

Flushing and Disinfection Guidance for Re-Opening Buildings to reduce *Legionella* risk

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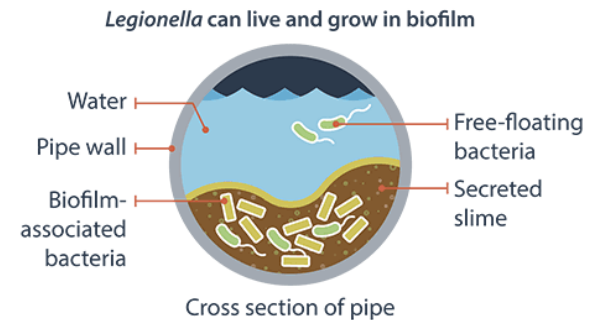
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Legionella

- *Legionella* is a genus of bacteria found worldwide.
- It is most well known as the causal agent of Legionnaires' disease (LD).
- LD is a form of pneumonia spread most frequently through the inhalation of aerosols containing *Legionella* bacterium (typically *L. pneumophila*).

Legionella

- *Legionella* species are often found in water distribution systems, surviving best in water between 77° F - 108° F
- The bacteria is influenced by residual disinfectant in the water distribution system. If disinfectant levels (usually free chlorine) are too low, populations of *Legionella* may increase.
- *Legionella* populations undergo rapid growth wherever water stagnates.
- Stagnation could be caused by dead end legs or periods of non-use.



Source: CDC

Legionella

- Biofilm from stagnant water lines has a high- risk of sloughing off once the water is used again.
- Released biofilm mixes water and is released into the air as aerosols that may be breathed.
- Sinks, showers, and other fixtures linked to a facility's hot water system pose a high risk when a system is used after a period of rest.



Source: CDC

Legionella and COVID-19

- Due to building closures and inactivity during COVID-19, many complex water systems have experienced several months of stagnation.
- Facilities such as schools that typically have complex water systems that experience heavy use pose a high risk for exposure when reopened.
- Following media coverage of several positive detections at schools this summer, many Ohio schools have begun testing for *Legionella*.

Legionella and COVID-19

- There are several methods a facility may employ to reduce risk of *Legionella* exposure after reopening a building.
- ODH has prepared a guidance document on recommissioning buildings. It may be downloaded at:
<https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/legionella-environmental/media/unoccupied-building-recommendations>
- It is recommended to contact a *Legionella* consultant before disinfecting a facility <https://www.cdc.gov/legionella/wmp/consultant-considerations.html>.

Flushing Procedures

- If the facility has a water management program, consult it to create an informed flushing and disinfection plan.
- If the facility does not have a WMP, conduct a risk assessment for all buildings.

<https://www.cdc.gov/legionella/downloads/legionella-environmental-assessment.pdf>

The image shows the cover page of the "Legionella Environmental Assessment Form" from the Centers for Disease Control and Prevention. The page has a blue header with the CDC logo and the title "Legionella Environmental Assessment Form". Below the header, there is a section titled "HOW TO USE THIS FORM" which explains the purpose of the form and provides instructions on how to use it. This is followed by a section titled "BEFORE ARRIVING ON SITE" which lists several steps to be taken before the assessment, such as requesting the attendance of the lead facility manager and bringing a plastic bottle, thermometer, pH test kit, and a chlorine test kit. The next section is "INSTRUCTIONS FOR MEASURING WATER PARAMETERS IN THE PREMISE PLUMBING (TABLE P. 8)" which provides detailed instructions for measuring water parameters. The page also includes the CDC logo and the text "Centers for Disease Control and Prevention National Center for Immunization and Respiratory Diseases" at the bottom.

Centers for Disease Control and Prevention
Legionella Environmental Assessment Form

HOW TO USE THIS FORM

This form enables public health officials to gain a thorough understanding of a facility's water systems and assist facility management with minimizing the risk of legionellosis. It can be used along with epidemiologic information to determine whether to conduct *Legionella* environmental sampling and to develop a sampling plan. The assessment should be performed on-site by an epidemiologist and an environmental health specialist with knowledge of the ecology of *Legionella*. Keep in mind that conditions promoting *Legionella* amplification include water stagnation, warm temperatures (77–108°F or 25–42°C), availability of organic matter, and lack of residual disinfectant such as chlorine. For training and information, please visit CDC's legionellosis resources webpage at: <https://www.cdc.gov/legionella/outbreak-toolkit/>.

Complete the form in as much detail as possible. Do not leave sections blank; if a question does not apply, write "N/A". If a question applies but cannot be answered, explain why. Where applicable, specify the units of measurement being used (e.g., ppm). Completion of the form may take several hours.

BEFORE ARRIVING ON SITE

- ☐ Request the attendance of the lead facility manager as well as others who have a detailed knowledge of the facility's water systems, such as a facility engineer or industrial hygienist.
- ☐ Request that they have maintenance logs and blueprints available for the meeting.
- ☐ Bring a plastic bottle, thermometer, pH test kit, and a chlorine test kit that can detect a wide range of residual disinfectant (<1 ppm for potable water and up to 10 ppm for whirlpool spas).
- ☐ If the epidemiologic information available suggests a particular source (e.g., whirlpool spa, cooling tower), request that they shut it down (but do not drain or disinfect) in order to stop transmission.

