

# Controlling *Legionella* in Hot Tubs

## Purpose

Use this document to:

1. Help evaluate hazardous conditions associated with all types of hot tubs and whirlpool spas (including display models)
2. Implement *Legionella* control measures for hot tubs per ASHRAE Guideline 12-2020
3. Complement existing resources for water management programs
4. Support environmental assessments conducted during public health investigations

## Key Points

- Hot tubs have been associated with Legionnaires' disease outbreaks.
- All hot tubs—including display models—should be operated with proper disinfectant residuals and pH.
- Public hot tubs should use automatic feed and control systems for disinfectant and pH.

**Sediment and biofilm, temperature, water age, and disinfectant residual are the key factors that affect *Legionella* growth in hot tubs.**

## Design

Hot tubs maintain water temperatures within the most favorable range for *Legionella* growth (77–113°F, 25–45°C), create aerosols, and accelerate the decay of disinfectants. These conditions make the following design recommendations critically important for preventing disease:

- Use automatic feed and control systems to maintain proper disinfectant residual and pH.
- Ensure easy access to all mechanical and filtration components for routine and preventive maintenance and service.
- Ensure the hot tub basin can be easily, quickly, and completely drained and refilled and is suitable for regular scrubbing and cleaning.
- Consider locating indoor hot tubs in rooms with isolated air handlers and dehumidifiers.
- Locate building air-handling system outlets and returns to reduce the potential for transmission of aerosols.
- Post signage warning of increased health risks to individuals who are immune compromised or who have chronic lung disease.



## Operation, Maintenance, and Control Limits

Safe operation and regular hot tub maintenance protect staff, bathers, and bystanders from exposure to *Legionella*. Use a water management program to establish, track, and improve operation and maintenance activities. Operate and maintain hot tubs of all types and sizes with the following guidelines in mind:

- Follow manufacturer recommendations and requirements of the authority having jurisdiction; areas without local regulations can use CDC's *Model Aquatic Health Code* (MAHC).
- Monitor and maintain a chlorine or bromine disinfectant residual and pH according to Table 1.
- Test disinfectant residual and pH at least twice per day (as often as hourly when in heavy use).
- Backwash sand and diatomaceous earth filters routinely per manufacturer recommendations.
- Replace cartridge filters on a regular basis per manufacturer recommendations.
- Ensure steady water flow across the filter 24 hours per day.
- Clearly post the maximum bather load (CDC's MAHC recommends 10 ft<sup>2</sup> per bather) and rules for appropriate use.
- Remove hot tubs from service daily to carry out disinfection with a higher than normal disinfectant residual. For example, a free residual of 10 mg/L or 10 times the combined chlorine level, whichever is greater, for at least one to four hours is commonly used.
- Drain, scrub, clean, and fill hot tubs according to Table 1.
- Ensure all staff involved in hot tub operation and maintenance are trained appropriately.
- Maintain complete operating records for hot tubs and review trends of disinfectant residuals, pH, and maintenance activities.
- Consider testing for *Legionella* in accordance with Routine Testing for *Legionella* (Page F1).

### Private Hot Tubs

- All hot tubs have potential for *Legionella* growth if control measures are not taken.
- Monitor and maintain proper disinfectant residuals and pH, even when not in use.
- Follow manufacturer recommendations for cleaning, filter replacement, and all other maintenance activities.

## Remediation

**If an outbreak or illness is suspected, test in conjunction with public health in order to:**

- Confirm the presence of *Legionella* before performing remediation.
- Confirm *Legionella* elimination after remediation activities.

**If control measures are ineffective or if routine test results indicate poor *Legionella* control, and there are NO illnesses, then consider the following remediation steps:**

1. **Remove** the hot tub from service.
2. **Increase** disinfection by adding disinfectant and maintaining 10 ppm free chlorine for 1 hour.
3. **Drain** the water.
4. **Scrub**, clean, and rinse all hot tub surfaces with fresh potable water and drain as needed.
5. **Clean** and service filters according to manufacturer recommendations.
6. **Refill** with fresh potable water.
7. **Return** the hot tub to the routine disinfectant residual level.
8. **Resume** service once performance indicators are consistent with *Legionella* control and are within control limits.

