Sailing through Survey:
WHAT YOU NEED FOR WATER MANAGEMENT PROGRAMS IN LONG-TERM CARE FACILITIES
Presenters
WHCA Winter Conference
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Staci Kvak
Nurse Consultant
Healthcare Associated Infections & Antibiotic Resistance Program

GREGORY B. MCKNIGHT II
Environmental Planner
Environmental Public Health Emergency Response
Objectives

1. Define healthcare-associated Legionnaires’ Disease
2. Describe necessary steps to implement a water management program in a long-term care facility using real-world examples and tips
3. Develop a water management program for a long-term care facility
Background

Legionnaires’ disease is on the rise in the United States

Rate of reported cases increased 5.5 times (2000–2017)

Source: National Notifiable Diseases Surveillance System
Background
Center for Clinical Standards and Quality/Quality, Safety and Oversight Group

DATE:       June 02, 2017
TO:         State Survey Agency Directors
FROM:       Director
            Quality, Safety and Oversight Group (formerly Survey & Certification Group)
SUBJECT:    Requirement to Reduce Legionella Risk in Healthcare Facility Water Systems to Prevent Cases and Outbreaks of Legionnaires’ Disease (LD)

***Revised to Clarify Expectations for Providers, Accrediting Organizations, and Surveyors***

Memorandum Summary

- **Legionella Infections**: The bacterium Legionella can cause a serious type of pneumonia called LD in persons at risk. Those at risk include persons who are at least 50 years old, smokers, or those with underlying medical conditions such as chronic lung disease or immunosuppression. Outbreaks have been linked to poorly maintained water systems in buildings with large or complex water systems including hospitals and long-term care facilities. Transmission can occur via aerosols from devices such as showerheads, cooling towers, hot tubs, and decorative fountains.

- **Facility Requirements to Prevent Legionella Infections**: Facilities must develop and adhere to policies and procedures that inhibit microbial growth in building water systems that reduce the risk of growth and spread of Legionella and other opportunistic pathogens in water.

- This policy memorandum applies to Hospitals, Critical Access Hospitals (CAHs) and Long-Term Care (LTC). However, this policy memorandum is also intended to provide general awareness for all healthcare organizations.

- This policy memorandum clarifies expectations for providers, accrediting organizations, and surveyors and does not impose any new expectations nor requirements for hospitals, CAHs and surveyors of hospitals and CAHs. For these provider types, the memorandum is merely clarifying already existent expectations.

- This policy memorandum supersedes the previous Survey & Certification (S&C) 17-30 released on June 02, 2017 and the subsequent revisions issued on June 9, 2017.
Legionella defined

What is Legionella?
• Bacteria
• Naturally occurs in fresh water
• Does NOT usually affect healthy individuals
• Can grow and multiply in complex water systems
Exposure sources

How are individuals exposed to Legionella?

• Aerosolized bacteria

Common Sources
• Cooling towers
• Showers
• Hot tubs
• Fountains
Risk factors

Who is at risk?

- Age ≥ 50 years
- Smoker (previous or current)
- Chronic lung disease such as COPD or emphysema
- Immune system disorders due to disease or medication
- Cancer
- Underlying illness such as diabetes, renal failure, hepatic failure, or those who are immunocompromised
# Legionnaires’ disease vs. Pontiac fever

<table>
<thead>
<tr>
<th>Clinical features</th>
<th>Legionnaires’ disease</th>
<th>Pontiac fever</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever, myalgia, and cough (according to the <a href="https://www.cste.org/">CSTE* case definition</a>)</td>
<td>A milder illness without pneumonia (according to the <a href="https://www.cste.org/">CSTE* case definition</a>)</td>
<td>A flu-like illness, often with fever, chills, headache, myalgia, fatigue, malaise; less often with symptoms such as cough or nausea</td>
</tr>
<tr>
<td>These symptoms are typical but not required; additional symptoms (e.g., shortness of breath, headache, confusion, nausea, diarrhea) may be present</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Pneumonia (clinical or radiographic) | Yes | No |

| Pathogenesis | Replication of organism | Possibly an inflammatory response to endotoxin |

| Incubation period | 2 to 10** days after exposure | 24 to 72 hours after exposure |

| Percent of people who become ill, when exposed to the source of *Legionella* | Less than 5%² | Greater than 90%³ |

| Treatment | Antibiotics | Supportive care (because illness is self-limited) |

| Isolation of the organism | Possible | Never demonstrated |

| Outcome | Hospitalization common Case-fatality rate: 10% (25% for healthcare-associated) | Hospitalization uncommon Case-fatality rate: extremely low |

