



# COOLING TOWER MAINTENANCE PROGRAM AND PLAN

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Name of Facility \_\_\_\_\_

Total number of cooling towers: \_\_\_\_\_

NYC Department of Buildings (DOB) Registration Number(s):

\_\_\_\_\_  
\_\_\_\_\_

Check one - <input type="checkbox"/> Plan Follows MPP Model <input type="checkbox"/> Model was Modified	
Plan Preparer's Name (First and last)	
Plan Preparer's Address	
Plan Preparer's Phone Number	
Date completed (MM/YYYY)	

# MAINTENANCE PROGRAM AND PLAN SIGN-OFF

## OWNER

\_\_\_\_\_

Print Name (First and Last) as noted on the DOB's cooling tower registration profile

Building Identification Number  
(BIN #)

Facility Address

Owner's Contact Address

Telephone

Email Address(es)

## PLAN PREPARER

\_\_\_\_\_

Print Name (First and Last)

Certification, Licensure or  
Experience

Company

Address

Telephone

Email Address(es)

Signature attestation statement: The attached information is correct and complete to the best of my knowledge and represents integrated cooling tower management including appropriate water treatment, equipment operation and maintenance, and monitoring procedures. It will be implemented as required by the New York City Health Code ***Title 24, Chapter 8 (Cooling Towers) of the Rules of the City of New York***, as well as other applicable rules and regulations.

Plan Preparer/Lead Author \_\_\_\_\_ DATE \_\_\_\_\_  
Signature of plan preparer

Owner \_\_\_\_\_ DATE \_\_\_\_\_  
Signature of owner

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## OVERVIEW

### Cooling Tower Requirements

In August 2015, New York City and New York State created new requirements for owners of buildings with cooling towers.

The City's requirements became Local Law 77 of 2015. Local Law 77 required registration, inspection, cleaning, disinfection and testing of all New York City cooling towers. Local Law 77 also required that building owners annually certify that they were in compliance with the law. The standards for these new requirements were specified in the subsequent New York City Health Code, Title 24, Chapter 8, developed by the New York City Department of Health and Mental Hygiene (DOHMH). Chapter 8 of the Health Code also describes mandatory maintenance and other long-term management procedures. Besides DOHMH, the New York City Department of Buildings (NYCDOB) is also involved in the City's requirements; for example, building owners submit cooling tower registrations to NYCDOB. They also certify that they are complying with Local Law 77 with NYCDOB annually.

The State's requirements derive from its emergency regulations. Those regulations cover the topics within Local Law 77, along with cooling tower maintenance.

### How to Use This Document

This model document is intended for building owners with one or more cooling towers. The owner of a facility with one or more cooling towers must develop, implement and update as necessary, a written **Maintenance Program and Plan (MPP)** for each cooling tower(s).

This document describes all the major elements of a MPP. The MPP preparer is expected to modify this model to develop a comprehensive individual MPP for each facility. The MPP document should reflect exceptional conditions or circumstances where they exist.

Use and modify this electronic document according to the specifications of each unique facility.

1. Complete the required fields.
2. **Follow the instructions noted in red to enter your specific information.**
3. Use "N/A" if an item is not applicable and describe the reason. The MPP preparer must also state that the MPP will be revised if this changes.
4. Append flow plans or schematics of the cooling system and individual cooling tower operations. Additional information, sheets, plans, diagram, etc. as deemed necessary.

### Who Must Prepare the MPP

The MPP preparer must be a qualified person, such as a licensed professional engineer, a certified industrial hygienist or a certified water technologist with training and experience developing management plans in accordance with current standard industry protocols including ANSI/ASHRAE 188-2015.

Alternatively, the MPP may be developed by a general environmental consultant not possessing the above listed certifications or licensure provided he/she possesses at least 2 years of operational experience in water management planning and operation.

