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Preventive Maintenance Program and Plan
for
Cooling Towers

REVISION

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1	DCN1359	Initial Release	11-28-16	L. DiCostanzo	S. Heyborne

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1 PURPOSE AND SCOPE

The purpose is to define a preventive maintenance program and plan for cooling towers at the SUNY Polytechnic Quad C Building Utica New York. The program is designed to:

- 1.1 Ensure efficient equipment/system operation.
- 1.2 Maximize equipment life span.
- 1.3 Ensure cooling tower operation complies with NYS DOH Legionella Regulations.

2 RESPONSIBILITIES

2.1 HVAC Supervisor

Supervise HVAC Technicians and Water Treatment Contractor in the implementation of the water treatment program.

2.2 HVAC Water Treatment Technicians

Perform preventive maintenance tasks. Assist water treatment contractor in implementing water treatment program. Document, archive and distribute water treatment data, testing, inspections, certifications deficiencies, corrective actions, etc.

2.3 Water Treatment Contractor

Perform work as per the requirements of the water treatment service agreement related to cooling towers including, but not limited to: inspections, certification, water treatment adjustments, cleaning, Legionella and bacteriological testing, recommendations for improved operation and NYS DOH compliance.

2.4 System Owners

Provide oversight and input of the water treatment program of various systems to assure efficient operation and maximum life span of equipment.

2.5 SUNY Poly CNSE Environmental Health and Safety Department

Submit routine reporting to the NYS DOH. Make equipment status (in/out of service) notifications to NYS DOH. Make emergency notification to the NYS DOH.

3 ASSOCIATED DOCUMENTS

- 3.1 Water treatment logs.
- 3.2 Records of Legionella and bacteriological testing.
- 3.3 Records of cooling tower inspection.
- 3.4 Records of cooling tower certification.

4 EQUIPMENT

- 4.1 A list of current cooling tower equipment is located in the FOG Archive.

5 SAFETY

- 5.1 Reference the EHS Safety website:

<http://www.sunycnse.com/WorldClassResources/ContractorFormsTraining/EHSProceduresForms.aspx>

- 5.2 See SDS (a.k.a MSDS) information on water treatment located in the FOG Archive.

6 PROCEDURE

6.1 Equipment Siting

New equipment designs or modifications are reviewed by FEI (Facilities Engineering and Infrastructure) to ensure system designers have addressed the following:

- a. Potential contamination from building systems or facility processes to be drawn into the equipment
- b. Potential for equipment to discharge into occupied spaces, trafficable areas, pedestrian thoroughfares, outdoor air intakes, and building openings
- c. Potential for equipment siting that inhibits access to the equipment for the required maintenance and inspection consistent with the manufacturer's instructions and guide-lines

6.2 New-System Start-Up

FEI to ensure new system Designers and Construction Managers coordinate system start-up and cleaning with water treatment system start-up to ensure continuous treatment. All new equipment should be added to ongoing treatment schedules once commissioned.

6.3 **System Maintenance**

- a. Weekly inspection of cooling towers for:
 - General system cleanliness,
 - Drift eliminator condition,
 - Fill material condition,
 - Water distribution system operation,
 - No written record required.
- b. Monthly inspections for:
 - Cleanliness of basins and low flow zones.
 - Cleaning to be performed, as required.
 - Documentation kept for monthly inspections.

6.4 **Water Treatment**

- a. The equipment and chemicals used for treating open recirculating systems are as listed in Appendix A.
- b. Minimum schedule requirements as follows:
 - Annual certifications by Water Treatment Professional,
 - Quarterly sampling for Legionella by Water Treatment Professional tested at a certified ELAP Lab,
 - Quarterly inspections by Water Treatment Professional,
 - Monthly inspection by Facilities maintenance staff,
 - Monthly sampling and testing for microbiological activity by the Water Treatment Professional,
 - Weekly maintenance checks and monitoring by Facilities maintenance staff.
 - Corrective actions shall be based on the type of deficiency found.

- c. System water treatment is documented with 'annual certification', 'quarterly inspections with Legionella sampling results', 'monthly sampling for microbiological activity'.