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* CSTE: Council of State and Territorial Epidemiologists  
** The incubation period for Legionnaires’ disease is most commonly 2 to 10 days from the time of exposure to symptom onset, with an average of 5 to 6 days⁶, but public health officials have reported incubation periods up to 26 days under rare circumstances⁴. For surveillance purposes, public health officials collect exposure histories for the 10 days before date of symptom onset. However, in outbreak settings where it is important to consider a wide range of possible sources, use of a 14-day range (or more) may be desirable.
<table>
<thead>
<tr>
<th>Clinical Features</th>
<th><strong>Legionnaires’ disease</strong></th>
<th><strong>Pontiac fever</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initially:</strong></td>
<td>fever, loss of appetite,</td>
<td>Self-limiting flu-like illness with fever, chills, headache,</td>
</tr>
<tr>
<td></td>
<td>headache, malaise, lethargy, mild cough</td>
<td>muscle pain,</td>
</tr>
<tr>
<td></td>
<td>(50% have phlegm)</td>
<td>diarrhea, confusion, shortness of breath, nausea, hemoptysis</td>
</tr>
<tr>
<td><strong>Additionally may have:</strong></td>
<td>muscle pain, diarrhea, confusion, shortness of breath, nausea, hemoptysis</td>
<td><strong>Less often:</strong> cough, nausea</td>
</tr>
<tr>
<td><strong>Self-limiting flu-like illness</strong></td>
<td>with fever, chills, headache, muscle pain, malaise</td>
<td></td>
</tr>
<tr>
<td><strong>Radiographic Pneumonia</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Incubation Period</strong></td>
<td>2-10 days</td>
<td>Within 72 hours</td>
</tr>
<tr>
<td><strong>Attack Rate</strong></td>
<td>Less than 5%</td>
<td>Up to 95%</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td>Antibiotics</td>
<td>Symptomatic</td>
</tr>
<tr>
<td><strong>Duration of Illness</strong></td>
<td>Weeks</td>
<td>Days</td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
<td>Hospitalization common Case fatality: 10-15% of cases</td>
<td>Hospitalization uncommon Case fatality rate: extremely low</td>
</tr>
</tbody>
</table>
When to test

Other times to consider testing:
- Failed antibiotic therapy for community acquired pneumonia
- Severe pneumonia, especially with previous ICU stay
- Immunocompromised with pneumonia
- Travel within 10 days before onset of severe pneumonia
- All those with pneumonia during a legionellosis outbreak
- At risk for Legionnaires’ disease with healthcare acquired pneumonia (greater than 48 hours after admission)
When to test

It is especially important to test when:

- Other patients in your facility have been diagnosed with healthcare associated Legionnaires’ disease in the last 12 months
- There are positive environmental tests for Legionella in the past 2 months
- Changes to water quality that could lead to this (chlorine levels)
**Testing**

Get **TWO** tests at the same time if possible

- Legionella urinary antigen test
- Culture of lower respiratory secretions*
  - Sputum sample
  - Bronchoalveolar lavage

*Try to get culture before antibiotic administration, however do not delay antibiotic while waiting for sample or results
What can facilities do?

- Create a water management program
- Surveillance
- Test residents if Legionella is a suspected cause of illness
- Call your local health jurisdiction if even ONE case is found
An effective water management program could have prevented 4 of 5 (or 80%) of health care-associated *Legionella* outbreaks in the U.S.
Water Management Program (WMP)

Identifying Buildings at Increased Risk

Survey your building (or property) to determine if you need a water management program to reduce the risk of Legionella growth and spread.

If you answer YES to any of questions 1 through 4, you should have a water management program for that building’s hot and cold water distribution system.

Healthcare Facilities

Yes ___ No ___ 1. Is your building a healthcare facility where patients stay overnight or does your building house or treat people who have chronic and acute medical problems or weakened immune systems?

Yes ___ No ___ 2. Does your building primarily house people older than 65 years (like a retirement home or assisted-living facility)?

Yes ___ No ___ 3. Does your building have multiple housing units and a centralized hot water system (like a hotel or high-rise apartment complex)?

