

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 ft² 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.[†]
- 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 Whirlpool Spas*

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

* The listed control measures were last updated according to ASHRAE Guideline 12-2020 and CDC’s 2018 MAHC. View the current versions of ASHRAE Guideline 12 and MAHC for the most up-to-date recommendations.

** See Managing *Legionella* Risk in Display Hot Tubs section for recommendations for controlling *Legionella* in display hot tubs.

[†] Recommendation based on guidance from MAHC, accessible at: <https://www.cdc.gov/mahc/editions/current.html>.

[‡] 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>