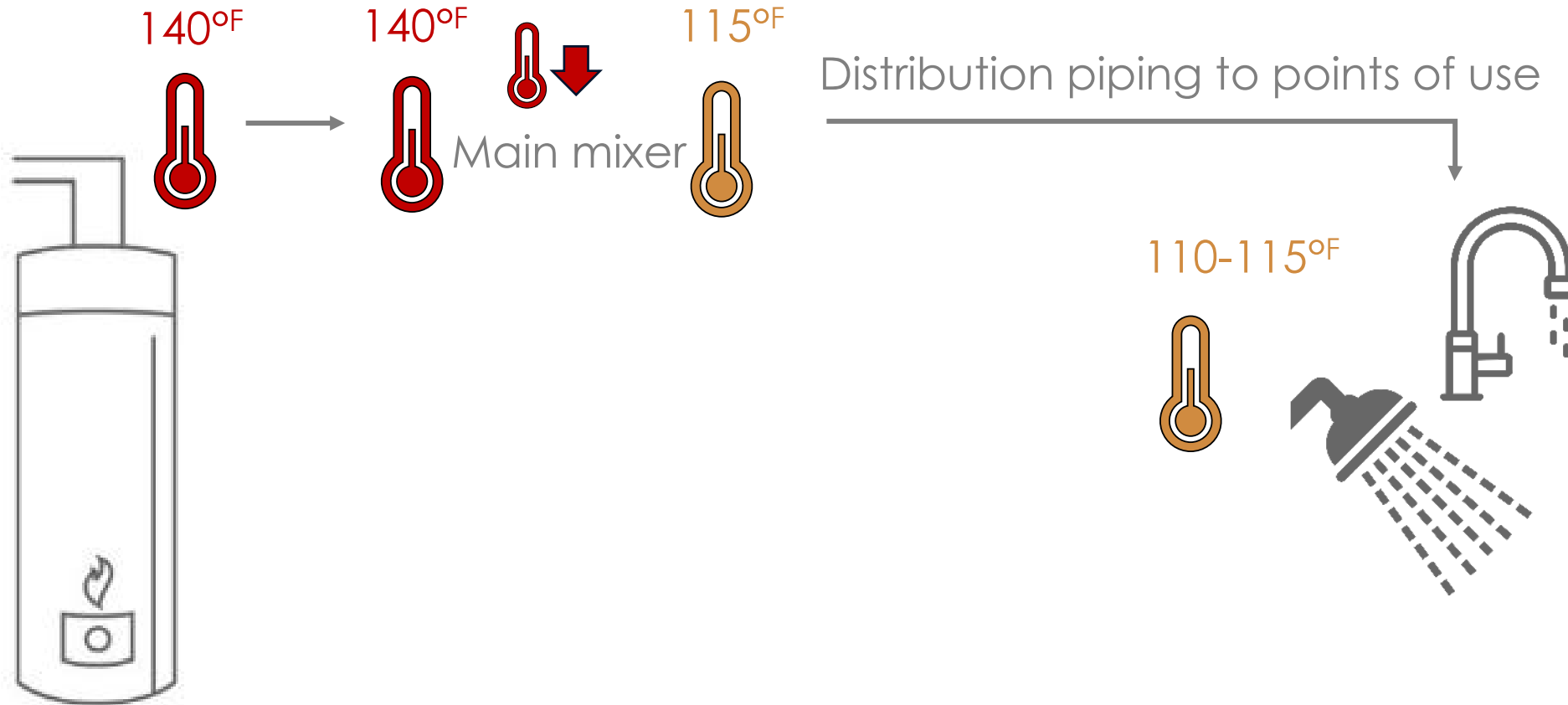


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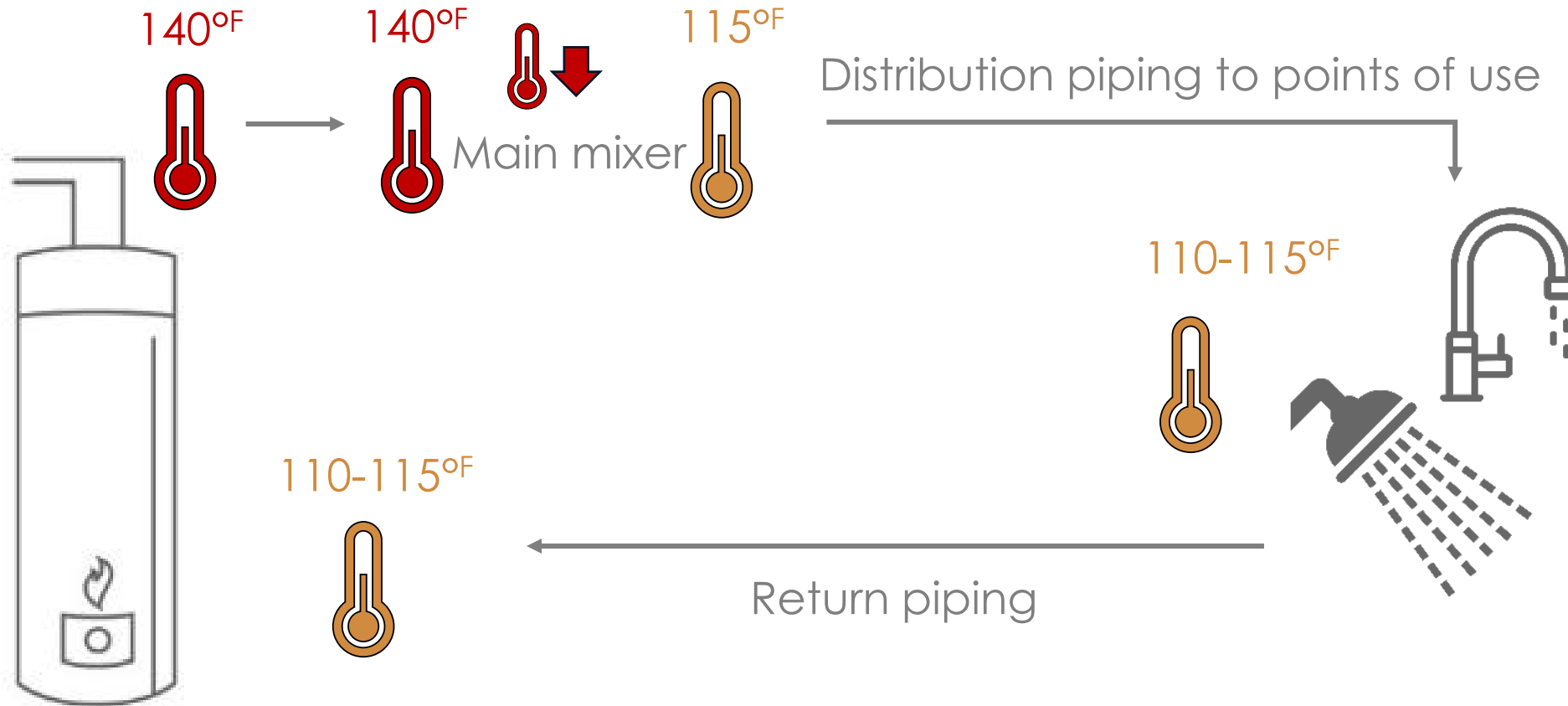


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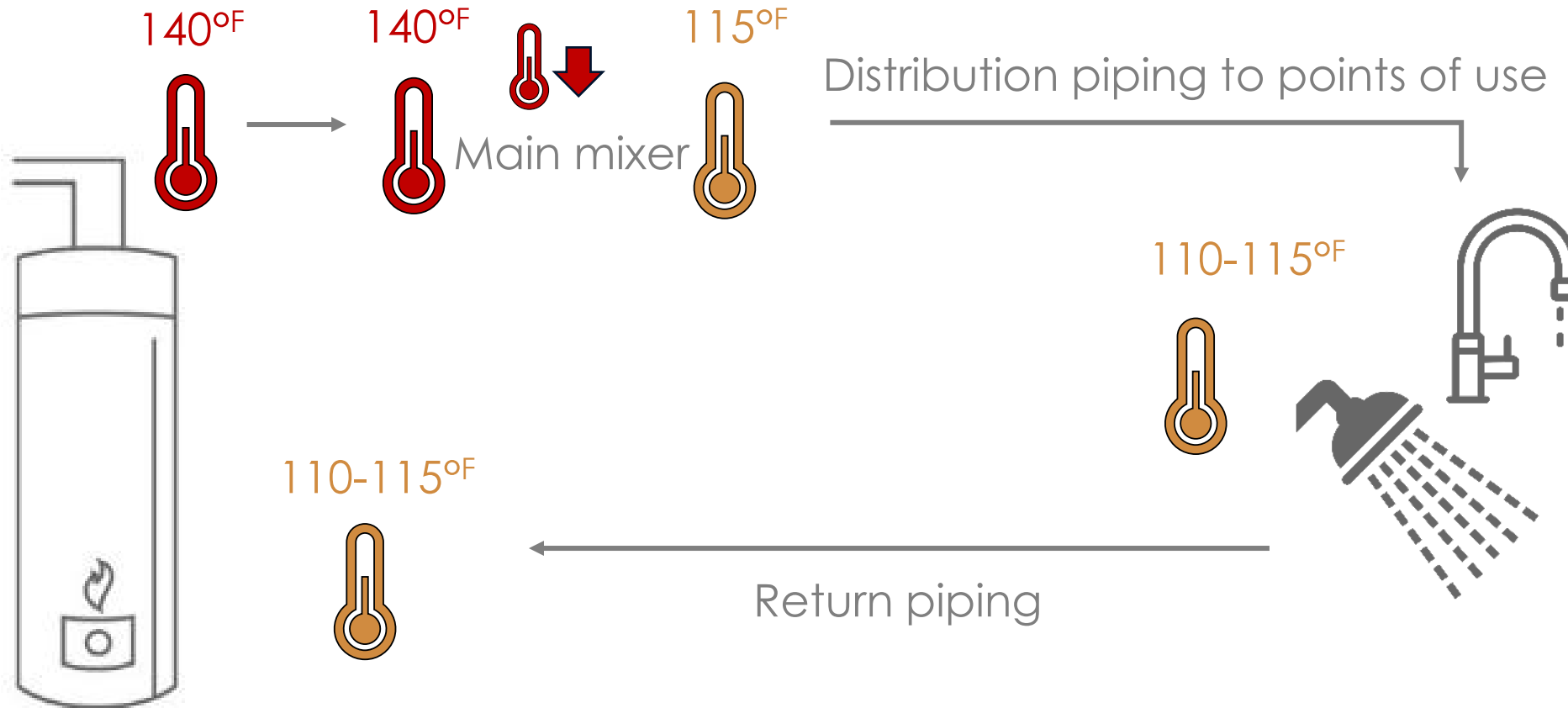


Typical Flow Diagram of Hot Water Distribution System in The Three Facilities





Typical Flow Diagram of Hot Water Distribution System in The Three Facilities



*Note: This design would **not** meet the conditions for thermal disinfection in health care and related facilities ([SPS 382.50\(3\)\(b\)6.](#)) for buildings constructed after May 1st, 2003.



