monroe one
EDUCATIONAL SERVICES

Daniel T. White
District Superintendent

Legionella Management Plan for Cooling Tower

A. Purpose

This plan intends to guide Board of Cooperative Educational Services, First Supervisory District of Monroe County of 41 O'Connor Road, Fairport, New York 14450, known as Monroe One BOCES, to organize and maintain compliance with New York State Legionella Law - Part 4 of Title 10: Protection against Legionella as well as ANSI/ASHRAE Standard 188-2015, section 7.2, related to Cooling Towers.

B. Plan and Program Management

Working under the direction of Lisa Ryan - Assistant Superintendent for Finance and Operations, James Hartman - Operations & Maintenance Foreman, Daniel Wyman - Maintenance Mechanic I, Richard Pavone - Maintenance Mechanic I and Barbara P. Carlson - Director of Sustainability, work to safely and properly operate the cooling tower located on the roof of Bldg 9, 10 of 25 O'Connor Rd, Fairport NY 14450. This includes regular reporting through the online HERD system for Cooling Tower Registration and Reporting as required by the New York State Department of Health. Monitoring, testing, inspection and certification is contracted to, hereinafter referenced as Contractor:

Metro Group Inc.
Tracey Crawford, Account Manager
150 Elmgrove Park, Rochester NY 14624
(585) 232-6470, FAX (585) 232-3057
tcrawford@metrogroupinc.com

C. Plan Update

The plan and program management team will update this plan annually, in late spring of each year, in order to specify the contract services needed for the new fiscal year. The Director of Sustainability will initiate that effort. The Director of Sustainability will consult with Dawn Howe, Genesee Valley Educational Partnership Health, Safety, Risk Management Services to guide any updates with regards to new legislation, standards or known risks. This conforms with the law which requires owners to obtain or update their existing cooling tower maintenance program and plan for all operational cooling towers by September 1, 2016, and prior to the startup of any newly installed cooling towers.

D. History of Legionella Concerns

A synopsis of the history of Legionella Concerns from Blue Earth Labs, ASHRAE 188- Legionellosis Risk Management, updated 05 January 2016, https://cdn2.hubspot.net/hubfs/376446/bel-ASHRAE-188-Booklet.pdf:

> The first recognized outbreak of Legionellosis was diagnosed in 1976 in Philadelphia, Pennsylvania, infecting 221 persons and causing 34 deaths. The Center for Disease Control estimates that in the U.S. alone, between 8,000 and 18,000 persons are hospitalized each year due to Legionnaires ' Disease, and that due to underreporting, actual cases may be closer to 100,000. Most cases involve a severe form of pneumonia from Legionella, the bacterium responsible for Legionnaires' disease, which thrives in warm, moist conditions such as human lungs.
>
> Not communicable from person to person, Legionnaires' disease is contracted by breathing in mist or vapor that has been contaminated by Legionella. While Legionella occurs naturally in the environment, particularly in warm water, outbreaks typically are associated with contaminated building water sources such as cooling towers, pools, hot tubs, decorative fountains, and potable water systems. Basically, any water source that can be aerosolized into a mist should be considered a potential source for Legionellosis transmission. Furthermore, because it is a natural occurring bacterium, Legionella is often present in water systems, awaiting the right conditions for reproduction. These conditions can occur in the deposits – the scale and biofilm - that build up in any water system. Particularly in warm weather, these deposits can produce the ideal conditions allowing Legionella to thrive.

E. New York State Legionella Law – Part 4 of Title 10

New York State passed specific legislation regulating and requiring registration of cooling towers in 2015. This plan maintains compliance by requiring and validating annual certification that the Monroe One BOCES cooling tower is inspected, tested, cleaned and disinfected in compliance with New York State Legionella Law - Part 4 of Title 10: Protection against Legionella. Specifically:

1. **§ 4-1.5 Legionella culture analysis** requires all Legionella culture analyses to be performed by a New York State Environmental Laboratory Approval Program (ELAP)

Certified Lab laboratory. Questions on certification for Legionella culture analysis can be sent to elap@health.ny.gov

