NBCC Legionella Preventative Maintenance in Cooling Towers

The following document provides the process for Legionella testing at NBCC per *Public Works and Government Services, MD 15161-2003 Control of Legionella in Mechanical Systems*

DEFINITIONS

Definition	
CFU	Colony Forming units
Culture Test	*Legionella* bacterial culture test in accordance with ISO 11731
GE/mL	Genome equivalents per milliliter
LBCMP	Legionella Bacteria Control Management Program
LP_{TOT}	*Legionella pneumophila* including all serogroups
O&M	Operation and Maintenance
qPCR Test	Quantitative PCR Test: reporting units are GE/mL
TBC	Total bacteria count

1.0 PURPOSE and SCOPE

Cooling towers present a significant risk for exposure to *Legionella* as they allow favorable conditions for the growth of *Legionella* bacteria. Plumes arising from cooling towers also pose a significant risk for transmission of *Legionella* bacteria. The risks should be minimized with proper design, start-up and commissioning, maintenance, and testing, as indicated in the following sections.

2.0 Operation and Maintenance

Inspection

Weekly inspection of cooling towers shall include as a minimum:

- Visual inspection under normal operating conditions, for signs of microbial growth, algae, water leaks, splashing, blockages, and restrictions at air inlets.
- Inspection of water treatment equipment for correct operation and adequate stock of chemicals.

Refer to Appendix B – Weekly Test Log Sheet

Monthly inspection of cooling towers shall include as a minimum:

- The requirements of the cooling tower weekly inspection.
- Examination of water flow through the tower for normal unrestricted flow.
- Examination of drift eliminators internally and externally for damage and for excessive drift.
- With system power off, examination of the internal structure of the tower for the condition of the plant and equipment. Report any deterioration of materials, particularly the fill, drift eliminators, basin, and water distribution system.
- Test for free chlorine or other biocide levels.

Yearly inspection of cooling towers shall include as a minimum:

- The requirements of the cooling tower monthly inspection.
- A more detailed inspection of all system components and a detailed assessment by a water treatment specialist for indications of corrosion, biofilms, or deposits

Cleaning

Cooling towers shall be maintained in a clean working condition whenever the equipment is in use.

Start-up and annual cleaning of cooling towers shall include as a minimum:

- Use additives to aid in cleaning, including detergents and anti-foaming agents.
- Circulate the water for at least one hour throughout the system to provide coarse cleaning of the wetted surfaces.
- Switch off equipment and drain to waste in a manner approved by the local water authority.
- Thoroughly clean the internal shell, fill, and sump off the cooling tower, moving or flushing away all debris.
- Refill with clean water.
- Dose with free chlorine or other biocide at recommended levels and circulate for one hour.
- Clean all filters, strainers, water nozzles, and fittings.
- Refill with clean water and treat again as required.

Disinfection

Disinfection shall be carried out at system start-up and when required by bacterial testing results.

Shock chlorination is one acceptable method for disinfection of cooling towers.

The disinfection procedure using shock chlorination for cooling towers shall be as follows:

- Ensure that the tower has been cleaned according to the cleaning procedure.
- Turn OFF the cooling tower fan during shock chlorination.
- Shock chlorinate the whole system including the cooling-tower distribution basin and fill with the circulating pump(s) in operation.
- During shock chlorination, maintain pH at less than 7.
- Maintain free chlorine residual of at least 5 ppm for at least 6 hours, or alternatively, a residual of 15 ppm for at least 2 hours.
- This shall be followed by continuous, automatically controlled feed of suitable water treatment chemicals with scale and rust inhibitors.
- Use an effective biocide program for microbiological control, complying with all federal, provincial/territorial, or municipal requirements.

Refer to Appendix A - Cooling Tower Bacterial Test Protocol Normal Mode

Water Treatment Plan

The water treatment plan for control of microbiological activity including *Legionella*, scale, and corrosion shall be site specific and will be set up by supplier or water treatment specialist per their recommendations.