Example B: What Went Wrong

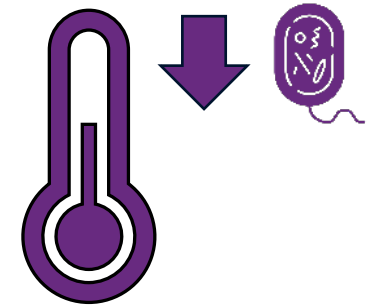
Equipment Failure



Human Error



Process Failure





Example B: What Went Wrong

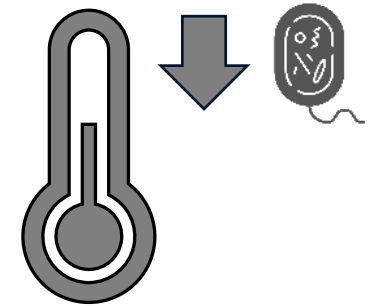
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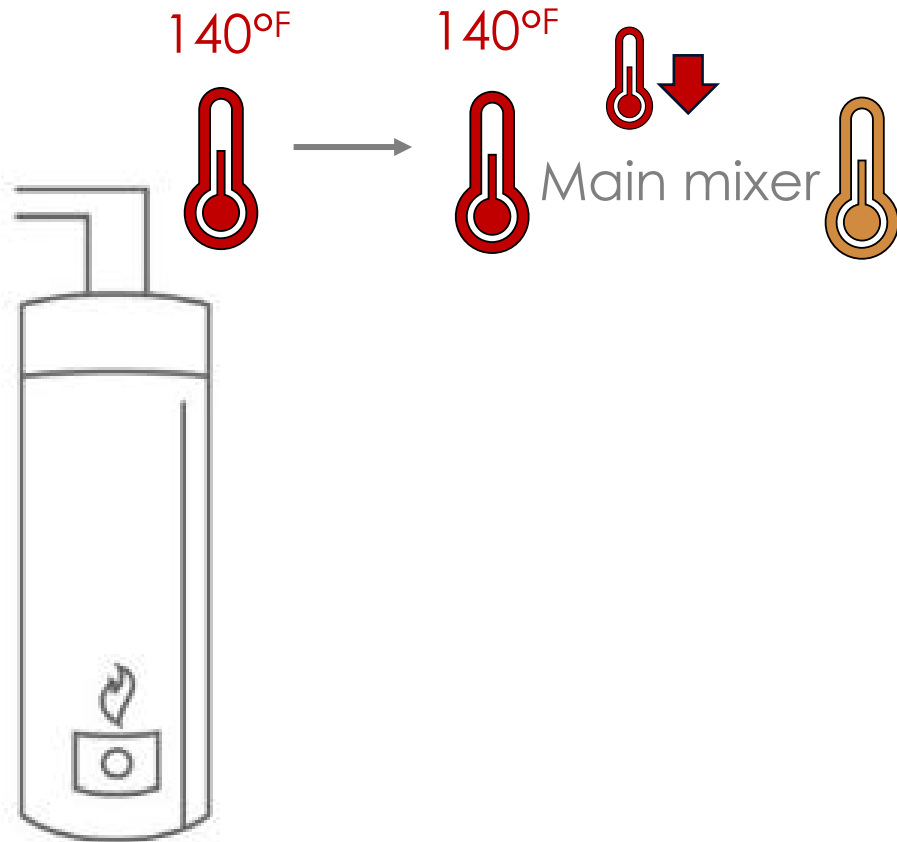