### **Requirements of the MPP**

In addition to ANSI/ASHRAE Standard 188-2015 or successor standard, the MPP must meet the requirements of Chapter 8 Section §8-03. This includes the procedures to be followed at the facility by the management and maintenance team in order to protect the public's health and safety, consisting of

- assessment of risk management
- procedures for implementing control measures and routine maintenance
- specific detailed seasonal or temporary shutdown and start-up procedures
- notification and communication strategies among team members regarding the required corrective actions.

The owner is responsible for full implementation while any cooling tower is operating. Registrants must periodically update the MPP whenever a change occurs in the facility. The MPP must be maintained onsite or nearby as a tool and guide for members of the management and maintenance team. The owner and plan preparer must sign and date the MPP.

### **Inspection Requirements**

Registrants must maintain the MPP onsite, or in an adjacent location on the same campus, complex or lot. It must be made immediately accessible for use and inspection by DOHMH, Department of Buildings (DOB) and other oversight agencies at all times (*Section §8-03*).

Registrants must have these elements ready before the start of the inspection:

- 1) Documents indicating proof of compliance.
- 2) Records of any maintenance, inspection, deficiency, corrective action, water treatment, test result, cleaning or disinfection performed on the cooling tower(s) in the previous 3 years.

### **Resources**

For more information, questions or comments, contact:

New York City Department of Health and Mental Hygiene  
Office of Building Water Supply Oversight  
42-09 28 Street, 14<sup>th</sup> Floor, CN 56  
Long Island City, NY 11101  
Telephone: (347) 396-6001  
Fax: (347) 396-6089  
Email: [CTcompliance@health.nyc.gov](mailto:CTcompliance@health.nyc.gov)

## **MANAGEMENT AND MAINTENANCE TEAM**

Individuals who are legally and practically responsible for the continued effective and safe operation of a cooling tower.

### **RESPONSIBLE PERSON (DAILY OVERSIGHT)**

\_\_\_\_\_  
Print Name (First and Last)

Company

\_\_\_\_\_  
(note if building staff)

Address

Telephone

Email

### **BACKUP TO THE RESPONSIBLE PERSON**

\_\_\_\_\_  
Print Name (First and Last) IF APPLICABLE

Company

Address

Telephone

Email

### **QUALIFIED PERSON (INSPECTION/GUIDANCE)**

\_\_\_\_\_  
Print Name (First and Last)

Qualifications

Company

Address

Telephone

Email

### **CLEANING/CHEMICAL APPLICATION PERSON**

\_\_\_\_\_  
Print Name (First and Last)

Qualifications

\_\_\_\_\_  
(such as NYS DEC applicator # for person or their supervisor if applicator apprentice)

Company

Address

Telephone

Email

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**OTHER  
(ENVIRONMENTAL  
CONSULTANT, ETC.)**

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Print Name (First and Last)

Role

Company

Address

Telephone

Email

## 1.1 Staff Responsibilities

*Requirement: Title 24, Chapters §8-03 and §8-04*

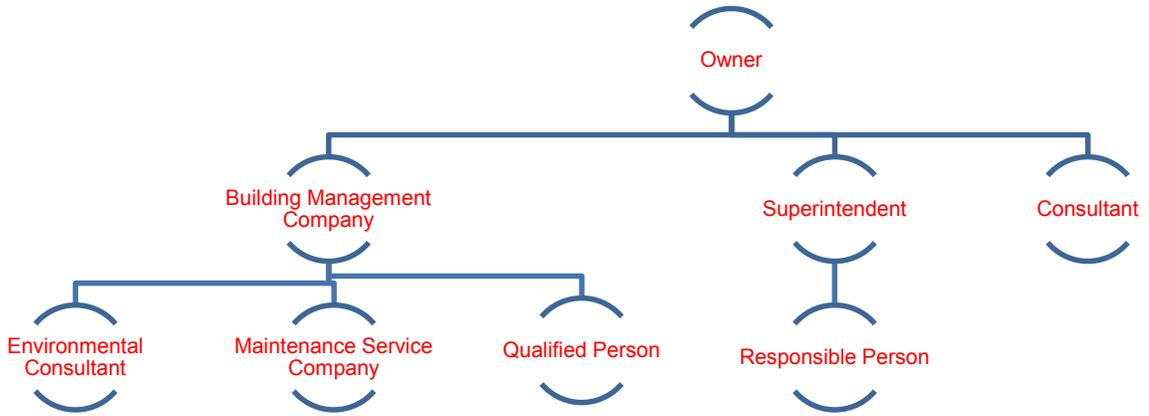
Provide a description of the persons responsible for various aspects of the cooling tower system's management in the following table. This table does not include the owner, responsible for compliance and who commissions the plan preparer.

