Legionella Mitigation

Better Have A Plan!!!

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What is this ASHRAE 188-2015

- ASHRAE 188-2015, entitled ‘Legionellosis: Risk Management for Building Water Systems’ is an industry standard that firmly places the onus on the building owner for good facility management and the safety of the building’s water systems.

- Its purpose is to establish minimum standards and risk management requirements for building water systems throughout the USA. It has been developed to assist building owners and those involved in the management and construction of buildings to develop effective management strategies to prevent outbreaks of Legionellosis.

Are You Required To Comply with ASHRAE 188-2015?

- No, the ASHRAE Standard188-2015 is a set of standards, not legislation. However, failure to comply with the recommendations of the document could expose organizations to potential legal action if they are implicated in an outbreak of Legionellosis.
- The USA based Occupational Safety and Health Administration (OSHA) has indicated that those responsible organizations are required by law to do everything in their power to protect building occupants from known hazards such as legionella bacteria.
- Following the guidelines set out in ASHRAE's new Standard188-2015 will help to ensure that building owners have in place a robust and effective legionella risk management system, and should have greater protection against allegations of wrongdoing or negligence, should a legionella outbreak occur.

How is ASHRAE 188-2015 different from TJC Standards (JCAHO Standard EC 7.1)?

- The Joint Commission (TJC), formerly the Joint Commission on Accreditation of Healthcare Organizations or JCAHO, require management of healthcare facility systems to have a plan to prevent/minimize pathogenic biological agents in water systems – but do not proscribe specific steps regarding how this should be accomplished. In contrast, ASHRAE 188-2015 specifies the risk management approach and the process for developing a water management plan.

Phase 1 - Do I Need a Water Management Plan?????

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.

- 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?
- Does your building primarily house people older than 65 years (like a retirement home or assisted-living facility)?
- Does your building have multiple housing units and a centralized hot water system (like a hotel or high-rise apartment complex)?
- Does your building have more than 10 stories (including basement levels)?

Phase 2 - Do I Need a Water Management Plan?????

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*.

- Does your building have a cooling tower?
- Does your building have a hot tub (also known as a spa) that is not drained between each use?
- Does your building have a decorative fountain?
- Does your building have a centrally-installed mister, atomizer, air washer, or humidifier?

I Answered "YES" To One of Those Questions!! What The Heck Do I Do Now??

Develop A Water Management Plan

- Step 1 – Develop A Water Management Team
- Step 2 – Describe Your Building Water Systems Using Text & Flow Diagram
- Step 3 – Identify Potential Contraction (Control) Points, Control Measures and Corrective Actions
- Step 4 – Decide How To Monitor Your Control Points
- Step 5 – Establish Corrective Actions For Non Compliant Control Points
- Step 6 – Is The Program Working – Verification & Validation
- Step 7 – Document And Communicate All Water Management Team's Activities

Step 1 – Develop A Water Management Team

Consider who among your employees, partners, and outside experts can provide these skills so that you can develop the most effective program possible. Those who might be part of your water management program team include:

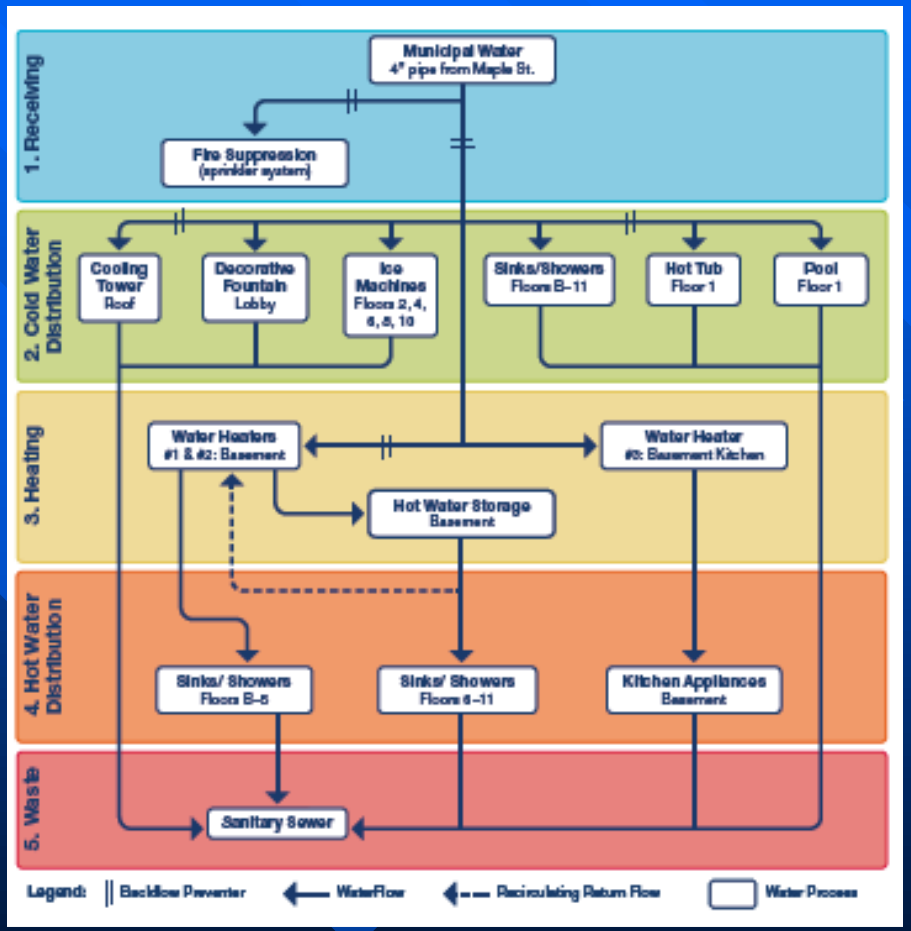
- Building owner
- Building manager/administrator
- Maintenance or engineering employees
- Safety officers
- Equipment or chemical suppliers
- Contractors/consultants (e.g., water treatment professionals)
- Certified industrial hygienists
- Microbiologists
- Environmental health specialists – Infectious Control
- State and local health officials
- In some cases, you may need to train your in-house personnel or hire professionals with specific experience in *Legionella* bacteria in building water systems.

Step 2 – Describe Your Building Water Systems Using Text

- You will need to write a simple description of your building water system and devices you answered YES to on page 2. This description should include details like where the building connects to the municipal water supply, how water is distributed, and where pools, hot tubs, cooling towers, and water heaters or boilers are located.
- Be sure to include descriptions of water sources relevant to:
  - Patient care areas
  - Clinical support areas
  - Components and devices that can expose patients to contaminated water
  - You should also develop an ongoing dialogue with your drinking water provider so that you are aware of changes that may affect your building's water supply.

Step 2 – Describe Your Building Water Systems Using Flow Diagrams

- WATER IN AND WHAT IT TOUCHES
- WATER OUT



Step 3 – Identify Potential Contraction (Control) Points, Control Measures and Corrective Actions