2. **§ 4-1.6 Notifications** requires that within 24 hours of receipt of a Legionella culture sample result that exceeds 1,000 Colony forming units (CFU) per milliliter the cooling tower:
    a. Monroe One BOCES must notify the local health department, Monroe County Department of Health, who will notify the NYS health Department within 24 hours of receipt of that report.
    b. Monroe One BOCES must notify the public as well as any potentially exposed employees and guardians of students in a manner approved of by the Monroe County Department of Health.
3. **§ 4-1.10 Enforcement**
    a. The NYS Department of Health (NYSDOH) or the Monroe County Department of Health (MCDOH) may require any owner to conduct Legionella culture sampling and analysis, following a determination, based upon epidemiologic data or laboratory testing, that one or more cases of Legionellosis are or may be associated with a cooling tower.
    b. An officer or employee of NYSDOH or MCDOH may enter onto any property to inspect a cooling tower for compliance and may take water samples as part of such inspections.
    c. If an owner does not register, obtain certification, disinfect, perform or obtain culture sampling and analysis, or inspect a cooling tower within the time and manner set forth in the regulations then NYSDOH or MCDOH may take such action and subject the owner to civil and criminal penalties. Further, each day that an owner remains in violation of any provision of New York State Legionella Law - Part 4 of Title 10 will constitute a separate and distinct violation of such provision.
4. **Cooling Towers shut down for five days** or more without treatment are required to be cleaned and disinfected.
5. **Disinfection definition** has been clarified to mean the control of microorganisms or microbial growth. Therefore, cleaning through application of detergents, penetrants, brushes or other tools, high-powered water is not adequate. Disinfection MUST involve the use of a pesticide, and therefore, must be supervised by a person that holds a NY State 7G Commercial Pesticide Applicators License.

F. Risk Overview and Control Measures for Cooling Tower Legionella Contamination

This plan addresses the Legionella risk presented by a specific cooling tower, that operated by Monroe One BOCES located on the roof of 35 O'Connor Road, Fairport, NY. This cooling tower is used seasonally to provide air conditioning by cooling from the evaporation of misting water. The control measures to prevent the growth of bacteria and Legionella intend to conform to ANSI/ASHRAE Standards and are:

6. Testing and monitoring
7. Inspections at 90 day intervals
8. Chemical treatment of the cooling water
9. Cleaning and disinfection schedule for equipment
10. Formalizing start-up and shut-down procedures
11. Water system maintenance documentation including the connected HVAC equipment and bleeding off components
12. Maintenance documentation to address low-flow and stagnant water zones
13. Contingency plan documentation to response to an actionable test result.

G. Risk Overview and Control Measure for Water System Cross Contamination

Cooling tower water loops are required to be separated from makeup water sources by back flow prevention devices; no cross-connection may legally exist between treated or untreated cooling tower water and public or building water supplies. This requirement is to insure the safety of building level and public water supplies. Backflow devices must be installed and maintained between the water supply, makeup connections and the cooling tower water system. These back flow devices will be regularly inspected and properly maintained through the Preventative Maintenance Work Order System.

H. Program Control Measures

14. Cooling Tower System Preventative Maintenance
    a. At Fall shut down in October, Monroe One BOCES O&M Mechanics are assigned, using Que Ware Preventative Maintenance Work Orders, which are maintained on a cloud based database, to drain the cooling tower.
    b. Monthly, while the tower is in operation April through October, the Contractor will inspect the water treatment pumps and the wye strainers and review the tower overall. These reviews are documented on a monthly report and e-mailed to the Director of Sustainability who will post the results on the NYS Department of Health Website, if required.

c. Three times a year, in April, July and October, the tower's distribution section, pan/basin, fill/packing, and drift eliminators shall be inspected by the Contractor. This shall be documented on the RCP Form and e-mailed to the Director of Sustainability who will post the results on the NYS Department of Health Website.
d. At Spring start up in April, Monroe One BOCES O&M Mechanics are assigned, using Que Ware Preventative Maintenance Work Orders, to remove and clean the strainers and to inspect the backflow devices.
e. At Spring start up and again at Fall shut down, the Contractor will perform a cleaning and disinfection. These functions are documented on the invoice and the CTC Certificate and e-mailed to the Director of Sustainability who will post the results on the NYS Department of Health Website.