Process Failure



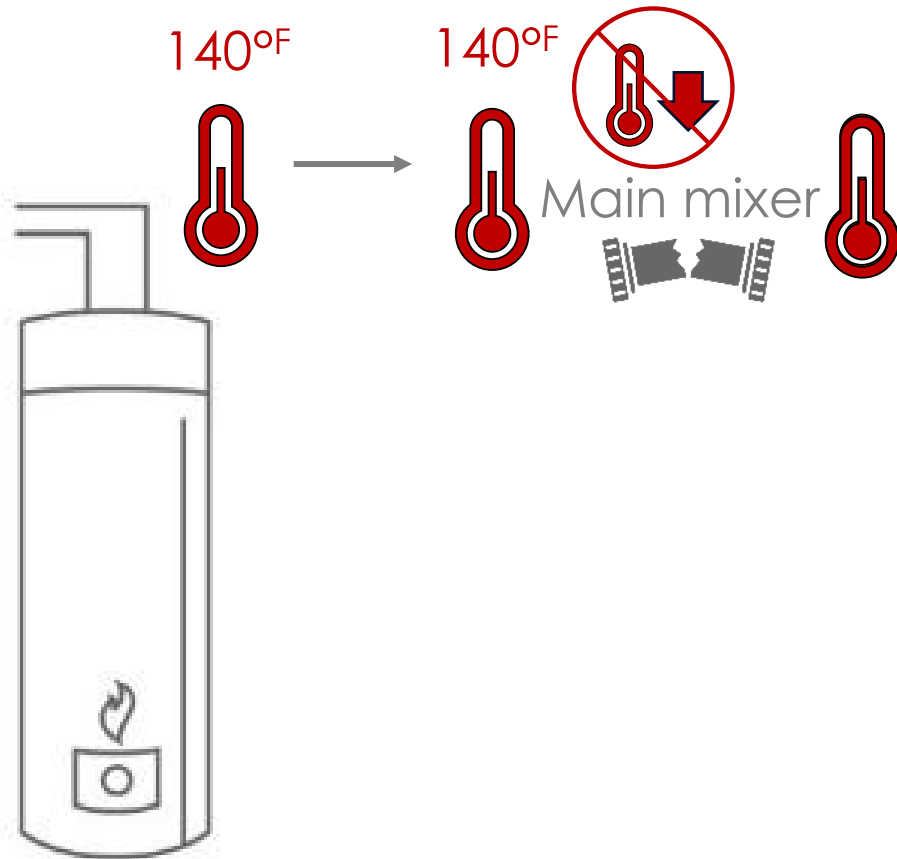


Flow Diagram of Possible Consequences of Main Mixer Failure



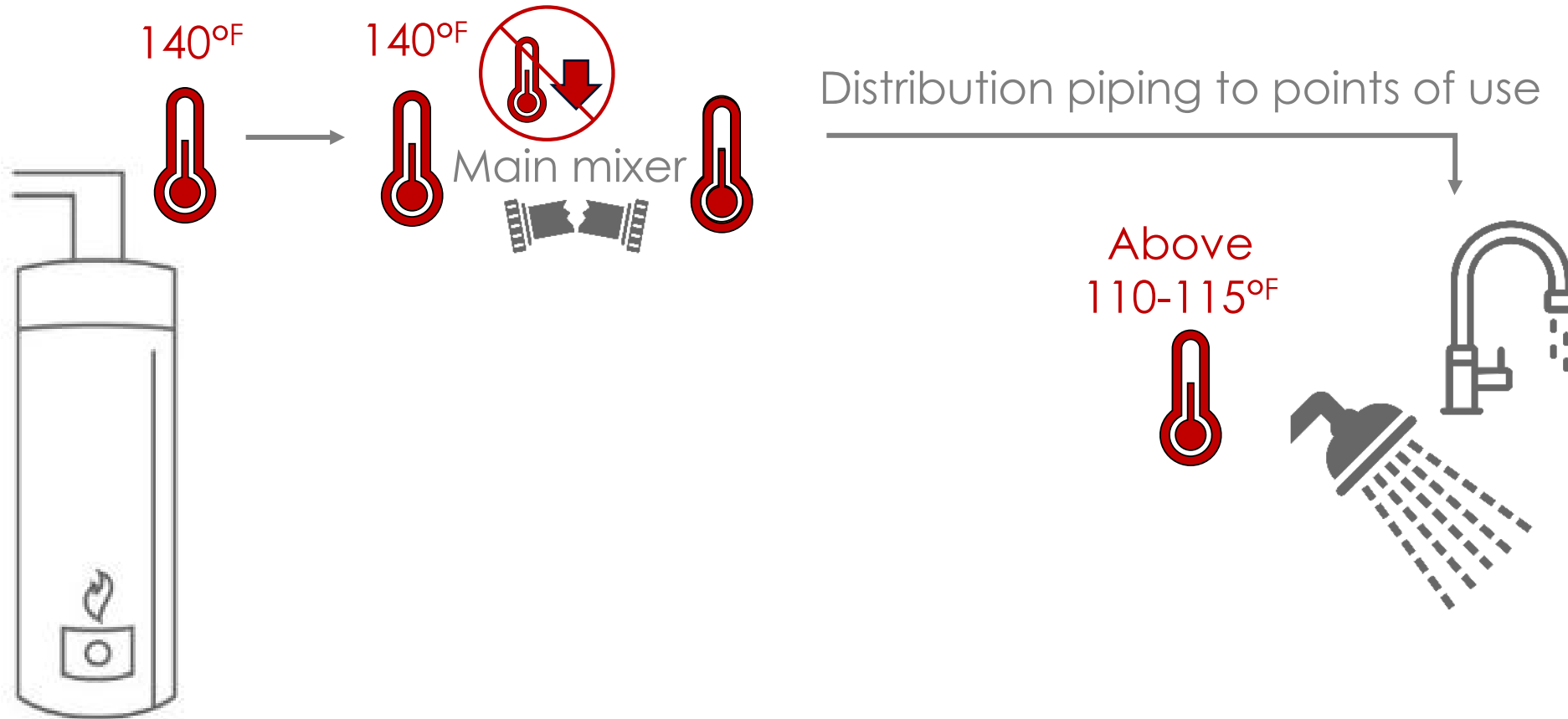


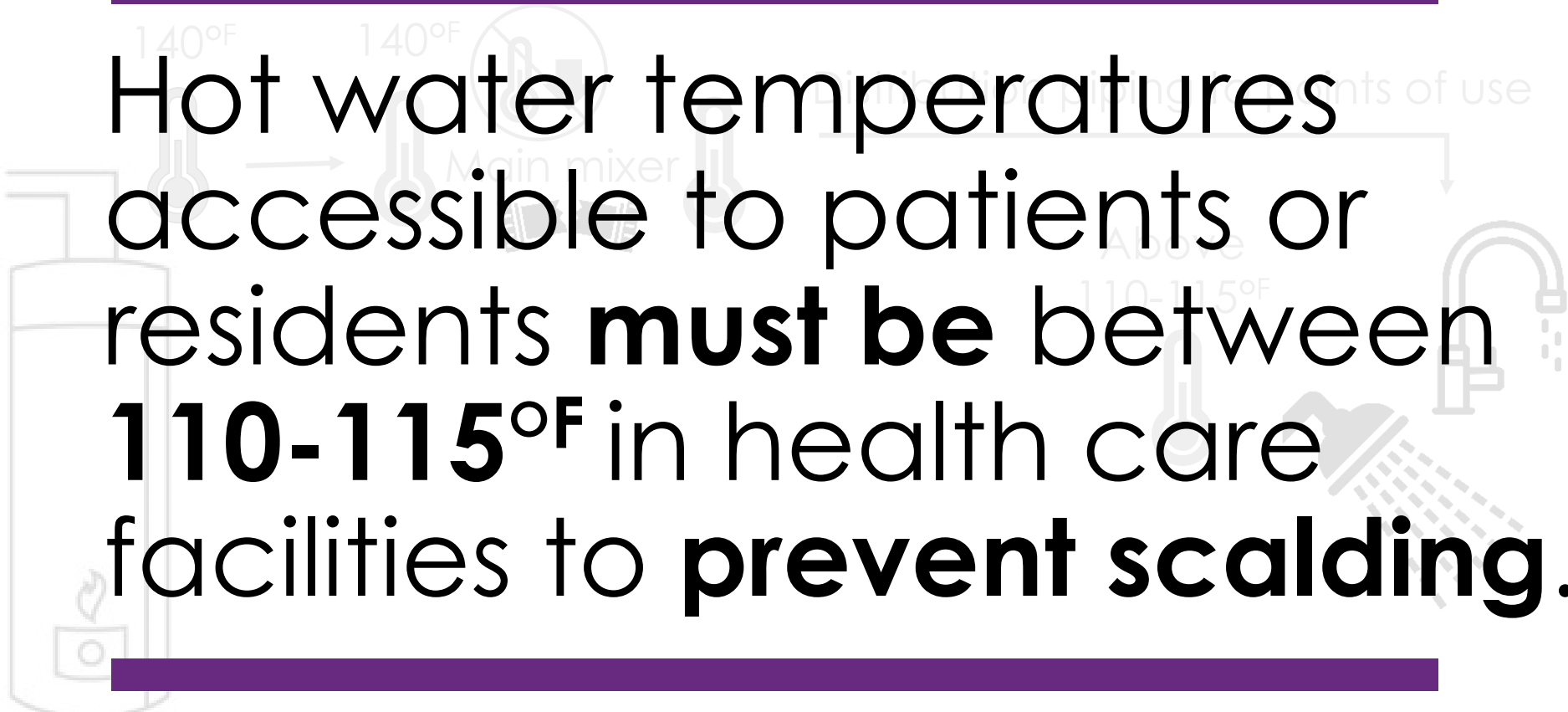
Flow Diagram of Possible Consequences of Main Mixer Failure





Flow Diagram of Possible Consequences of Main Mixer Failure