Yes ___ No ___ 4. Does your building have more than 10 stories (including basement levels)?

Devices in buildings that can spread contaminated water droplets should have a water management program even if the building itself does not. If you answer NO to all of questions 1 through 4 but YES to any of questions 5 through 8, you should have a water management program for that device.

Yes ___ No ___ 5. Does your building have a cooling tower?

Yes ___ No ___ 6. Does your building have a hot tub (also known as a spa) that is not drained between each use?

Yes ___ No ___ 7. Does your building have a decorative fountain?

Yes ___ No ___ 8. Does your building have a centrally-installed Mister, atomizer, air washer, or humidifier?

If you answer NO to questions 1 through 8, you should still maintain water systems according to manufacturer recommendations. On properties with multiple buildings, prioritize buildings that house or treat people who are at increased risk for Legionnaires’ disease (see Appendix A to learn who is at increased risk).

The building standards discussed in this toolkit do not apply to single-family or small multiple-family residences (e.g., duplexes), even those with the devices in questions 9 through 8, but residents do need to take steps to protect themselves from waterborne diseases.

Homeowners should follow local and state guidelines for household water use, and owners of the devices in questions 8 through 8 should follow the manufacturer’s instructions regarding cleaning, disinfecting, and maintenance.


*For a definition of a cooling tower, visit www.cfs.org/whats/a-cooling-tower.shtml
Step 1: WMP team

1. Establish a water management program team
2. Describe the building water systems using text and flow diagrams
3. Identify areas where Legionella could grow and spread
4. Decide where control measures should be applied and how to monitor them
5. Establish ways to intervene when control limits are not met
6. Make sure the program is running as designed and is effective
7. Document and communicate all the activities

Continuous program review (see page 6)
WMP team

Skills needed

Ability to:

• Oversee the program
• WMP regular communication
• Identify control locations & control limits (CL)
• Identify & take corrective actions
• Monitor & document WMP performance
• Confirm WMP performance

Expertise in:

• Water system knowledge
• Infection prevention
• Infectious diseases (clinician)
• Risk and quality management
• Accreditation standards
WMP Team

Empowered to make decisions

- Maintenance or engineering
- Infection preventionist
- Quality and risk assessment
- Someone who understands accreditation standards
- Administrator

Water Management Team
Table 1  Risk management team members

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
<th>Position</th>
<th>Legionella risk management responsibilities</th>
<th>Contact details (phone, email)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Emergency Contacts and Numbers

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

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Step 2: Building water system

1. Establish a water management program team
2. Describe the building water systems using text and flow diagrams
3. Identify areas where Legionella could grow and spread
4. Decide where control measures should be applied and how to monitor them
5. Establish ways to intervene when control limits are not met
6. Make sure the program is running as designed and is effective
7. Document and communicate all the activities

Include all areas where hazardous conditions may contribute to Legionella growth and spread:
- Patient care areas (such as patient rooms and ICUs, but don’t forget other places like dialysis, respiratory therapy, and hydrotherapy)
- Clinical support areas (including dietary and central supply) which could contribute to spread by aspiration

Include all components and devices that can contribute to Legionella growth and spread, as listed in the glossary on page 3. Think about all of the places where patients can be exposed to contaminated water. Don’t forget about ice machines, heater-cooler units, and respiratory therapy equipment.

Think about:
- Areas where medical procedures may expose patients to water mists, such as hydrotherapy and respiratory therapy devices
- Areas where patients are more vulnerable to infection, such as bone marrow transplant units, oncology floors, or intensive care units

Continuous program review (see page 6)
Water system description

System uses and description

- **Users of water**
  - Clinical functions, specialist functions, high and low clinical risk patients
- **Uses of water**
  - Ice machines
  - Water fountains
  - Hydrotherapy tubs
  - Humidifiers
  - Salons and dental procedures

- **Incoming water details**
  - Public, private or well
  - Source
  - Treatment
  - Process

- **Water quality characteristics**
- **Reliability of incoming water**
- **Emergency supply**
- **Water entry points**
- **How water is treated at your facility**
Create a written description of your water system
## System components inventory