Title	Staff Responsibilities
Building Management Company	Such as manages building administration and operations
Responsible Person (as defined under §8-02)	Such as performs duties as outlined in §8-04(a), including filling out Appendix C Water Quality Parameter Log and Routine Monitoring Checklist
Qualified Person (as defined under §8-02)	Such as performs inspections as outlined in §8-04(a) and Appendix C Compliance Inspection Checklist, as well as emergency/other inspections as needed
Cleaning/Chemical Application Person Service Provider	Such as performs at least twice per year cleaning and oversees application of daily or other approved chemical treatment procedures
Environmental Consultant/Other	Such as executes other plan components or tasks as needed

## 1.2 Notification and Communication for Corrective Actions

*Requirement: Title 24, Chapter §8-04(d)(3)*

Describe the notification and communication strategies for implementing corrective actions in the table below, which can be modeled according to the example chain of command schematic given below (please insert/attach your chain of command in Appendix D).



A list of conditions requiring corrective action	Description of Notification Procedure and Corrective Actions
Routine System and Water Quality Monitoring: detection of anomaly in cooling tower condition and process as described in §8-04(a)	Concurrent with arranging procedures to fulfill Section 3.1 ( <i>Routine System Monitoring</i> ), describe notification strategies for routine system and water quality monitoring corrective actions, including chain of command
Compliance Inspections: detection of presence of conditions as described in §8-04(b)	Concurrent with arranging procedures to fulfill Section 3.2 ( <i>Compliance Inspection</i> ), describe notification strategies for compliance inspection corrective actions, including chain of command
Routine Maintenance and Part Replacement: inspection results trigger replacement and repair as described in §8-04(c)	Concurrent with arranging procedures to fulfill Section 3.3 ( <i>Routine Maintenance and Part Replacement</i> ), describe notification strategies for routine maintenance and part replacement, including chain of command
<i>Legionella</i> and Bacteriological Indicator Sampling: results trigger corrective action levels as described in §8-05(f)	Concurrent with arranging procedures to fulfill Sections 6.2-6.3 ( <i>Bacteriological Indicator Sampling and Legionella Culture Testing</i> ), describe notification strategies for required <i>Legionella</i> and bacteriological indicator sampling corrective actions, including chain of command and Departmental notification
Others as Needed	Describe notification strategies for any other corrective actions

## COOLING TOWER SYSTEM

*Requirement: Title 24, Chapter §8-03(b)*

A clear understanding of the principles of operation and basics of the cooling tower(s) is essential for the efficiency of the operation, proficiency of personnel and public safety. Cooling tower operations are governed in part by the nature of the cooling load of the serviced facility or facilities.

The information in this section captures the defining characteristics of the cooling tower system and is used throughout the MPP. This informs the framework for assessing each individual cooling tower and how it comprises part of/or the entire cooling system.

Describe the key parameters below.

You can use the same model to record information for additional cooling towers.