Hot water temperatures accessible to patients or residents **must be** between **110-115°F** in health care facilities to **prevent scalding.**



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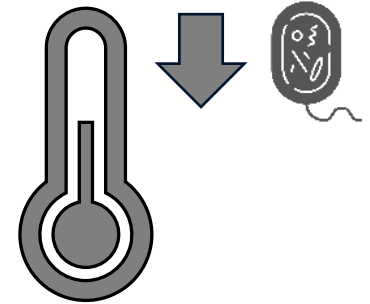
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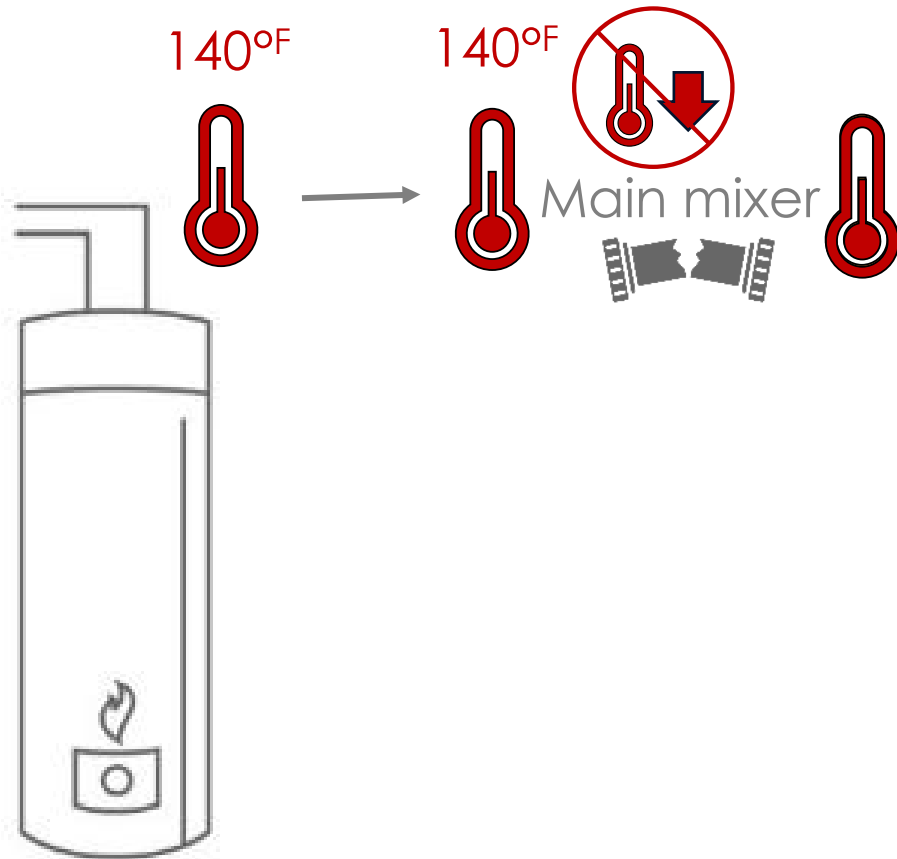


