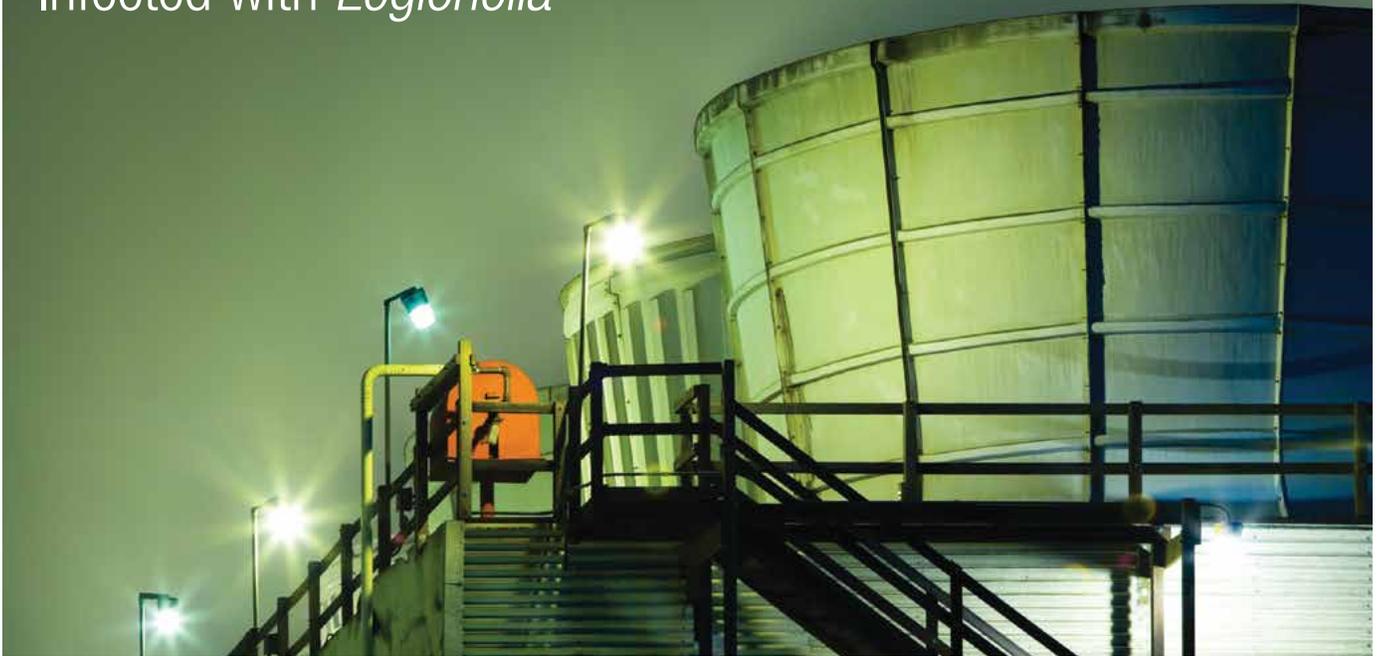


CDC Procedure for Cleaning Towers Infected with *Legionella*



The CDC developed a procedure for cleaning cooling towers and related equipment. The procedure was adapted from the *Emergency Protocol in Control of Legionella spp. in Cooling Towers: Summary Guidelines*.

I. Preparatory to Chemical Disinfection and Mechanical Cleaning

- A. Provide protective equipment to workers who would perform the disinfection, to prevent their exposure to (a) chemicals used for disinfection and (b) aerosolized water containing *Legionella spp.* 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.
- B. Shut off cooling tower.
 1. If possible, shut off heat source.
 2. Shut off fans, if present, on the cooling tower/ evaporative condenser (CT/EC).

3. Shut off the system blowdown (purge) valve. Shut off automated blowdown controller, if present, and set system controller to manual.
4. Keep make-up water valves open.
5. Close building air-intake vents within at least 30 meters of the CT/EC until after the cleaning procedure is complete.
6. Continue operating pumps for water circulation through the CT/EC.

2. Chemical Disinfection

- A. Add fast-release, chlorine-containing disinfectant in pellet, granular, or liquid form, and follow safety instructions on the product label. Examples of disinfectants include sodium hypochlorite (NaOCl) or calcium hypochlorite [$\text{Ca}(\text{OCl})_2$], calculated to achieve initial free residual chlorine (FRC) of 50 mg/L, i.e., 3.0 lbs (1.4 kg) industrial grade NaOCl (12–15% available Cl) per 1,000 gallons of CT/EC water; 10.5 lbs (4.8 kg) domestic grade NaOCl (3–5% available Cl) per 1,000 gallons of CT/EC water; or 0.6 lb (0.3 kg) $\text{Ca}(\text{OCl})_2$

per 1,000 gallons of CT/EC water. If significant biodeposits are present, additional chlorine may be required. If the volume of water in CT/EC is not known, it can be estimated (in gallons) by multiplying the recirculation rate in gallons/minute by 10, or the refrigeration capacity in tons by 30. Other appropriate compounds may be suggested by a water-treatment specialist.

- B. Record the type and quality of all chemicals used for disinfection, the exact time the chemicals are added to the system, and the time and results of measurements of FRC and pH.
- C. Add the dispersant simultaneously with or within 15 minutes of adding the disinfectant. The dispersant is best delivered by first dissolving it in water and adding the solution to a turbulent zone in the water system. Examples of low or non-foaming, silicate-based dispersants include automatic dishwasher compounds (e.g., Cascade*, Calgonite*). Dispersants are added at 10–25 lbs (4.5–11.25 kg) per 1,000 gallons of CT/EC water.
- D. 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 two hours. Add chlorine as needed to maintain FRC at $> \text{ or } = 10 \text{ mg/L}$. Since the biocidal effect of chlorine is reduced at higher pH, adjust pH to 7.5–8.0. The pH may be lowered by using any acid (e.g., muriatic acid or sulfuric acid used for maintaining swimming pools) that is compatible with the treatment chemicals.

- E. Two hours after adding disinfectant and dispersant, or after FRC level is stable at 10 mg/L, monitor at two-hour intervals and maintain FRC at 10 mg/L for 24 hours.
- F. After FRC level has been maintained at 10 mg/L for 24 hours, drain the system. CT/EC water may be safely drained to the sanitary sewer. Municipal water and sewerage authorities should be contacted regarding local regulations. If a sanitary sewer is not available, consult local or state authorities (e.g., Department of Natural Resources) regarding disposal of water. If necessary, the drainoff may be dechlorinated by dissipation or chemical neutralization with sodium bisulfite.
- G. Refill system with water and repeat procedure outlined in steps 2 through 6 in I-B above. ☺

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