**Total number of cooling towers:** \_\_\_\_\_

**Origin of the water supply:** [Select here.](#) \_\_\_\_\_





### Cooling Tower System Schematic or Flow Diagram

(Develop and insert a detailed system schematic/diagram, with the following components, below or in Appendix D)

- Cooling towers with their individual number of cells and circulation pumps marked
- System pumps and control valves
- Standby equipment, e.g. spare pumps
- Locations of system bleed valves
- Associated storage tanks
- Associated pipework
- Location of chemical dosing points and/or injection points
- Location of the system drain valve
- Any parts that may be temporarily out of use
- Other systems (as marked above)
- Water quality monitoring points for water quality measurements, bacteriological indicator sampling, and *Legionella* sampling

## PROCESS CONTROL MEASURES

### 3.1 Routine System Monitoring

*Requirement: Title 24, Chapter §8-04(a)*

The responsible person for each cooling tower system must monitor the system on a weekly basis (at minimum), under the guidance of a qualified person while the system is in use. The responsible person must conduct routine monitoring by:

- using a written or electronic checklist (insert checklist in Appendix C) to record visual observations of the cooling tower system and associated equipment;
- observing all wetted surfaces (safely visible during tower operation), tower basins and drift eliminators and recording the presence of organic material, biofilm, algae, scale, sediment and silt/dust deposits, organics (oil and grease), and other visible contaminants;
- performing a check of chemical dosing and control equipment, including sufficient storage and delivery of treatment chemicals, and the bleed-off system;
- reporting any system anomalies or problems to the management and maintenance team for immediate corrective action.

### 3.2 Compliance Inspection

*Requirement: Title 24, Chapter §8-04(b)*

The qualified person must conduct a compliance inspection at least once every ninety (90) days while a cooling tower system is in operation. The qualified person must complete a written or electronic checklist (insert checklist in Appendix C) and keep this on-site. It must reflect observations and findings including:

- presence of visible contaminants;
- general condition of the tower, the basin packing material and drift eliminator;
- quality of the water make-up connections and control
- proper functioning of the conductivity control;
- proper functioning of all dosing equipment (pumps and strain gauges);
- review of routine maintenance records to ensure proper implementation of required activities and corrective actions as needed.

### **3.3 Routine Maintenance and Part Replacement**

*Requirement: Title 24, Chapter §8-04(c)*

You must ensure appropriate general maintenance and part replacement. Routine maintenance activities must conform to manufacturers' recommendations, including, but not limited to, general system cleanliness, drift eliminator and fill material condition, overall distribution operation, water treatment system, basin/remote sump cleaning, and purging of stagnant and low-flow zones.

You must maintain and operate cooling tower systems in accordance with the manufacturer's specifications and keep a copy of the tower manufacturer's "Operation and Maintenance Manual" or related documents on site for DOHMH representative review.

**Insert the Routine Maintenance protocol including inspection frequency and maintenance checklists in accordance with manufacturer's specifications (attach the manufacturer's checklist in Appendix D, if applicable).**

In addition, any part or equipment used in a cooling tower must comply with the manufacturer's original design and performance specifications and any part or equipment used in an associated cooling tower system must comply with the New York City Construction Codes. As applicable, replacement materials must be corrosion-resistant and effectively prevent the penetration of sunlight.

### **3.4 Cleaning**

*Requirement: Title 24, Chapter §8-04(d)*

The cooling tower system must be cleaned whenever routine monitoring and inspections indicate a need for cleaning, but no less than twice a year (which can include a pre-startup cleaning for seasonal systems), in accordance with the manufacturer's recommendations. Cleaning protocol and personnel safety protective measures must be specified. Water contact areas such as the basin, sump, fill, spray nozzles and fittings, drift eliminators, and air intake louvres must be properly accessed or removed to facilitate cleaning.

If packs (fill sections) are present and cannot be removed, are there alternative methods of making sure they remain clean in place?