If an outbreak or illness is suspected by the public health authority having jurisdiction (AHJ), do the following. Note: The public health AHJ determines whether there are associated illness(es) or an outbreak.

1. **Remove** the hot tub from service.
2. **Drain** the hot tub after collection of samples per public health instructions.
3. **Scrub** and clean all surfaces, including skimming devices and weirs, using water with a minimum free chlorine concentration of 5 ppm.
4. **Rinse** all hot tub surfaces with fresh potable water and drain as needed.
5. **Replace** filters or filter media (if applicable).
6. **Repair** parts as needed.
7. **Refill** the hot tub with fresh potable water.
8. **Hyperchlorinate** the water to 20 ppm free chlorine. Circulate hyperchlorinated water with jets off for 1 hour. Circulate hyperchlorinated water with jets on for 9 additional hours. Maintain a minimum free chlorine residual of 20 ppm for a total of 10 hours.
9. **Flush** the entire system with fresh potable water and refill.
10. **Return** the hot tub to the routine disinfectant residual level.
11. **Resume** service in coordination with public health authority.

## Managing *Legionella* Risk in Display Hot Tubs

- A hot tub on display that contains water also requires disinfectant.
- Residual disinfectant (free chlorine: 3–10 ppm, bromine: 4–8 ppm) and pH (7.2–7.8) should be monitored twice a day.<sup>†</sup>
- Maintain complete operating records for display hot tubs, including disinfectant residual levels, pH, and maintenance activities.

**Table 1. *Legionella* Control Measures for Hot Tubs and Whirl Pool Spas**

Water Parameter	Control Measure	Recommendations*
<b>Sediment and Biofilm</b>	Cleaning frequency	<ul style="list-style-type: none"> <li>• Vigorously scrub all surfaces each time tub is drained.</li> </ul>
<b>Temperature</b>	Control limits unlikely met due to operating conditions	<ul style="list-style-type: none"> <li>• Hot tubs operate within the favorable growth range for <i>Legionella</i> (77–113°F, 25–45°C).</li> <li>• Additional measures are required to control <i>Legionella</i>.</li> <li>• Water should not exceed 104°F (40°C) to prevent scalding.</li> </ul>
<b>Water Age</b>	Bather load, frequency of use	<ul style="list-style-type: none"> <li>• Water replacement frequency in days = (Spa volume in gallons/3)/average # users per day.<sup>‡</sup></li> </ul>
<b>Disinfectant Residual<sup>‡</sup></b>	Control limits	<ul style="list-style-type: none"> <li>• pH: 7.2–7.8<sup>†</sup></li> <li>• Free chlorine: 3–10 ppm<sup>†</sup></li> <li>• Bromine: 4–8 ppm<sup>†</sup></li> </ul>

\* See Managing *Legionella* Risk in Display Models section for recommendations for controlling *Legionella* in display hot tubs.

<sup>†</sup> Recommendation based on guidance from CDC’s Model Aquatic Health Code (MAHC), accessible at: <https://www.cdc.gov/mahc/editions/current.html>.

<sup>‡</sup> Cyanuric acid or stabilized chlorine products should not be used in hot tubs as they slow disinfection.

## Resources

- Toolkit for Controlling *Legionella* in Common Sources of Exposure: <https://www.cdc.gov/legionella/wmp/control-toolkit/index.html>
- Toolkit: Developing a Water Management Program to Reduce *Legionella* Growth and Spread in Buildings: <https://www.cdc.gov/legionella/wmp/toolkit/index.html>
- *Legionella* Environmental Assessment Form: <https://www.cdc.gov/legionella/downloads/legionella-environmental-assessment.pdf>
- PreventLD Training: <https://www.cdc.gov/nceh/ehs/elearn/prevent-LD-training.html>
- Display Hot Tub Fact Sheet: <https://www.cdc.gov/nceh/ehs/docs/factsheets/hot-tub-displays-ld-risk-p.pdf>
- Operating Public Hot Tubs Fact Sheet: <https://www.cdc.gov/healthywater/pdf/swimming/resources/operating-public-hot-tubs-factsheet.pdf>
- Model Aquatic Health Code: <https://www.cdc.gov/mahc/>
- ASHRAE Guideline 12-2020: <https://www.ashrae.org/technical-resources/standards-and-guidelines/guidance-on-reducing-the-risk-of-legionella>