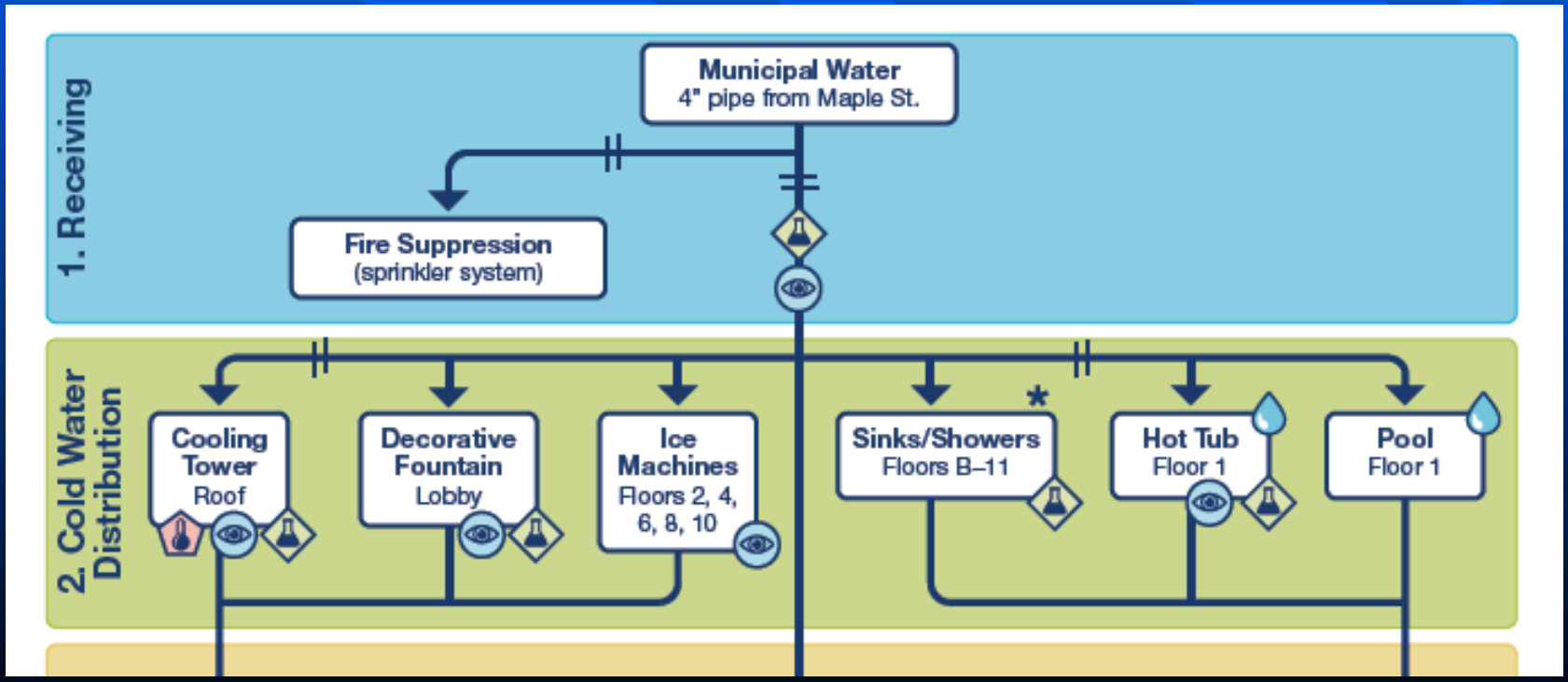
- Once you have developed your process flow diagram, identify where potentially hazardous conditions could occur in your building water systems. Each potentially hazardous condition should be addressed individually with a control point, measure and limit.
- If you find that a control limit (i.e., temperature levels, disinfectant levels) is not being met, you need to take corrective actions to get conditions back to within an acceptable range.

What is HAACP?

- (Note: ASHRAE 188-2015 no longer includes the term "HACCP" but it was in the first few drafts and the general approach followed in 188 is similar.)
- HACCP stands for "Hazard Analysis and Critical Control Point" and is a systematic method of assessing and controlling risk. The HACCP approach was developed in the 1960s under work for NASA and has been applied extensively in the food industry as well as in pharmaceuticals, cosmetics, etc.
- Essentially a HACCP plan addresses (a) what are the hazards, (b) how are they being controlled and (c) how do you know the controls are working?
- There are seven essential steps in HACCP:
- Conduct a hazard analysis
- Identify critical control points
- Establish critical limits for each critical control
- Establish monitoring for the control at each critical control point
- Establish corrective actions
- Establish verification and validation procedures for the HACCP plan
- Establish documentation procedures

Step 4 – Decide How To Monitor Your Control Points (Frequency and Levels)

- Visual Inspection
- Disinfectant Levels
- Temperature



Does anyone know the two teams that played in the 1992 Peach Bowl?

East Carolina University versus NC State

Does anyone know the final score in the 1992 Peach Bowl?

East Carolina University	37
NC State	34

Step 5 – Establish Corrective Actions For Non Compliant Control Points

- Building water systems are dynamic. You should plan for your monitoring results to vary over time and be prepared to apply corrective actions. **Corrective actions** are taken in response to systems performing outside of control limits.
- You should be prepared to respond, even to unexpected problems, based on your knowledge of the building water systems and how *Legionella* grows and spreads. You may need to initiate a customized contingency response to gain control of a building water system. **Contingency responses** may involve several steps and often require follow up. A contingency response is always required when a case of Legionnaires' disease has been linked to a building and is also appropriate in other situations.

Step 5 – Establish Corrective Actions For Non Compliant Control Points – Corrective Action Example

Corrective Action Example – a person from the water management team notices “slimy growth” in the decorative fountain. The fountain is drained and cleaned per instructions in the water management program. After cleaning, the program’s startup procedure to refill the fountain are followed and disinfectant levels are confirmed. The entire procedure is documented.