15. Cooling Tower System Water Treatment
    a. Once a day, the Contractor, through the use of an auto timer pump, a Justeq 07 Feed Timer, injects 1 dose of biocide, Kathon WT 1.5%. Sufficient use of the biocide is monitored through visual inspections and bio culture tests.
    b. Monthly, the Contractor tests, and e-mails results to the Director of Sustainability who will post the results on the NYS Department of Health Website as necessary:
        i. Chlorine in the cooling tower system, seeking to maintain between 1.0 – 4.0 ppm.
        ii. Inhibitor control for scale resistance, seeking to maintain 2.0 – 4.0 ppm Molybdate (Na_2MoO_4) using Vaporene 9200SC with an auto timer pump.
        iii. Conductivity probe calibration for the Pulsafeede auto controller solenoid, seeking +/- 50 µmhos/cm v. hand held meter.
        iv. Check for visible signs of algae, biofilm, or organic matter.
        v. Check if corrosion coupons are installed if needed.
        vi. Check bleed solenoid operation
        vii. Check that chemical drum labels are attached to respective tanks.
        viii. Check chemical inventory and order supplies as necessary.
        ix. Check reagent stock and order as necessary.
        x. Properly document biocides in NYS Pesticide Applicator records, include changes to feed rates/dosages.
    c. Every 90 days, the Control will sample the circulating water and have it cultured and have it CDC-Elite Lab tested for Bio-Culture and Legionella. The results and

certifications will be e-mailed to the Director of Sustainability who will post the results on the NYS Department of Health Website.

I. Documentation

a. The following files will be maintained publically online on the Monroe One BOCES website, Notices & Procedures Directory, https://www.monroe.edu/site/Default.aspx?PageType=1&SiteID=8&ChannelID=1459&DirectoryType=6
b. Cooling Tower Inspection Report
c. Bio Culture Laboratory Report
d. Legionella Culture Laboratory Report
e. Cleaning & Disinfection Certificate
f. Regulatory Compliance Letter

2. The following details will be maintained, in addition to backup copies of those above, on the shared drive O&M-Staff, Health & Safety, Cooling Tower & HVAC Water, Legionella Management Plan S:\Workgroups\O & M-Staff\Health & Safety\Cooling Tower & HVAC Water\Legionella Management Plan
    a. NYS Pesticide Applicator License of Contractor
    b. Contractor's Monthly Service Reports
    c. Contractor's Quarterly Service Reports
    d. Cooling Tower Registration and Reporting to NYS Department of Health, scanned from NYSDOH HERDS website
    e. Preventative Maintenance Logs, see below, scanned at least annually.
3. The preventative maintenance work below will be documented within the online Que Ware, maintained by C&S Companies, http://quecentreweb.monroe.edu/monroe1boces/Login.aspx
    a. Backflow Device Inspections Spring Startup
    b. Strainer Inspections Spring Startup
    c. Cooling Tower Winterizing, Draining at Fall Shutdown

J. Procedure for Cleaning and Decontaminating the Cooling Tower by the Contractor:

1. Purpose: Use both chemical and mechanical methods remove dirt and organic growths, bio-film, and microbiological foulants to prevent or treat the growth and amplification of Legionella.
2. Schedule for Cleaning and Decontaminating the Cooling Tower

a. Spring Startup, normally in April
b. Fall Shutdown, normally at the end of October
c. Any time the cooling tower is taken out of service for any period five (5) days or greater
d. Any time the system has a contaminated biofilm or identified levels of Legionella