Process Failure



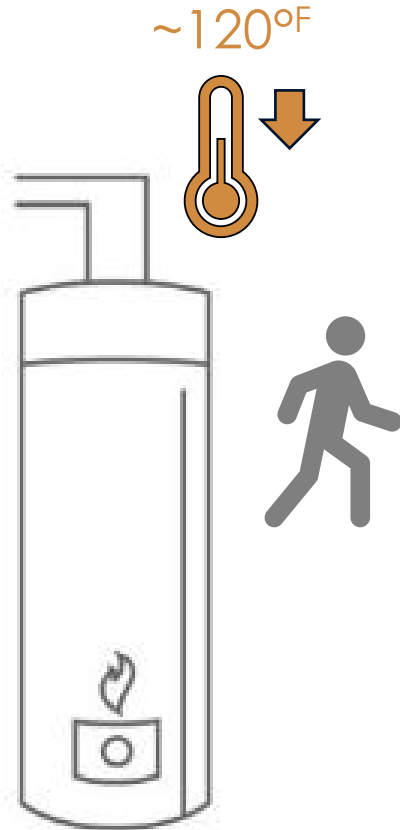


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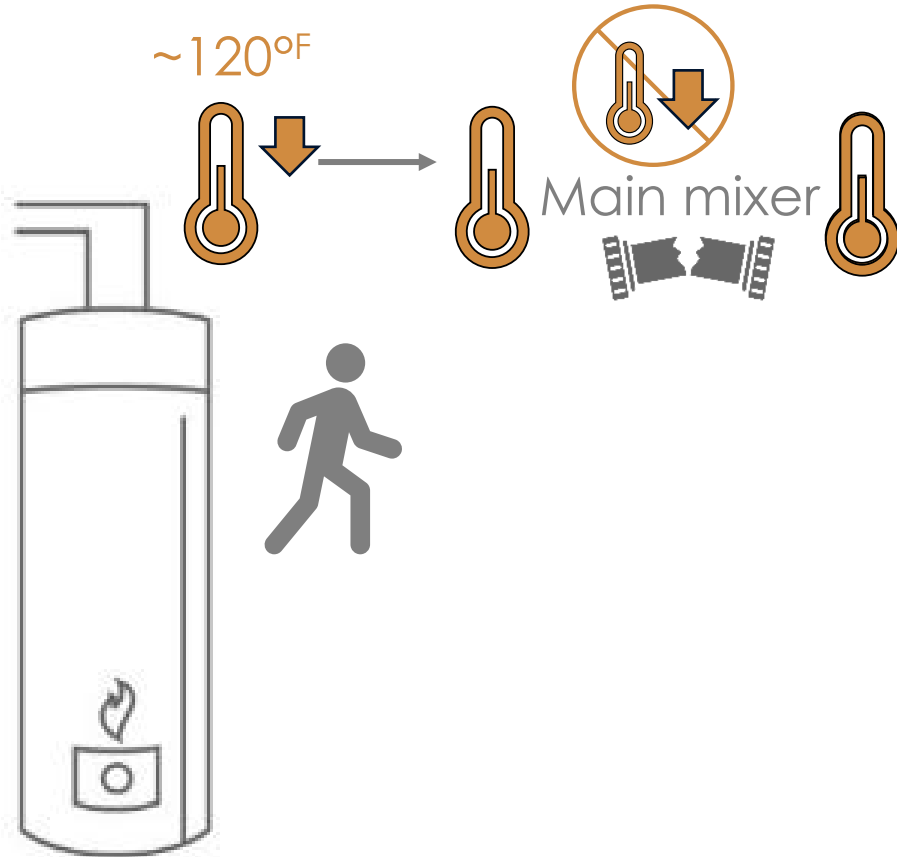