<table>
<thead>
<tr>
<th>System component</th>
<th>Characteristic</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hot water heaters</strong></td>
<td>Number, location, capacity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type of heating</td>
<td>e.g. solar, gas, instant, electric</td>
</tr>
<tr>
<td></td>
<td>Max. temperature</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average temperature</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age of heaters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Capacity</td>
<td></td>
</tr>
<tr>
<td><strong>Cold water storages</strong></td>
<td>Number, location, capacity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Capacity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Material</td>
<td>e.g. concrete, steel, plastic</td>
</tr>
<tr>
<td></td>
<td>Water age (Time since disinfection)</td>
<td>If known</td>
</tr>
<tr>
<td><strong>Incoming water</strong></td>
<td>Company name</td>
<td>e.g. water utility company</td>
</tr>
<tr>
<td>treatment</td>
<td>Source</td>
<td>e.g. reservoir, pond, rainwater</td>
</tr>
<tr>
<td></td>
<td>Disinfection type</td>
<td>e.g. chlorine, monochloramine</td>
</tr>
<tr>
<td><strong>Facility water</strong></td>
<td>Type, location</td>
<td>e.g. chlorine disinfection</td>
</tr>
<tr>
<td>treatment</td>
<td>Dose rate (if chemical treatment)</td>
<td>e.g. 1 mg/L</td>
</tr>
<tr>
<td></td>
<td>Chemical target residual at most distal point in water system (if chemical treatment)</td>
<td>e.g. 0.5 mg/L</td>
</tr>
<tr>
<td><strong>Pipework</strong></td>
<td>Age</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type and extent of insulation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of dead legs and locations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Areas of low flow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of pipework that is accessible</td>
<td></td>
</tr>
<tr>
<td><strong>Outlets</strong></td>
<td><strong>Hot water</strong></td>
<td>Number, type, location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e.g. 5 sinks in kitchen and 5 showers in 1st floor bathroom; 2 sinks in kitchen; 2 sinks in 2nd floor bathroom; 10 sinks on thirds floor (1 per room)</td>
</tr>
<tr>
<td></td>
<td><strong>Cold water</strong></td>
<td>Number, type, location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e.g. 8 taps in landscaped garden</td>
</tr>
<tr>
<td></td>
<td><strong>Warm water</strong></td>
<td>Number, type, location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e.g. 35 showers on 3rd floor (1 per room)</td>
</tr>
<tr>
<td><strong>TMVs (thermostatic</strong></td>
<td>Type, number, age, location</td>
<td>Include date of last service</td>
</tr>
<tr>
<td>mixing valves &amp;**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tempering valves**</td>
<td>Distance from outlets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accessibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum temperature at outlet</td>
<td></td>
</tr>
</tbody>
</table>
Basic Flow Diagram

1. Receiving
   - Fire Suppression (sprinkler system)

2. Cold Water Distribution
   - Cooling Tower Roof
   - Decorative Fountain Lobby
   - Ice Machines Floors 2,4,6,8,10
   - Sinks/Showers Floors B-11
   - Hot Tub Floor 1
   - Pool Floor 1

3. Heating
   - Water Heaters #1 & #2: Basement
   - Water Heater #3: Basement Kitchen
   - Hot Water Storage Basement

4. Hot Water Distribution
   - Sinks/Showers Floors B-5
   - Sinks/Showers Floors 6-11
   - Kitchen Appliances Basement

5. Waste
   - Sanitary Sewer

Legend: BACKFLOW PREVENTER ← WATER FLOW ← RECIRCULATING RETURN FLOW WATER PROCESS

Municipal Water 4” pipe from Maple St.
Step 3: Identify where Legionella can grow & spread
Hazard identification

Identify potential hazards and risk locations in your facility. Potential hazard and risk areas include:

• Temperature permissive conditions
• Stagnation of water in pipes
• No disinfectant or lower than recommended levels in water
• Areas where conditions for bacteria spread are more likely
  o Decorative fountains, cooling towers, hot tubs, ice machines
• External hazards
  o Construction, water main break, low levels of disinfectant
• Special considerations for healthcare facilities with at-risk populations
  o Hydrotherapy tubs
  o Respiratory equipment
  o Ice machines
Hazard identification

Hazard ≠ Risk

- Risk is a combination of probability and severity
- WMP team must:
  - Decide if risk of injury is significant
  - State basis for deciding the significance of the risk