**List methods.**

**Describe the routine cooling tower cleaning schedule including pack areas where scale, debris and biofilm are likely to accumulate, which may require a complete system shutdown and impact business operations.**

### **3.5 Cooling Tower System Aerosol Control**

*Requirement: Title 24, Chapter §8-04(e)*

The cooling tower system must be operated at all times to minimize the formation and release of aerosols and mist. Owners must install and maintain drift eliminators in accordance with the manufacturer's specifications and the NYC Construction Codes. Drift eliminators must be maintained, installed and inspected to ensure good working order and proper function and to verify that they are not physically damaged or contaminated with

scale or algae. The calculated drift loss at maximum design water circulation must not exceed the manufacturer's tested value for maximum drift loss. Counter-flow cooling towers must achieve a reduction of drift loss to no more than 0.002% percent of the recirculated water volume; cross-flow cooling towers must achieve a reduction of drift loss to no more than 0.005% of the recirculated water volume.

Insert text affirming that routine cooling tower drift loss reduction, driven by implementation of drift eliminators (list product name/number), will be in accordance with the manufacturer's specifications and NYC rules and regulations.

### **3.6 System Shutdown and Startup**

*Requirement: Title 24, Chapter §8-06*

Procedures to shut down a cooling tower system must conform to the manufacturers' recommendations. When shut down, the system must be completely drained and protected from offline contamination.

At a minimum, before cooling tower system startup, a cooling tower(s) that has been shut-down or idle for more than five days must be cleaned and disinfected (*Administrative Code §17-194.1*). Cleaning and disinfection must be done no later than 15 days before the first seasonal use of such tower. The MPP must contain detailed seasonal and idle period start-up procedures that, at a minimum, include:

- before the startup of a cooling tower, either fully cleaning and disinfecting, draining to waste and disinfecting, or sufficiently hyperhalogenating the recirculated water;
- before the startup of a cooling tower after an extended shutdown of five or more days, collecting a *Legionella* culture sample and taking appropriate actions once results are received (as defined in Chapter 8); and
- before the seasonal startup of a system that has been fully shutdown, performing a pre-startup inspection, as detailed below.

In addition, you must clean and disinfect newly installed cooling tower systems prior to operation according to this section and the MPP, and register these with the DOBs' cooling tower registration system in accordance with § 28-317.3 of the Administrative Code.

You must notify the DOB electronically within 30 days of removal or permanent disuse of a cooling tower in accordance with § 28-317.3.1 of the Administrative Code. Such notice must include a statement that the cooling tower has been drained and sanitized.

Below, provide detailed procedures for system shutdown and startup that at least meet the minimum requirements described above.

**Shutdown, Startup and Idling Procedure Summary**

Seasonal Shutdown	Describe seasonal shutdown procedure
Seasonal Startup	Describe seasonal startup procedure (insert pre-startup inspection protocol in Appendix D)
Idling	Describe system idling procedure

# WATER TREATMENT

## ***Requirement: Title 24, Chapter §8-05***

A qualified person must evaluate the cooling tower design, installation, operation and maintenance prior to changing or using a chemical treatment system, or introducing a new chemical treatment agent. This is in order to ensure compatibility between the chemicals and the cooling tower system's materials and to minimize microbial growth and the release of aerosols.

The evaluation must describe the optimum level of chemicals to achieve the desired result in a manner which can be used as a system performance measure.

### **4.1 Daily Treatment**

#### ***Requirement: Title 24, Chapters §8-05 (a) and (c)***

Water in the cooling tower system must be treated at least once a day when the system is operating. The treatment is to be automated unless the MPP explicitly states how manual or less-frequent biocide addition will provide effective control of *Legionella* growth.

**Does the system have automatic, daily biocide treatment?** (Yes or No) \_\_\_\_\_

**If the system does have automatic biocide treatment, describe it below.**

(E.g. ORP-feedback or timed dosing).

**If the system does not have automatic biocide treatment, describe it below.**

(Specifically, describe how manual or less frequent, intermittent biocide application will effectively protect against *Legionella* growth, and why an alternative method is being used).