Step 5 – Establish Corrective Actions For Non Compliant Control Points – Contingency Response Example

Contingency Response Example – going back to the decorative fountain example. During the annual review of the water management program it is noticed that the decorative fountain has received six interim cleanings. The slime/biofilm was noted most prominent near the incandescent light. The light is changed for a LED light to reduce the heat source. The entire procedure is documented. After three months it is noted that routine inspections have not initiated an interim cleaning.

Step 6 – Is The Plan Successful (Verification & Validation)

Verification: Are we doing what we said we would do?

- Your program team should establish procedures to confirm, both initially and on an ongoing basis, that the water management program is being implemented as designed. This step is called “verification.” For example, if you said you would test the hot tub daily for chlorine and record and communicate those results, have you been doing that? If you found a problem, did you take the action included in your program?

Validation: Is our program actually working?

- Now that you have a water management program, you need to be sure that it is effective. Your program team should establish procedures to confirm, both initially and on an ongoing basis, that the water management program effectively controls the hazardous conditions throughout the building water systems. This step is called “validation.”

Step 6 – Validation "Is The Plan Successful"?

Environmental testing for *Legionella* is useful to validate the effectiveness of control measures. The program team should determine if environmental testing for *Legionella* should be performed and, if so, how test results will be used to validate the program. Factors that might make testing for *Legionella* more important include:

- Having difficulty maintaining the building water systems within control limits
- Having a prior history of Legionnaires' disease associated with the building water systems
- Being a healthcare facility that provides inpatient services to people who are at increased risk for Legionnaires' disease
- If the program team decides to test for *Legionella*, then the testing protocol should be specified and documented in advance.
- AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC's Analytical Accreditation Board (AAB)
- CDC Elite Status - Environmental Legionella Isolation Techniques Evaluation Program

Interpreting Legionella Testing Results

Very High Risk Situation

Legionella pneumophila SG1 > 5,000 CFU/ml	and/or	*Legionella pneumophila* SG 2-14 & *Legionella* non-*pneumophila* species > 10,000 CFU/ml

- Significant potential for causing an outbreak of Legionnaires' disease
- **Immediate disinfection of the Cooling Tower is indicated**
- Alter the current biocide treatment program
- Schedule an immediate re-test for *Legionella* to determine effectiveness of the disinfection

High Risk Situation

Legionella pneumophila SG1 1,000 - 5,000 CFU/ml	and/or	*Legionella pneumophila* SG 2-14 & *Legionella* non-*pneumophila* species 5,000 - 10,000 CFU/ml

- High level of health concern - *Legionella* at a level associated with outbreaks of Legionnaires' disease.
- **Immediate disinfection of the Cooling Tower is indicated**
- Alter the current biocide treatment program
- Schedule an immediate re-test for *Legionella* to determine effectiveness of the disinfection

Moderate Risk Situation

Legionella pneumophila SG1 100 – 999 CFU/ml	and/or	*Legionella pneumophila* SG 2-14 & *Legionella* non-*pneumophila* species 1,000 - 4,999 CFU/ml

- Moderate level of health concern - *Legionella* approaching the level associated with outbreaks of Legionnaires' disease
- Disinfection of the Cooling Tower is usually indicated as a precaution against any future *Legionella* amplification
- Review current biocide treatment program
- Schedule an immediate re-test for *Legionella* to determine effectiveness of the disinfection

Low Risk Situation

Legionella pneumophila SG1 10 – 99 CFU/ml	and/or	*Legionella pneumophila* SG 2-14 & *Legionella* non-*pneumophila* species 100 – 999 CFU/ml

- Low level of health concern - *Legionella* well below the level associated with outbreaks of Legionnaires' disease
- Disinfection of the Cooling Tower is generally not recommended unless located near susceptible populations
- Review the current biocide treatment program
- Schedule regular testing for *Legionella* in the future

Very Low Risk Situation

Legionella pneumophila SG1 <10 CFU/ml	and/or	*Legionella pneumophila* SG 2-14 & *Legionella* non-*pneumophila* species < 100 CFU/ml

- Very low level of health concern - background levels of *Legionella*
- Review location of the Cooling Tower in relation to susceptible population
- Review current biocide treatment program
- Schedule regular testing for *Legionella* in the future

Cooling Tower Disinfection

Legionella Levels High Risk – Off Line Disinfection Part 1

- If possible, shut off heat source.
- Shut off fans, if present, on the cooling tower/evaporative condenser (CT/EC).
- Shut off the system blowdown (purge) valve. Shut off automated blowdown controller, if present, and set system controller to manual.
- Keep make-up water valves open.
- Close building air-intake vents within at least 30 meters of the CT/EC until after the cleaning procedure is complete.
- Continue operating pumps for water circulation through the CT/EC Shut off cooling tower fans and associated equipment (chiller)
- Protective equipment may include full-length protective clothing, boots, gloves, goggles, and a full- or half-face mask that combines high efficiency particulate air filter and chemical cartridges to protect against airborne chlorine levels of up to 10 mg/L.