### Table 4 Qualitative measures of consequence or impact on facility

<table>
<thead>
<tr>
<th>Level</th>
<th>Descriptor</th>
<th>Example description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Insignificant</td>
<td>Insignificant impact, little disruption to normal operation, low increase in normal operating costs (e.g., temporary low chlorine residual that can be resolved via increased flushing)</td>
</tr>
<tr>
<td>2</td>
<td>Minor</td>
<td>Minor impact for part of facility, some manageable disruption to normal operation, some increase in operating costs (e.g., several rooms or one wing with total bacterial count &gt;500 CFU/mL, requiring more frequent flushing to maintain chlorine residuals)</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Minor impact for most of facility, significant but manageable modification to normal operation, increase in operating costs, increased monitoring (e.g., extensive bacterial growth with some <em>Legionella</em>, requiring extensive flushing and additional controls)</td>
</tr>
<tr>
<td>4</td>
<td>Major</td>
<td>Major impact for part of facility, systems significantly compromised, abnormal (if any) operation, high level of monitoring required (e.g., temporary closure of part of facility requiring extensive disinfection)</td>
</tr>
<tr>
<td>5</td>
<td>Catastrophic</td>
<td>Major impact for whole of facility, complete failure of systems (e.g., extensive <em>Legionella</em> colonisation, with possible cases of Legionnaires' disease)</td>
</tr>
</tbody>
</table>

### Table 7C. Qualitative Risk Analysis Matrix – Level of Risk

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>1 (Insignificant)</th>
<th>2 (Minor)</th>
<th>3 (Moderate)</th>
<th>4 (Major)</th>
<th>5 (Catastrophic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Almost certain)</td>
<td>Moderate</td>
<td>High</td>
<td>Very High</td>
<td>Very High</td>
<td>Very High</td>
</tr>
<tr>
<td>B (Likely)</td>
<td>Moderate</td>
<td>High</td>
<td>High</td>
<td>Very High</td>
<td>Very High</td>
</tr>
<tr>
<td>C (Possible)</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Very High</td>
<td>Very High</td>
</tr>
<tr>
<td>D (Unlikely)</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Very High</td>
</tr>
<tr>
<td>E (Rare)</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
Evaluating risk

Risk ≠ Probability

High Probability \times \text{Low Severity} = \text{Low Risk}

Moderate Probability \times \text{High Severity} = \text{High Risk}
Evaluating risk

Table 5  Hazard identification and risk assessment table, including examples (edit and add rows as required)

<table>
<thead>
<tr>
<th>System component</th>
<th>Hazard and hazardous event</th>
<th>Impact</th>
<th>Possible control measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incoming water</td>
<td>Supply of water with low chlorine residual</td>
<td>Moderate (controllable)</td>
<td>Install onsite chlorination to achieve 0.5 mg/L at all high risk outlets</td>
</tr>
<tr>
<td>Incoming water</td>
<td>Supply of microbiologically contaminated water</td>
<td>Moderate (controllable)</td>
<td>Agreement with water supplier to notify facility manager of any bacteriological contamination; increase chlorine dose chlorinator; flush out contaminated water</td>
</tr>
<tr>
<td>Hot water system</td>
<td>Water temperature too low (to inhibit growth of <em>Legionella</em> and other opportunistic pathogens)</td>
<td>Moderate (controllable with some increased monitoring)</td>
<td>Measure temperature daily and adjust if too low</td>
</tr>
<tr>
<td>Warm water system</td>
<td>Distance from Thermostatic Mixing Valves (TMV) to outlet &gt; 20 ft. leading to <em>Legionella</em> detections in high risk locations</td>
<td>Major (Legionella is detected requiring remediation)</td>
<td>Move TMV closer to outlet or install point of use filter on outlet</td>
</tr>
<tr>
<td>Pipework</td>
<td>Low flow in several areas (allows adherence and proliferation of <em>Legionella</em> and other opportunistic pathogens)</td>
<td>Moderate to Major (Legionella not detected but much of facility is impacted)</td>
<td>Weekly flushing of water in areas of low use</td>
</tr>
</tbody>
</table>
Step 4: Control measures & monitoring

1. Establish a water management program team
2. Describe the building water systems using text and flow diagrams
3. Identify areas where Legionella could grow and spread
4. Decide where control measures should be applied and how to monitor them
5. Establish ways to intervene when control limits are not met
6. Make sure the program is running as designed and is effective
7. Document and communicate all the activities

Include all areas where hazardous conditions may contribute to Legionella growth and spread:
- Patient care areas (such as patient rooms and ICUs, but don’t forget other places like dialysis, respiratory therapy, and hydrotherapy)
- Clinical support areas (including dietary and central supply) which could contribute to spread by aspiration