—

### **4.2 Detailed Treatment Description**

Chemicals and biocides must be used in quantities and combinations sufficient to control the presence of *Legionella*, minimize biofilms and prevent scaling and corrosion that may facilitate microbial growth. The following conditions must be met:

- Any person who performs cleaning or disinfection, or applies biocides to a cooling tower system, must be a commercial pesticide applicator or a pesticide technician certified in accordance with the requirements of Article 33 of the New York State Environmental Conservation Law and 6 NYCRR Part 85, or a pesticide apprentice under the supervision of a certified applicator.
- Only biocide products registered with the New York State Department of Environmental Conservation may be used as the primary biocide control.
- Non-chemical water treatment devices that employ alternative technologies to control biological growth may not be used in lieu of chemical biocide. Only biocide

products registered with the New York State Department of Environmental Conservation may be used in disinfection. Provided that chemical treatment is demonstrated as adequate to control *Legionella* in the maintenance and management plan, non-chemical water treatment devices may also be installed as a part of the cooling tower system.

- Water treatment records must be kept for all chemicals and biocides added noting: purpose of their use; manufacturer’s name; brand name; safety data sheet; date and time of each addition; and amount added per week.
- For systems where oxidizing chemicals cannot be used as the primary biocide to control the presence of *Legionella*, building owners must submit an alternative plan for effective bacteriological control for approval by the Department.

Chemicals and biocides must be added in accordance with the procedures described in the MPP, with details on feeding mechanism, location, frequency, set timer system, duration, feed rate, triggering events (prompting corrective actions), control procedures and target biocidal indicator levels. Water treatment chemicals and biocides must be used in accordance with the product label and manufacturer’s directions.

<b>Water Treatment Summary</b>	
Chemicals and Biocides	Describe all chemicals and biocides applied to the system and target biocide levels; biocide(s) must have proof of NYS-DEC registration, e.g. DEC stamp or PIMS printout
Feeding	Describe chemical and biocide feeding mechanism, location, frequency, set timer system, duration and feed rate
Corrective Actions	Describe trigger events and chemical and biocide corrective action implementation procedures

### 4.3 Recirculating System

**Requirement: Title 24, Chapter §8-05 (b)**

The cooling tower system must be operated and programmed to continually recirculate the water irrespective of the building’s cooling demand of the system, unless the MPP specifies in detail how the intended water treatment schedule will be carried out, and how effective biofilm and microorganism control will be achieved when the whole or a part of the cooling tower system is idle during the scheduled chemical injection.

**Does the cooling tower system have a continuous recirculating system?**

(Yes or No) \_\_\_\_\_

**If the system does *not* have a continuous recirculating system, describe the operating program/rules below. Specifically, explain how effective chemical treatment will occur when part or all of the system is idle (such as during periods of low cooling demand) at the time of a scheduled chemical application.**

#### **4.4 Hyperhalogenation Disinfection**

As required by corrective actions in Section §8-05(f)(5), start up procedures in Section §8-06(b) and as otherwise described in this Plan, procedures for hyperhalogenation disinfection must be followed.

Describe the hyperhalogenation disinfection procedures including referenced standards or protocols (e.g. from Cooling Technology Institute WTB-148), minimum concentrations, holding times and monitoring procedures.

# RISK MANAGEMENT ASSESSMENT

**Requirement: Title 24, Chapter §8-03(c)**

It is essential to understand system design and operation and components, water chemistry and water treatment principles, and risk management techniques in the development of a risk-based MPP. Risk management assessment consists of the following components:

- understanding system operation,
- identifying critical risks and potential hazards,
- analyzing risks,
- evaluating risks,
- monitoring risks,
- controlling and managing risks,
- performance and control measures review and consultation.

## 5.1 Risk Assessment

The assessment of the risk of *Legionella* growth within and transmission from the cooling tower system should be conducted for each process step. As applicable, risk management procedures to mitigate the potential conditions listed in the below table should be undertaken, with additional sampling, measurement, and general observation to be implemented at high risk locations within the cooling tower system as identified by the risk management assessment conducted for that monitoring period.

