

Cooling Tower Maintenance Practices and *Legionella* Prevalence Survey

Allegheny County Health Department

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What are cooling towers?

Cooling towers are large structures that enable energy efficient cooling as part of air conditioning and sometimes large refrigeration systems. These structures can sometimes provide an ideal environment for *Legionella* bacteria to grow and can cause fatal Legionnaires' disease outbreaks.

What is Legionnaires' disease?

Legionnaires' disease, a common form of bacterial pneumonia, is caused by *Legionella* bacteria which live naturally in water and grow under certain conditions in water systems. People become ill by breathing in or choking on water contaminated with *Legionella*.

What is the connection?

Cooling towers produce mist which can be contaminated with *Legionella* and when people breathe in this contaminated mist they can become ill.

Why survey cooling towers in Allegheny County?

Allegheny County experiences high rates of Legionnaires' disease. The source of these cases can be very difficult to pinpoint given the magnitude of possible water exposures. The source of the majority of Allegheny County cases is unknown. Given cooling towers are a known source of Legionnaires' disease, it is important to limit this exposure source in Allegheny County. As an example, a hotel cooling tower in the South Bronx neighborhood of New York City was implicated as the source of a large 2015 LD outbreak which sickened 138 people and killed 16.

Survey Objective

The purpose of the Allegheny County cooling tower survey was to assess cooling tower maintenance and disinfection practices and as well as *Legionella* contamination. ACHD surveyed buildings that house susceptible people like healthcare facilities and senior apartments. City and county-owned buildings were also surveyed.

Results

Only 15% of the 377 buildings surveyed had cooling towers. Of those with cooling towers, 75% agreed to ACHD testing, of these 48% were positive for *Legionella pneumophila*, which is the most common species of *Legionella* to cause Legionnaires' disease. Of those positive, the median concentration was 35 colony forming units/mL (range 10 – 2,000 CFU/mL). The cooling towers surveyed were generally well maintained, but *Legionella* contamination can still occur in well maintained systems. Most towers were cleaned annually (93%), inspected monthly (62%), treated with biocide (98%), and serviced by a water treatment provider (90%). When interpreting these results, it is important to note that not all cooling towers in Allegheny County were surveyed as part of this initiative due to resource constraints. ACHD is not recommending cooling tower regulation at this time.

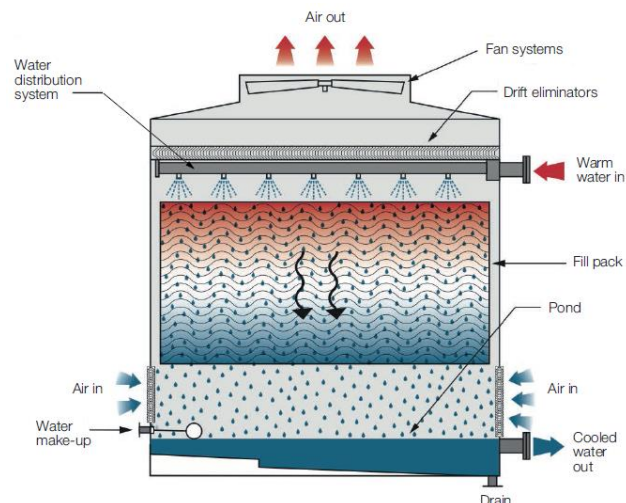


Figure 1. Evaporative Cooling Tower Diagram.
Health and Safety Executive HSG274 Part 1
Published 2013

Key Recommendations for Cooling Tower Maintenance

- A *Legionella* risk management plan should be developed for each cooling tower. This plan should meet the requirements described in ASHRAE Standard 188 and the plan should be followed by the water treatment provider.
- Cooling towers run year round should be cleaned and tested for *Legionella* at least quarterly.
- Cooling towers run seasonally should be cleaned and tested for *Legionella* at least before, during and immediately following the cooling season.
- Basin water should be collected for routine testing.
- The basin or sump tank should be cleaned and drained as part of routine cleaning.
- Older cooling towers should be inspected and cleaned diligently given their potential for *Legionella* contamination.
- If *Legionella* is identified, remediate the cooling tower per instructions developed by the New York State Department of Health (Table 1).

If you have any questions about this survey, please call Lauren Orkis or Dr. Kristen Mertz at ACHD (412-687-ACHD (2243)) for more information.

Table 1. Cooling Tower *Legionella* Remediation Protocol*

Legionella Test Result	Remediation Action
No <i>Legionella</i> detection = < 20 CFU/mL	Maintain treatment program and <i>Legionella</i> monitoring.
≥ 20 CFU /ml but < 1000 CFU/mL	Review biocide treatment program.
	Institute immediate online disinfection.
	Retest** the water in 3 – 7 days.
	Continue testing** every 3 – 7 days until two consecutive readings are improved.
	If retest is ≥ 20 CFU /ml but < 100 CFU/mL repeat online disinfection and retest until < 20 CFU/mL attained.
	If retest is ≥ 100 CFU/mL but < 1000 investigate the treatment program and immediately perform online disinfection. Retest (culture) and repeat control measures until < 20 CFU/mL attained.
	If ≥ 1000 CFU/mL then perform control measures below.
≥ 1000 CFU/mL	Review biocide treatment program.
	Institute immediate online decontamination.
	Retest (culture) the water in 3 – 7 days.
	Continue to retest at the same time interval until one sample retest result is < 20 CFU/mL. With receipt of result < 20 CFU/mL, resume routine maintenance program and plan.
	If retest (culture) is ≥ 20 CFU/mL but < 100 CFU/mL repeat online disinfection and retest until < 20 CFU/mL attained.
	If retest (culture) is ≥ 100 CFU/mL but < 1000 investigate the treatment program and immediately perform online disinfection. Retest (culture) and repeat attempts at control strategy until < 20 CFU/mL attained.
	If retest (culture) is ≥ 1000 CFU/mL perform systemwide decontamination.

* This remediation protocol was developed by the New York State Department of Health in 2015 as part of an amendment of NY State Official Compilation of Codes, Rules and Regulations. These protocols are to be followed by all New York State operators of evaporative cooling towers (identified through registration process).

** Any mention of testing or retesting in the protocol refers to culture methods for *Legionella*

Definitions

CFU = colony forming units

Online disinfection = Dose the cooling tower water system with either a different biocide or a similar biocide at an increased concentration than currently used.

Online decontamination = Dose the recirculation water with a halogen-based compound (either chlorine or bromine) equivalent to at least 5 mg/l (ppm) free residual chlorine for at least one hour.

Systemwide decontamination = Maintain 5 to 10 mg/l (ppm) free residual halogen for a minimum of one hour; drain and flush with disinfected water; clean wetted surface; refill and dose to 1 – 5 mg/l (ppm) of free residual halogen and circulate for 30 minutes. Refill, re-establish treatment and retest for verification of treatment.

For chlorine treatment, pH range should be 7.0 to 7.6.

For bromine treatment, pH range should be 7.0 to 7.8.

At higher pH values the treatment times may need to be extended.