Think about:
- Areas where medical procedures may expose patients to water mists, such as hydrotherapy and respiratory therapy devices
- Areas where patients are more vulnerable to infection, such as bone marrow transplant units, oncology floors, or intensive care units

Continuous program review (see page 6)
Risk management

Control procedures

• Control measures & monitoring include:
  o Regular maintenance
  o Operational practices
  o Corrective actions

• Require written procedures detailing how to undertake tasks

<table>
<thead>
<tr>
<th>System component</th>
<th>Control measure</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. pipework</td>
<td>Regular (weekly) flushing of low use areas</td>
<td>e.g. Enw Services Flushing of pipes in Ward 2</td>
</tr>
<tr>
<td>e.g. treatment</td>
<td>Changing dose rate of disinfectant</td>
<td>e.g. Operations Adjustment of chlorine dose</td>
</tr>
<tr>
<td>e.g. outlet — TMV</td>
<td>Regular maintenance of TMV</td>
<td>e.g. Enw Services Cleaning of TMV and thermal disinfection of all pipework and outlets downstream of TMV - yearly</td>
</tr>
<tr>
<td>e.g. outlets</td>
<td>Collecting warm water samples for <em>Legionella</em> testing if case detected</td>
<td>e.g. Operations manager sample collection for <em>Legionella</em> – Warm water AND e.g. storage and transportation to xxx Laboratory</td>
</tr>
</tbody>
</table>
Risk management

Operational monitoring & documentation
  • Ensures critical limits are not exceeded
  • Lists what to do if critical limits are exceeded
Includes:
  • System component
  • Risk
  • Parameter
  • Frequency
  • Location
  • Critical limit
  • Where results will be recorded
  • Corrective actions to take
Risk management

Conditions that promote *Legionella* growth include:

- Stagnation
- Warm water temperatures: 20-50 degrees Celsius (68-122 degrees Fahrenheit)
- pH: 5.0 and 8.5
- Sediment that tends to promote growth of commensal microflora
- Microorganisms:
  - algae, *flavobacteria*, and *Psuedomonas*, which supply essential nutrients for growth of Legionnaires’ disease bacteria or protozoa that harbor the organism such as amoebae
## Risk management

### Table 7  Operational monitoring, showing examples (edit, add or delete rows as required)

<table>
<thead>
<tr>
<th>System component</th>
<th>Risk</th>
<th>Parameter</th>
<th>Frequency</th>
<th>Location</th>
<th>Critical limit</th>
<th>Record (where is the measurement recorded)</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incoming water</td>
<td>Low disinfectant residual</td>
<td>Chlorine residual</td>
<td>Online or weekly</td>
<td>Point of entry into facility</td>
<td>Less than 0.5 mg/L</td>
<td>Chlorine residual record sheet CR 1.001</td>
<td>Increase chlorine dose within facility</td>
</tr>
<tr>
<td>Cold Water</td>
<td>Water temperature that supports <em>Legionella</em> growth</td>
<td>Temperature</td>
<td>Weekly</td>
<td>Water outlet in kitchen</td>
<td>Temperature over 67 °F</td>
<td>Weekly temperature kitchen record sheet TP 4.333</td>
<td>Increase temperature of water heater</td>
</tr>
<tr>
<td>Hot Water</td>
<td>Low temperature</td>
<td>Temperature</td>
<td>Weekly</td>
<td>Hot water outlet in kitchen (sink tap at far right corner)</td>
<td>Temperature less than 140 °F</td>
<td>Weekly temperature kitchen record sheet TP 4.333</td>
<td>Increase temperature of water heater</td>
</tr>
<tr>
<td>Tempered Water from TMV</td>
<td>Scalding risk</td>
<td>Temperature</td>
<td>Weekly</td>
<td>At valve</td>
<td>Temperature at 130 °F</td>
<td>Faucet or tap</td>
<td>Adjust accordingly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>At outlets</td>
<td>Temperature at 113-120 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm water</td>
<td>Water temperature that supports <em>Legionella</em> growth</td>
<td>Temperature</td>
<td>Daily</td>
<td>Outlet furthest from water heater (wash basin tap in room xx)</td>
<td>Temperature greater than 68 °F and less than 122 °F</td>
<td>Daily temperature – ward 2 record sheet TP 1.333</td>
<td>Check heater temp and adjust if required, check pipework for loss of heat, check operation of TMV</td>
</tr>
</tbody>
</table>
Risk management