INSTRUCTIONS FOR MEASURING WATER PARAMETERS IN THE PREMISE PLUMBING
(TABLE P. 8)

It is very important to measure and document the current physical and chemical characteristics of the potable water, as this can help determine whether conditions are likely to support *Legionella* amplification.

STEP 1: Plan a sampling strategy that incorporates all central hot water heaters/boilers and various points along each loop of the potable water system. For example, if the facility has one loop serving all occupant rooms, an occupant room near (proximal) the central hot water heater and another at the farthest point (distal) of the loop should be sampled.

STEP 2: For each sampling point (e.g., tap in an occupant room):

- Turn on the hot water tap. Collect the first 50 ml from the tap. Measure the free chlorine residual and pH. Document the findings in the table on p. 8. Note: If there is no residual chlorine in the hot water, measure it in the cold water. Note: Total chlorine should be measured instead of free chlorine if the method of disinfection is not chlorine (e.g., monochloramine).
- Allow the hot water tap to run until it is as hot as it will get. Collect 50 ml and measure the temperature. Document the temperature and the time it took to reach the maximum temperature.

Centers for Disease Control and Prevention
National Center for Immunization and Respiratory Diseases

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Flushing Procedures

- Before starting, create a list of all water fixtures and features in the facility. These should include but are not limited to:

- Sinks
- Showers
- Drinking fountains
- Misters
- Tubs
- Humidifiers
- Ice machines



Flushing Procedures

- Remove and thoroughly disinfect (following CDC recommendations) all terminal fixtures including:

- Sink aerators
- Hoses
- Shower heads
- Sprayers



Flushing Procedures

- Make sure back-flow prevention is present and functioning.
- Prepare to flush hot and cold water lines by:
 - Removing aerators from faucets if not already done.
 - Install filters to protect sensitive equipment.
 - Ensure drainage and sewerage can receive maximum flow during flushing.

Flushing Procedures

- Flush should achieve highest velocity possible without damaging lines.
- Open all fixtures for a minimum of 10 minutes.
- Start with cold water systems.
- If the building has more than one floor or multiple loops, flush one loop or floor at a time starting with the first floor.
- Flush all toilets twice.

Flushing Procedures

- Follow industry best practices to disinfect or flush additional water features including:
 - Fountains and other decorative water features.
 - Ice machines should be emptied, followed by 2-3 additional volumes.
 - Equipment with water reservoirs should be drained (sprayers, pressure tanks, water heaters, etc.).

Disinfection

- Building managers may choose to further disinfect the system based on the environmental assessment, water management program, or sampling results.
- Most consultants will suggest using hyperchlorination.
- To hyperchlorinate the system, consultants will inject and circulate chlorine through the system at 50-200 ppm, holding for at least two hours before flushing through each fixture for 20 minutes.

Environmental Sampling

- After speaking with a consultant and looking at the assessment form, it may be determined that a facility is at high risk for *Legionella* species.
- In this case, the facility should sample their water systems.
- Either the facility manager or consultant should contact a CDC ELITE certified lab to run the samples
<https://wwwn.cdc.gov/elite/Public/MemberList.aspx>.
- The lab or consultant will typically provide the bottles and swabs for sampling.

Environmental Sampling

- Use the assessment form and consultant recommendations to identify key areas for sampling along the hot and cold water system.
 - Incoming cold water.
 - Hot water supply.
 - Hot water return (if recirculating).
 - Several cold and hot distal outlets (sinks and showers).
- Collect samples at any additional water features such as cooling towers or decorative fountains.

Environmental Sampling

- For distal outlets collect at least two samples per hot water loop of floor.
- Total samples can vary depending on floor plan shape, square footage, number of risers, etc.
- Follow CDC protocols for sampling, include both swab (or first draw) and flush samples

<https://www.cdc.gov/legionella/downloads/cdc-sampling-procedure.pdf>.



Environmental Sampling

- Request the lab use the ELITE certified ISO culture method.
- Results using the culture method will be provided in 7-14 days depending on the lab.
- Facilities may request PCR results for a two to four day turnaround, but those do not omit dead *Legionella* cells from testing positive.



Source: CDC

Follow-up

- Depending on the results of sampling or other procedures, facility managers may decide to disinfect. Recommended best practice is to sample again 72 hours after disinfection with a second sample set 14 days after that.
- If the facility continues to have *Legionella* detections, it may want to consider installing a long-term disinfection system such as monochloramine or chlorine dioxide.

FAQs

- What do I HAVE to do?
- What is a requirement and what is not?
- What are the risks for stagnation?
- How long are we talking about stagnant water?
- Where my maintenance folks can learn more about this?
- What should I consider sampling for?
- How do I flush my system?
- How do I start developing a water management program if I do not have one?
- What do I need to do to ensure I am serving good water?

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