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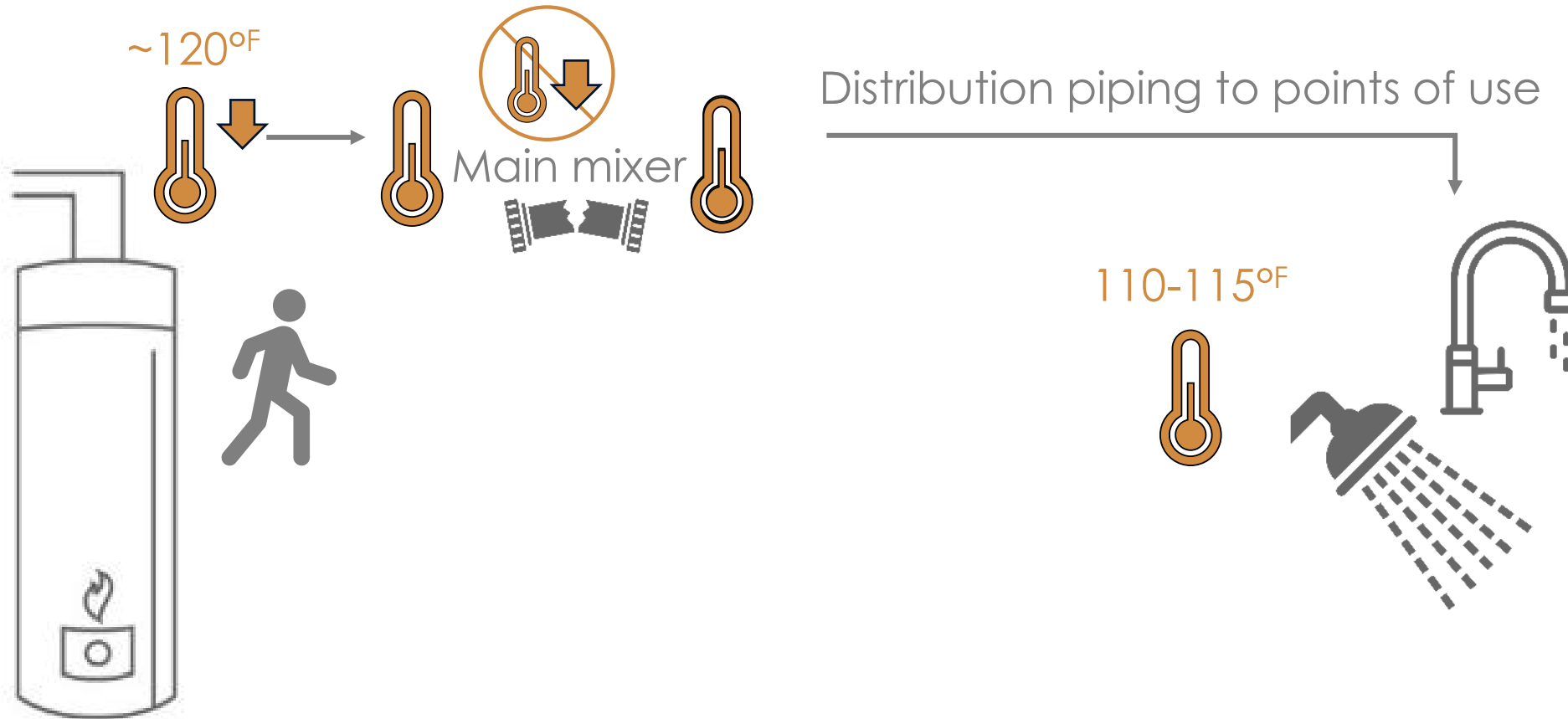



Flow Diagram of Possible Consequences of Main Mixer Failure





Flow Diagram of Possible Consequences of Main Mixer Failure





As of October 1, 2023, hot water temperatures **must be initiated and stored** at a minimum of **140°F** in all new health care facilities*.

*Per Wisconsin Plumbing Code: [SPS 382.50\(3\)\(ag\)](#)



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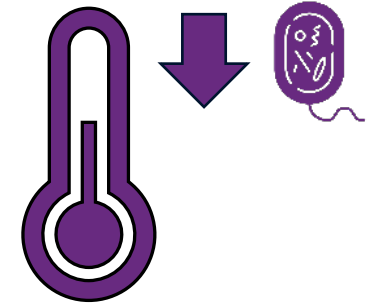
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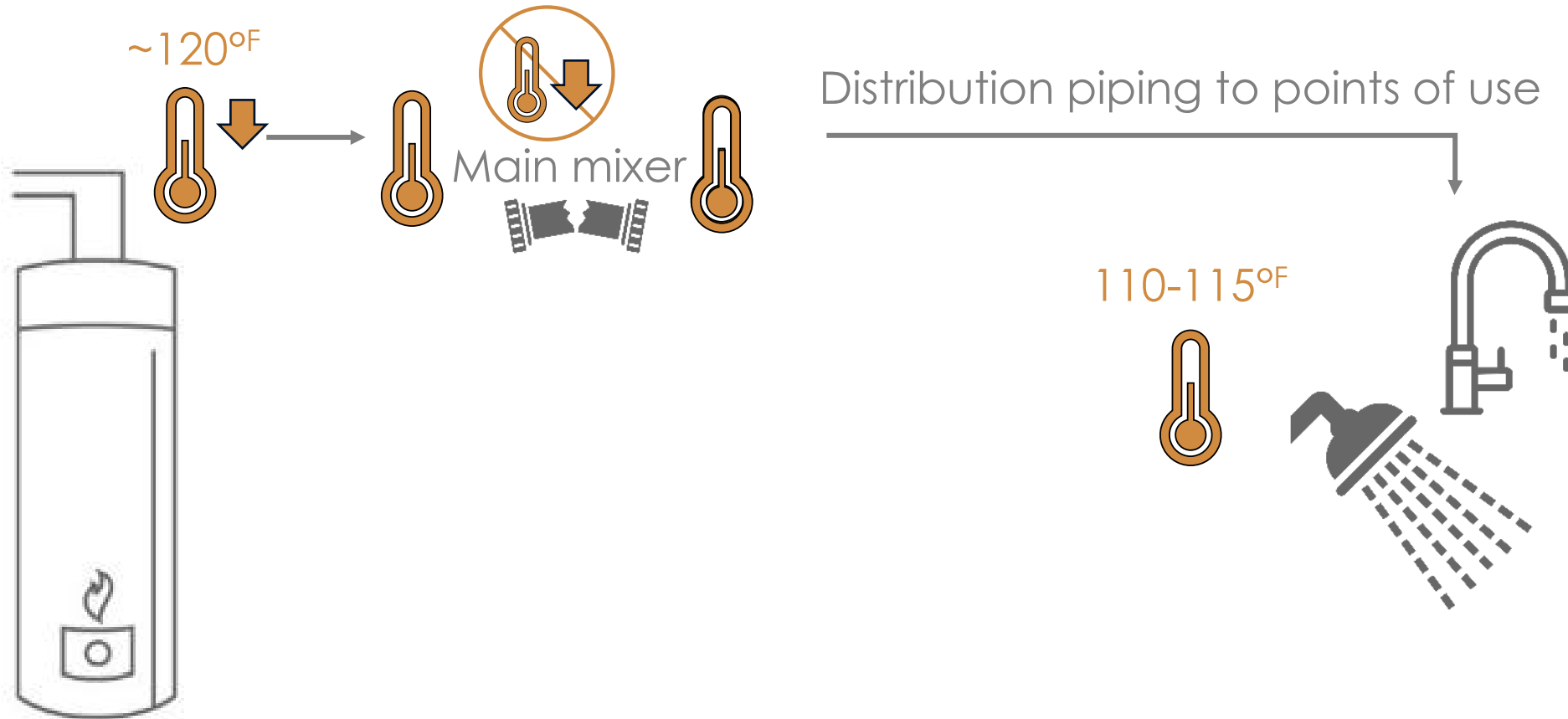