Flow Diagram:
Monitoring & Control

1. Receiving
   Municipal Water 4" pipe from Maple St.
   - Fire Suppression (sprinkler system)

2. Cold Water Distribution
   - Cooling Tower Roof
   - Decorative Fountain Lobby
   - Ice Machines Floors 2, 4, 5, & 10
   - Sinks/Shower Floors B-11
   - Hot Tub Floor 2
   - Pool Floor 1

3. Heating
   - Water Heaters #1 & #2: Basement
   - Water Heater #3: Basement Kitchen
   - Hot Water Storage Basement
   * Monitoring at representative fixtures close to and far from the central distribution point is recommended. It is not necessary to routinely monitor water conditions at every tap.

4. Hot Water Distribution
   - Sinks/Shower Floors B-5
   - Sinks/Shower Floors 5-11
   - Kitchen Appliances Basement

5. Waste
   - Sanitary Sewer

Legend:
- ■ Backflow Preventer
- ← Water Flow
- ← Recirculating Return Flow
- □ Water Process

*Monitoring at representative fixtures close to and far from the central distribution point is recommended. It is not necessary to routinely monitor water conditions at every tap.*

State and local regulations may exist that govern the design, construction, operation, and maintenance of public aquatic facilities (e.g., pools and tubs). INSERT LINKS
Step 5: Intervene when CL not met
Monitoring & response

Verification monitoring and response
• Ensures control measures effective
• Water quality risk managed appropriate

How to complete
• Take samples for noted parameter
• Action taken when outside of critical limit, quality standards or a case of Legionellosis found
  • Can be operational or clinical
• Document responses
## Monitoring & response

### Table 8  Verification monitoring, showing examples (edit, add or delete rows as required)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Location</th>
<th>Limit</th>
<th>Reported to</th>
<th>Operational response to exceedance of critical limit <em>(all responses should have a procedure as per Table 6)</em></th>
<th>Clinical response to exceedance of limit <em>(all responses should have a procedure listed as per Table 6)</em></th>
</tr>
</thead>
</table>
| Heterotrophic plate count  | *         | Distal warm water taps — wash basins in rooms xxx                         | Greater than 500 CFU/mL       | Building, engineering and maintenance services (BEMS) supervisor | 1. Check operational measurements (temperature, pH, turbidity, disinfectant residuals and dose), maintenance schedules (including flushing regimes) and structural integrity  
2. Flush water through until sufficient disinfectant residual is achieved at sampling point  
3. Resample after responses are completed | None |
| **Legionella species**     | *         | Distal warm water taps – wash basins in room with low risk patients       | Greater than 10 CFU/100 mL    | BEMS manager and CEO                             | 1. Check operational measurements, maintenance schedules and structural integrity of system  
2. Clean and sanitise TMV and outlet fitting  
3. If resample positive, move to next row | Remove patient/s from affected room |
| **Legionella species**     | *         | Distal warm water taps — wash basins in room with high risk patients      | Greater than 10 CFU/mL        | BEMS manager and CEO                             | 1. Check operational measurements, maintenance schedules and structural integrity of system  
2. Clean and sanitise TMV and outlet fitting  
3. Clean pipework  
4. Superchlorinate system | Remove patient/s from affected room |

*Different sampling frequencies exist in the literature. See Appendix for details and recommendations.*
Step 6: Ensure WMP is running and effective
Step 7: Documentation & communication

- Establish a water management program team
- Describe the building water systems using text and flow diagrams
- Identify areas where Legionella could grow and spread
- Decide where control measures should be applied and how to monitor them
- Establish ways to intervene when control limits are not met
- Make sure the program is running as designed and is effective
- Document and communicate all the activities

*Devices that are commonly used during cardiac surgical procedures to warm and cool a patient's blood during cardiopulmonary bypass

Continuous program review (see page 6)
Document, document, communicate

Documentation is **KEY** for a WMP

- If it is not documented, surveyors will not know it was done
- Can protect you from litigation

Overall your WMP should include:

- WMP team information
- A building description
- A water system description
- What control measures will be taken
- Documentation that the program is being followed and show that is effective
- Information on who will complete environmental testing if it is required, how it will be collected and how it will be transported.