3. Products to be used include:
   a. Bio-mass penetrant and an oxidizing cleaner such as VAPORENE 8204 coupled with DICHLOR 56 or TOWERCHLOR.
   b. If Legionella has been identified, then site-generated chlorine dioxide @ a minimum of 5 ppm together with other products may be added to the procedure. The Contractor's preferred approach is to strip or remove biofilm with site-generated chlorine dioxide. Where this is not possible or practical, the Contractor will use a double chlorination approach, preceded by VAPORENE 8204.
   c. This work must be supervised by a person with a NYS Certified Pesticide Applicator, Category 7G working under and listed on the Contractor's NYS Business/Agency Registration.
4. If a Legionnaire's outbreak occurs, then abatement must include decontamination by removal of biofilm, followed by disinfection with chlorine, and subsequent maintenance of a sustained reserve of 5 to 10 ppm of Free Available Chlorine.
5. Safety Considerations:
   a. <u>All cooling tower cleaning work requires a minimum of two people.</u>
   b. To prevent exposure during cleaning and maintenance, proper personal protective equipment must be worn. If a Legionnaire's Outbreak is suspected, a Tyvek-type suit with a hood, protective gloves, and a properly fitted respirator with a HEPA filter should be employed.
   c. Before initiating the project a site survey should be made to evaluate the project's site-specific Safety Requirements. The survey should include but not be limited to "Locking Out" system components, positioning of ladders, need for harnesses, or Confined Space issues.
   d. Not less than 24 hours before the Contractor begins, to protect those doing the cleaning and disinfecting, Monroe One BOCES Maintenance Mechanics will:
      i. Isolate all adjacent make-up air units from the cooling tower's air space.
      ii. Drain and refill the cooling tower water system
      iii. Lock out/tag out the cooling tower fans.
   e. The Contractor is responsible to check that the safety considerations have been completed prior to starting work.
6. On the day of the physical cleaning, Monroe One BOCES Maintenance Mechanics will shut-down refrigeration, compressors and other equipment and stay on site to orient the contractor's personnel.
7. The Contractor's cleaning and disinfection procedure will then start:

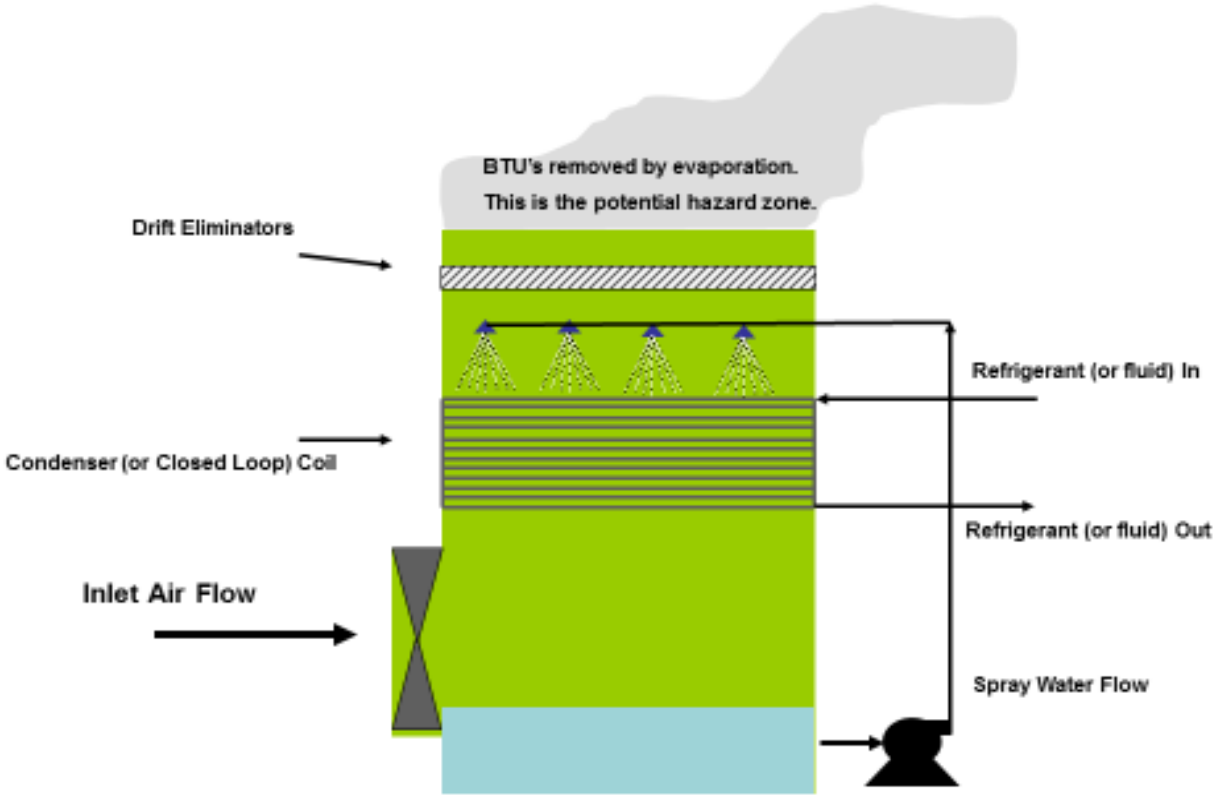
i. If suspended matter is high, pre-bleed the cooling system to reduce the dirt loading.
ii. If pH is higher than 7.6, use either pre-bleed to reduce the pH value, or an acid based product such as VAPORENE 9550, using the following dosage chart.
iii. While the cooling tower water is circulating:
    - Dose the cooling tower water with VAPORENE 8204 at 1 quart per 1,000 gallons system volume, or
    - Inject site-generated chlorine dioxide to establish a measured reserve of at least 5 ppm
iv. Once a suitable product reserve has been established throughout the system, add DICHLOR 56 according to the following dosage chart while circulating to achieve 5 to 10 ppm free residual chlorine. Test to confirm.
v. Circulate solution for two to four hours. Test periodically to confirm a reserve of 5 to 10 ppm free residual chlorine and pH value < 7.6. Adjust chemistry as needed to ensure these levels are sustained.
vi. Use an anti-foaming agent such as VAPORENE DC50 for foam control.
vii. Stop circulation to physically clean the wetted surface to remove all dirt and debris that may be accumulated. This includes cleaning of cooling tower internals/externals, slats and structure, pan, deck and other wetted components using a power washer, hoses and other tools such as squeegees.
viii. Drain and flush the system with a chlorinated water supply until no dirt or bio-film is visible. Refill with fresh water by complete volume turnover until all system water until the makeup water has stabilized.
ix. Dose with DICHLOR 56 again to achieve 1 to 5 ppm of free residual chlorine. Test to confirm chlorine reserves and pH value < 7.6.
x. Dose the system with normal water treatment inhibitors, such as VAPORENE 9402 at 1 – 2 pints per 1000 gallons, and activate treatment program including the primary halogen-based biocide.
xi. Return tower to normal service and retest water supply for verification of treatment.
xii. Obtain a water sample for certified Legionella analysis, no earlier than 3 days and less than 7 days after project completion. Obtain another sample in approximately 10 days, or shortly after the initial result is returned.
xiii. Issue a Certificate of Cleaning and Disinfection along with copies of post disinfection Legionella Test results.

K. Post Cleaning & Disinfection Work by Monroe One BOCES Maintenance Mechanics:

1. Remove and clean cooling water strainers.
2. Check and spray down distribution manifolds and trees/nozzles to complete the removal of any suspended matter.

3. After the Contractor has added start-up chemical treatments, re-establish circulation.
4. Evaluate make-up assembly, bleed line, distribution decks, and nozzles or spray trees.
5. Inspect tower components for correct operation evaluating make-up and float assembly, bleed line, distribution decks, and nozzles or spray trees.

L. Cooling Tower Flow Diagram



M. Reference for Chemical Dosing used by Contractor for a 15 ton capacity Cooling Tower:

1. If the pH is between 7.6 and 8.5, then Vaporene 9550 should be added at the rate of 2.5 oz. but if the pH is between 8.6 and 9.5 then the dosage should be 3.6 oz.
2. To achieve 5-10 ppm chlorine using Dichlor 56 or Towerchlor, use 0.075 lbs.
3. Other products that may be used are 8204 at the dose of 4.5 oz.; DC50 dosed at 0.6 oz., 9402sc or 9200sc dosed at ½ pint, and JUSTEQ dosed at 0.3 oz.