6.5 Shutdown and Start-Up

- a. For shutdown of a system, perform an online disinfection via hyper-halogenation (5ppm free halogen residual for at least 6 hours). Following the completion of this service perform a complete physical cleaning of the towers once annually. Such cleaning shall consist of power washing all surfaces including fill material and all tower surfaces including basin and sump.
- b. For start-up from a drained system and undrained (stagnant) system, perform a physical cleaning of the sump and basin area of the towers. Following cleaning perform an online disinfection via hyper-halogenation (5ppm free halogen residual for at least 6 hours).

6.6 Disinfection of Cooling Towers and Evaporative Condensers

- a. A **remedial disinfection** will be performed when microbiological activity Legionella count levels are above action threshold.

The Water Treatment Technician under the supervision of the Water Treatment Professional will be responsible for initiating a remedial disinfection.

A remedial disinfection will be performed by a routine online disinfection hyper-halogenation (5ppm free halogen residual for at least 6 hours).

- b. **Emergency disinfection** will be performed when Legionella action levels exceed >1,000 CFU/ml.

The Water Treatment Technician under the supervision of the Water Treatment Professional will be responsible for initiating an emergency disinfection.

Emergency Disinfection Procedure:

1. Remove heat load from the cooling system, if possible.
2. Shut off fans associated with the cooling equipment.
3. Shut off the system blowdown. Keep makeup water valves open and operating.

4. Close building air intake vents in the vicinity of the cooling tower (especially those downwind) until after the cleaning procedure is complete.
5. Continue to operate the recirculating water pumps.
6. Add a biocide sufficient to achieve 25 to 50 ppm of free residual halogen.
7. Add an appropriate bio-dispersant (and antifoam, if needed).
8. Maintain 10 ppm free residual halogen for 24 hours. Add more biocide, as needed, to maintain the 10 ppm residual.
9. Monitor the system pH. Since the rate of halogen-disinfection slows at higher pH values, acid may be added, and/or cycles reduced in order to achieve and maintain a pH of less than 8.0 (for chlorine based biocides) or 8.5 (for bromine-based biocides).
10. Drain the system to a sanitary sewer. If the unit discharges to a surface water source under a permit, dehalogenation will be needed.
11. Refill the system and repeat steps #1 through 10.
12. Inspect after the second drain-off. If a biofilm is evident, repeat the procedure.
13. When no biofilm is obvious, mechanically clean the tower fill, tower supports, cell partitions, and sump. Workers engaged in tower cleaning should wear (as a minimum) eye protection and a ½ face respirator with High Efficiency Particulate (HEPA) filters, or other filter capable of removing >1micron particles.
14. Refill and recharge the system to achieve a 10 ppm free halogen residual. Hold this residual for one hour and then drain the system until free of turbidity.
15. Refill the system and charge with appropriate corrosion and deposit control chemicals, reestablish normal biocontrol residuals and put the cooling tower back into service.

6.7 Location of Cooling Tower Makeup Valve

All cooling tower equipment is fed by Industrial City Water. These systems are segregated from City Water (potable water) by means of backflow

prevention devices. Backflow prevention devices are certified on an annual basis.

6.8 **Contingency Response Plan**

If any known or suspected cases of Legionellosis are identified, notify NYS DOH via SUNY Poly CNSE EHS and implement emergency disinfection procedure.

- a. Follow direction issued by any national, regional or local health department authorities with guidance from SUNY Poly CNSE EHS and the Water Treatment Professional.
- b. If testing for Legionella or other pathogens is determined to be necessary; testing shall be performed as soon as practical, via drain port by the water treatment controller or from the tower basin. Samples shall be tested for general bacteria counts and cultured for Legionella by an ELAP certified laboratory. Interpretation of the results shall be as per NYS DOH Appendix 4-A.
- c. Emergency Disinfection Procedure: Please refer to Section 6.6.b.
- d. Recommendations from agencies, authorities with guidance of SUNY Poly CNSE EHS and the Water Treatment Professional will be followed to prevent exposure to contaminated water.

