To The Point
As Business Operations Resume– Reducing the Risk of Legionnaires' Disease

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As many operations, processes, and even entire buildings may be temporarily removed from service, it is important to consider safe reopening measures for returning occupants. One potential microbial hazard that should be evaluated prior to reopening is *Legionella* (the cause of Legionnaires' disease).

Legionella bacteria can flourish in large, complex water systems that are not properly maintained. For *Legionella*, a "prolonged period" may be weeks or months depending on plumbing-specific factors, disinfectant residuals, water heater temperature set points, water usage patterns, and preexisting *Legionella* colonization[1]. A primary concern associated with building-related contamination is inhalation or aspiration of water containing live *Legionella* strains that can infect humans and result in Legionnaires' disease, which may result in death, or the less serious form known as Pontiac fever, which produces flu-like symptoms.

The Centers for Disease Control and Prevention (CDC) recommends that building owners develop a comprehensive water management program (WMP) for a water system and all devices that use water. States such as New York and municipalities such as New York City and New Orleans have regulations addressing *Legionella*.

Three key areas for building owners, property managers, and tenants to maintain as they seek to prevent or manage Legionella when reopening an operation or a facility:

Domestic Water Systems

- Hot and cold water systems, including bathroom plumbing, should be flushed frequently to prevent stagnation and ensure adequate levels of residual disinfectants.
- Best practices for flushing your water systems include:
  - Flush hot and cold water through all points of use (e.g., showers, sink faucets).

Risk Engineering Services

- Flushing may need to occur in segments (e.g., floors, individual rooms) due to facility size and water pressure. The purpose of building flushing is to replace all water inside building piping with fresh water.
- If hot water is available in the system, flush the system until the hot water reaches its maximum temperature—while preventing potential scalding risks.
- Care should be taken to minimize splashing and aerosol generation during flushing.

Other Water-Using Devices

- This category includes a range of devices, such as ice machines and ice makers, hot tubs, spas, and pools, as well as decorative fountains and water features.
- Devices should be drained and shuttered properly prior to any shutdown.
  - Clean all devices and decorative water features:
    - Be sure to follow any recommended manufacturer guidelines for cleaning.
    - Ensure that decorative water features are free of visible slime or biofilm.
  - After the water feature has been refilled, measure disinfectant levels to ensure that the water is safe for use.
  - Ice machines should be emptied (including old ice) and flushed.
  - Safety equipment such as fire sprinkler systems, eye wash stations, and safety showers should also be included in any building's water management program.

Cooling Towers

- Ensure that cooling towers are clean and well maintained (including start-up and shut-down procedures) per manufacturer's guidelines and industry best practices.
- Guidance on start-up and shut-down procedures and disinfection procedures are available from the Cooling Technology Institute (CT 159, WTB-148).
- Ensure that the tower and basin are free of visible slime, debris, and biofilm before use.
- If the tower appears well maintained, perform an online disinfection procedure:
  - Typical chemical treatment would include biocides such as sodium hypochlorite and bromine.
  - For cooling towers, physical treatment such as cavitation and oxidation should be considered.

Proactive Ways to Mitigate Legionella Risk—IoT Devices

In addition to maintenance considerations, there are proactive ways to mitigate Legionella risk. One way to do this is through Internet of Things (IoT) objects or devices that are connected by the Internet and that are able to collect and exchange data. The IoT can assist in monitoring for conditions that might permit Legionella to develop in a water system. For example:

- Real-time sensors can be placed throughout water systems to monitor parameters such as water temperature and flow.
- Sensors are monitored by a central dashboard and the data is stored. That stored data is important for demonstrating compliance with regulatory or industry standards.
- Multiple facilities can be connected to the same dashboard for ease of monitoring.
- The monitoring system can alert a user to a change in condition or to conditions where *Legionella* could thrive.

The sensors used by these monitoring systems are relatively inexpensive and simple to install. Another important consideration is that monitoring systems use LoRaWAN, which is a low-power, wide area networking protocol designed to connect battery-operated "things" to the Internet to transmit data. This means that there is no need to connect to existing networks, which can help mitigate a company's cyber risk.

References

[1] https://www.cdc.gov/coronavirus/2019-ncov/php/building-water-system.html)

Additional Resources

A number of organizations, including the CDC and various industry groups, offer guidance, and specific standards exist to help building owners address *Legionella* concerns and help reduce the risk in their buildings after a prolonged shutdown.

Government Resources
Centers for Disease Control and Prevention (U.S. health protection agency) Legionnaires' disease prevention https://www.cdc.gov/legionella/index.html

Occupational Health and Safety Administration (OSHA) Safety and Health Topics | Legionellosis (Legionnaires' Disease and Pontiac Fever) Control and Prevention

OSHA Standards https://www.osha.gov/SLTC/legionnairesdisease/standards.html

Fast Facts about the Disease
Legionella bacteria can cause a serious type of pneumonia (lung infection) called Legionnaires' disease. The bacteria can also cause a less serious illness called Pontiac fever.

About the Disease https://www.cdc.gov/legionella/about/index.html

Fast Facts https://www.cdc.gov/legionella/fastfacts.html

Causes, How It Spreads, and People at Increased Risk
Spread and Risk https://www.cdc.gov/legionella/about/causes-transmission.html

Training
Preventing Legionnaires' Disease: A Training on Legionella Water Management Programs https://www.cdc.gov/nceh/ehs/elearn/prevent-LD-training.html

Hazard Recognition
Worksheet to Identify Buildings at Increased Risk for *Legionella* Growth and Spread

Answer the following questions to help assess if your building needs a water management program or if certain devices within the building need a water management program to reduce the risk of Legionella growth and spread.

https://www.cdc.gov/legionella/wmp/toolkit/wmp-risk.html

Hazard Recognition https://www.osha.gov/SLTC/legionnairesdisease/hazards.html

Program Development
Toolkit: Developing a Water Management Program to Reduce *Legionella* Growth and Spread in Buildings.

Many buildings need a water management program to reduce the risk for *Legionella* growing and spreading within their water system and devices. This toolkit is designed to help people understand which buildings and devices need a Legionella water management program to reduce the risk for Legionnaires' disease, what makes a good program, and how to develop it.

https://www.cdc.gov/legionella/wmp/toolkit/index.html

Control and Prevention
Prevention https://www.cdc.gov/legionella/about/prevention.html

Monitoring Your Building Water https://www.cdc.gov/legionella/wmp/monitor-water.html

Guidance for Reopening Buildings After Prolonged Shutdown or Reduced Operation—Ensure the safety of your occupants and building water system and devices https://www.cdc.gov/coronavirus/2019-ncov/php/building-water-system.html

Control and Prevention https://www.osha.gov/SLTC/legionnairesdisease/control_prevention.html

Industry Resources
Considerations for Hotel Owners and Managers: How to Prevent Legionnaires' Disease https://www.cdc.gov/legionella/wmp/hotel-owners-managers.html

Water Management in Healthcare Facilities

Considerations for Public Hot Tub Operators

Resources for Purchase
American Industrial Hygiene Association (AIHA)

Recognition, Evaluation, and Control of Legionella in Building Water Systems

ANSI/ASHRAE Standard 188-2018, Legionellosis: Risk Management for Building Water Systems

Guideline 12-2020—Managing the Risk of Legionellosis Associated With Building Water Systems

Cooling Technology Institute
Guideline: Best Practices for Control of Legionella www.cti.org/downloads/WTP-148.pdf

Guideline (GDL) 159—Practices to Reduce the Risk of Legionellosis from Evaporative Heat Rejection Equipment Systems

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