Cooling Tower Disinfection

Legionella Levels High Risk – Off Line Disinfection Part 2

- Add fast-release, chlorine-containing disinfectant in pellet, granular, or liquid form, and follow safety instructions on the product label to achieve 50 ppm free chlorine.
- Record the type and quality of all chemicals used for disinfection, exact time the chemicals are added to the system, and time and results of measurements of (FRC) and pH
- Add dispersant simultaneously with or within 15 minutes of adding disinfectant.

Cooling Tower Disinfection

Legionella Levels High Risk – Off Line Disinfection Part 2

- After adding disinfectant and dispersant, continue circulating the water through the system. Monitor FRC by using an FRC-measuring device, such as a swimming pool test kit, and measure the pH with a pH meter every 15 minutes for 2 hours.
- Two hours after adding disinfectant and dispersant or after FRC level is stable at 10 mg/L, monitor at 2-hour intervals and maintain FRC at 10 mg/L for 24 hours.
- After FRC level has been maintained at 10 mg/L for 24 hours, flush/drain the system until no free chlorine is detected. Chlorine neutralization may be required. Refill system and charge with treatment chemicals as recommended by your water treatment consultant.
- Document disinfection procedure as part of your Water Management Program.

Cooling Tower Disinfection

Legionella Levels Moderate Risk – On-Line Disinfection

- Bleed off system to reduce conductivity to half of normal operation (turn off inhibitor if feed).
- Shut chemical feed system and valve off bleed off line.
- Add fast-release, chlorine-containing disinfectant in pellet, granular, or liquid form, and follow safety instructions on the product label to achieve >5 ppm free chlorine.
- Add dispersant simultaneously with or within 15 minutes of adding disinfectant.
- After adding disinfectant and dispersant, continue circulating the water through the system. Monitor FRC by using an FRC-measuring device, such as a swimming pool test kit, and measure the pH with a pH meter every 15 minutes for the first hour.

Cooling Tower Disinfection

Legionella Levels Moderate Risk – On-Line Disinfection

- One hour after adding disinfectant and dispersant or after FRC level is stable at 5 mg/L, monitor at 1-hour intervals and maintain FRC at 5 mg/L for 6 hours.
- After FRC level has been maintained at 5 mg/L for 6 hours, flush/drain the system until no free chlorine is detected. Chlorine neutralization may be required. Refill system and charge with treatment chemicals as recommended by your water treatment consultant.
- Document disinfection procedure as part of your Water Management Program.
- On-line disinfections are performed routinely without any associated Legionella testing/results.

Step 7 – Document And Communicate All Activities By The Water Management Team

Documentation - Now that you have done all of the work required to create your water management program, write it down. This information will be important to improve your program and if you or others want to review your records. Your written program should include at least the following:

- Program team, including names, titles, contact information, and roles on the team
- Building description, including location, age, uses, and occupants and visitors
- Water system description, including general summary, uses of water, aerosol-generating devices (e.g., hot tubs, decorative fountains, cooling towers), and process flow diagrams
- Control measures, including points in the system where critical limits can be monitored and where control can be applied
- Confirmatory procedures, including verification steps to show that the program is being followed as written and validation to show that the program is effective
- Document collection and transport methods and which lab will perform the testing if environmental testing is conducted

Step 7 – Document And Communicate All Activities By The Water Management Team

Communication - You have worked hard to develop your water management program and you have carefully documented all aspects of it. Resist the temptation to put it on a shelf and walk away. Consider notifying building occupants that you have a plan in place to keep the building water systems safe, just as you would for an elevator inspection. Be sure to communicate with your employees and colleagues about your program on a regular basis and train those responsible for implementing and monitoring the program. Use this communication as an opportunity to identify strategies for improving the management and efficiency of your water systems.

Thank You For Your Time!!
Any Questions???

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