7 RECORDS

- 7.1 The HVAC Water Treatment Technician performing or overseeing work activities shall be responsible to collect all records and provide them to the Records Coordinator.
- 7.2 Records shall include copies of all inspection findings, deficiencies, corrective actions, cleaning and disinfection, and tests performed.
- 7.3 The Record Coordinator shall place records on the 'V' drive. Records shall be kept for a minimum of three (3) years per NYS regulation.
- 7.4 In addition, a copy of the maintenance program and plan will be kept on the premises where a cooling tower is located.

8 APPENDICES

Appendix A - Cooling Tower Water Treatment Equipment & Chemical List

Appendix B - Interpretation of Legionella Culture Results from Cooling Towers

APPENDIX A - Cooling Tower Water Treatment Equipment & Chemical List

System	Water Treatment Controller	Chemical Pump/ Chemical feed	Chemical	Use	Container Size	Tank Size
Condenser water	LUMITRAC Model XS	No Pump Slug Fed	Formula 3091	Biocide	5 gal container	No tank Slug Fed
Condenser water	LUMITRAC Model XS	Walchem Model LB64	Formula 315	Biocide	30 gal barrel	62 gal Double Containment
Condenser water	LUMITRAC Model XS	Walchem Model LB64	Formula 3338	Biocide	30 gal barrel	62 gal Double Containment
Condenser water	LUMITRAC Model XS	Walchem Model LB64	Formula 2002 - LT	Inhibitor	55 gal barrel	62 gal Double Containment
Condenser water	Spectrum	No Pump Slug Fed	Formula 5100	Multiphase Corrosion Inhibitor	5 gal container	No Tank Slug Fed
Chilled water closed system	Spectrum	No Pump Pot Feeder Fed	Formula 12-L	Corrosion Inhibitor	5 gal container	No Tank Pot Feeder Fed

Appendix B - Interpretation of Legionella Culture Results from Cooling Towers

Interpretation of <i>Legionella</i> Culture Results from Cooling Towers	
<i>Legionella</i> Test Results in CFU/mL ¹	Response
No detection (< 20 CFU/mL)	Maintain treatment program and <i>Legionella</i> monitoring in accordance with the maintenance program and plan.
For levels at ≥ 20 CFU/mL but < 1000 CFU/mL perform the following:	<ul style="list-style-type: none"> ○ Review treatment program. ○ Institute immediate <i>online disinfection²</i> to help with control ○ Retest the water in 3 – 7 days. <ul style="list-style-type: none"> ▪ 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 is ≥ 20 CFU/mL but < 100 CFU/mL, repeat <i>online disinfection²</i> and retest until < 20 CFU/mL attained. ▪ If retest is ≥ 100 CFU/mL but < 1000 CFU/mL, further investigate the water treatment program and immediately perform <i>online disinfection²</i>. Retest and repeat attempts at control strategy until < 20 CFU/mL attained. ○ If retest is ≥ 1000 CFU/mL, undertake control strategy as noted below.

For levels ≥ 1000 CFU/mL perform the following:

- Review the treatment program and provide appropriate notifications per Section 4-1.6 of this Subpart.
- Institute immediate online decontamination³ to help with control
- Retest 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 any retest is ≥ 20 CFU/mL but < 100 CFU/mL, repeat online disinfection² and retest until < 20 CFU/mL attained.
 - If any retest is ≥ 100 CFU/mL but < 1000 CFU/mL, further investigate the water treatment program and immediately perform online disinfection.² Re-test and repeat attempts at control strategy until < 20 CFU/mL attained.
 - If any retest is ≥ 1000 CFU/mL:
 - ❖ carry out system decontamination⁴.

- ¹ Colony forming units per milliliter.
- ² Online disinfection means – Dose the cooling tower water system with either a different biocide or a similar biocide at an increased concentration than currently used.
- ³ Online decontamination means – Dose the recirculation water with a halogen-based compound (chlorine or bromine) equivalent to at least 5 milligrams per liter (mg/L) or parts per million (ppm) free residual halogen for at least one hour.
- ⁴ System decontamination means – Maintain between 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 the pH range should be 7.0 to 7.6; for bromine treatment the pH range should be 7.0 to 8.7. At higher pH values the treatment times may need to be extended.

NOTE: Stabilized halogen products should not be used for online decontamination or system decontamination as defined in this Appendix per footnotes 3 and 4.