Process Failure



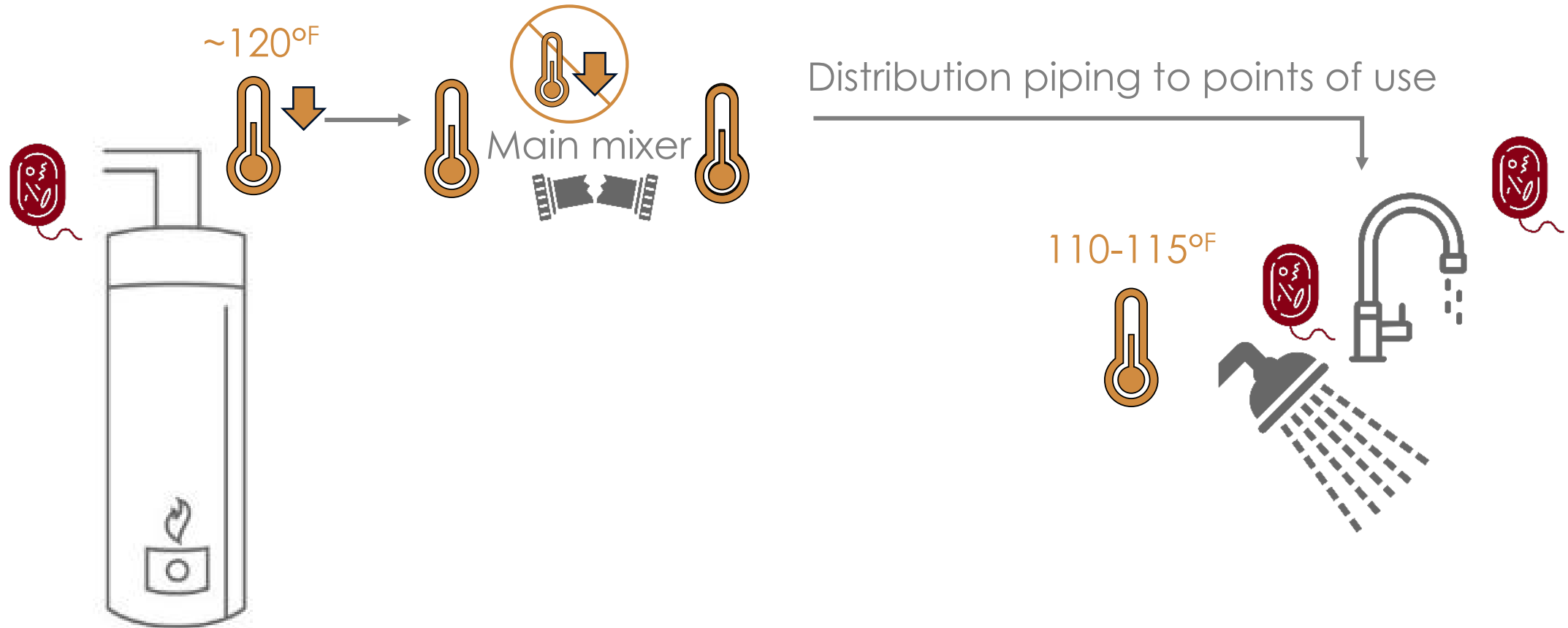


Flow Diagram of Possible Consequences of Main Mixer Failure





Flow Diagram of Possible Consequences of Main Mixer Failure



Example B: Main Thermostatic Mixing Valve Failure

Temperatures within the *Legionella* growth zone likely led to **amplification** and **colonization** of these hot water distribution systems.



As of May 1, 2003, Wisconsin Plumbing Code requires health care facilities to initiate hot water at 140°F and **return at a minimum of 124°F** if using thermal disinfection only.