3.0 System Risk Assessment

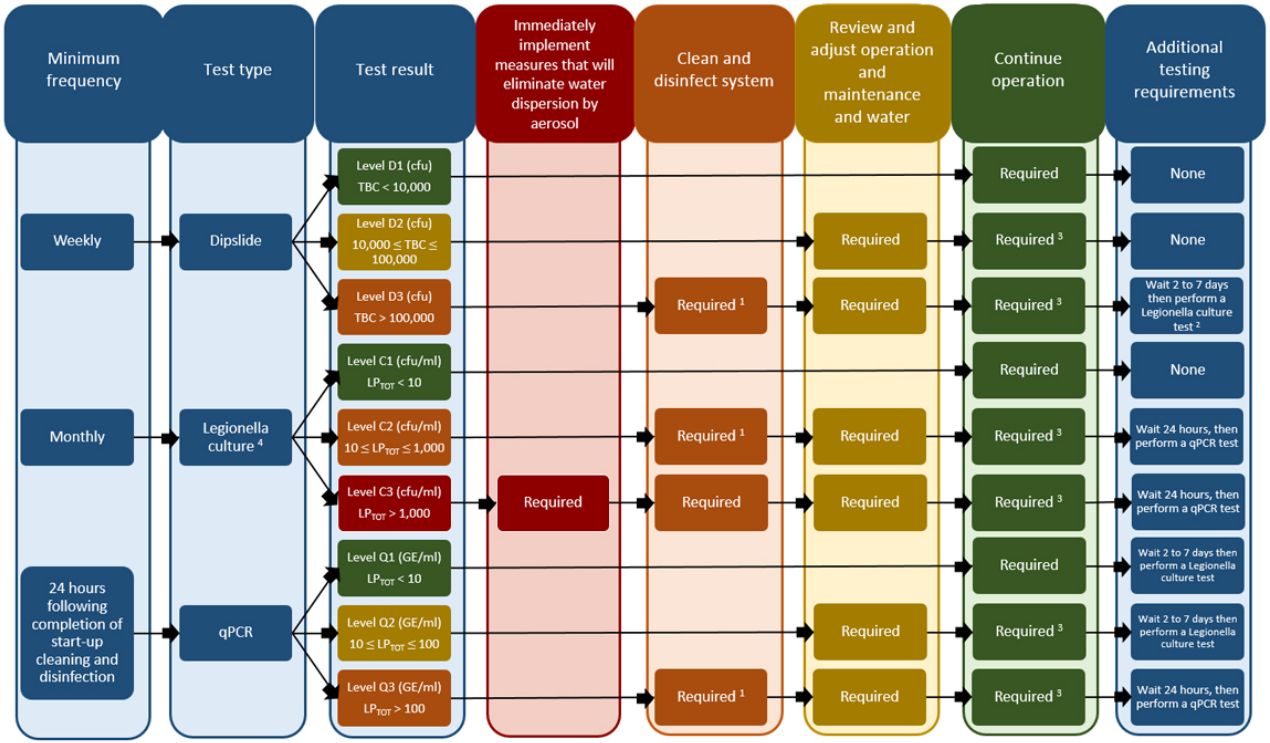
The system Legionella risk level shall be identified as low, medium, or high based on the presence of Legionella hazard characteristics specific to that type of system. The table below provides NBCC's Cooling Tower Risk Assessment.

Cooling Towers

	Risk Level	Fredericton	Miramichi	Woodstock	Moncton
No Evaporative Condenser	Low	NO	NO	NO	NO
Located more than 10m from air intake	Low	YES	YES	YES	YES
Located less than 10m from air intake	High	NO	NO	NO	NO
Excessive drift from tower exhaust	High	NO	NO	NO	NO
Water temperature always below 20°C at any point in the system	Low	YES	YES	YES	YES
Water temperature in 20-35°C range at any point in the system	Medium	YES	YES	NO	YES
Water temperature exceeds 35°C at any point in the system	High	NO	NO	NO	NO
Located within 10m of the kitchens exhaust, vegetation, etc.	High	NO	NO	NO	NO
Recent history of elevated bacteria levels		NO	NO	NO	NO
Risk Level		**Medium**	**Medium**	**Low**	**Medium**

Appendix A:

Cooling Tower Bacterial Test Protocol Normal Mode



Notes:

1. Clean and disinfect system within 7 days.
    1. **Option 1:** Shutdown within 48 hours to perform the cleaning and disinfection procedure.
    2. **Option 2:** Perform a running disinfection within 48 hours. Shutdown within 7 days to perform cleaning and disinfection procedure.
2. Perform additional culture testing if condenser water temperature is above 18 °C. If condenser water temperature is less than or equal to 18 °C, then no additional culture testing is required.
3. With adjusted O&M and water treatment program.
4. Refer to MD 15161 clause 3.5.14 when there is interfering flora in the test result.

Appendix B:

NBCC						
WEEKLY TEST LOG SHEET						
		Bacteria Dip slide Test	Controller Conductivity	Pump #1	Pump #2	Pump #3
Day	Time	Result				