Critical Risks and Hazards	Risk Management Assessment and Management
<p>Dead legs or stagnant water in the recirculation system Title 24, Chapter §8-03(c)(1)</p> <p>(High risk means dead legs or stagnant water exist, while low risk means none exist, typically due to use of a recirculation pump to provide continuous water circulation)</p>	<p>Identify and describe high risk locations or processes and mitigation measures</p>
<p>Operating configurations and conditions that may occur after periods of extended inactivity lasting more than three (3) days, including idling or low circulation while not being fully drained Title 24, Chapter §8-0(c)(2)</p> <p>(High risk means conditions like idling without a recirculation pump controlled by a timer to circulate biocide and other water treatment through the system, while low risk means such conditions are avoided e.g. through use of a recirculation pump with a set timer to operate continuously under all operational phases)</p>	<p>Identify and describe high risk locations or processes and mitigation measures</p>

Critical Risks and Hazards	Risk Management Assessment and Management
<p>System parts that require continual operation throughout the year making regular, periodic offline cleaning and disinfection difficult Title 24, Chapter §8-03(c)(3)</p> <p>(High risk means consistent high demands for cooling e.g. in data centers exist, while low risk means no such conditions exist)</p>	<p>Identify and describe high risk locations or processes and mitigation measures</p>
<p>Any components that may add additional risk factors for organic material buildup and microbial growth such as strainers and out-of-use filters Title 24, Chapter §8-03(c)(4)</p> <p>(High risk means components like disused sand filters or strainers are present [or in-use ones lack maintenance protocols and oversight or elements such as pressure gauges, backwash equipment and filter media], while low risk means no such components are present)</p>	<p>Identify and describe high risk locations or processes and mitigation measures</p>
<p>Sources of elevated organic contamination, including, but not limited to windblown debris, bird waste and plant material Title 24, Chapter §8-03(c)(5)</p> <p>(High risk means sources like nesting birds and weeds are proximal and able to introduce contamination, while low risk means no such sources can contaminate the system)</p>	<p>Identify and describe high risk locations or processes and mitigation measures</p>
<p>Design configurations that present risk of direct sun exposure on basin, deck or fill Title 24, Chapter §8-03(c)(6)</p> <p>(High risk means basin, deck or/and fill are not protected from direct sun, while low risk means those areas are protected)</p>	<p>Identify and describe high risk locations or processes and mitigation measures</p>
<p>Ventilation intakes or other routes for human exposure to cooling tower aerosols Title 24, Chapter §8-03 (c)(7)</p> <p>(High risk means high numbers of people are potentially exposed given proximity to a health care facility, major places of assembly, public transportation, high density residential buildings and commercial district, and busy streets, while low risk means ventilation is located and aimed away from occupied areas, pedestrians, transportation and traffic areas)</p>	<p>Identify and describe high risk locations or processes and mitigation measures</p>

Critical Risks and Hazards	Risk Management Assessment and Management
<p>System components adversely affecting water quality management procedures Title 24, Chapter §8-03(c)(8)</p> <p>(High risk means components like aged, lower efficiency drift eliminators or heat exchange equipment associated with high head pressure or approach temperatures are present, while low risk means no such components exist)</p>	<p>Identify and describe high risk locations or processes and mitigation measures</p>
<p>Other risk or limiting factors or constraints in the cooling tower system’s design and functioning Title 24, Chapter §8-03(c)(9)</p> <p>(High risk means risk factors like high water temperature or difficult cooling tower access exist, while low risk means no other risk/limiting factors are present).</p>	<p>Identify and describe high risk locations or processes and mitigation measures</p>

**5.2 Makeup Water Source**

*Requirement: Title 24, Chapter §8-05(e)*

Owners using water derived from rainwater capture or recycling water systems as a source of cooling tower system makeup water must install a drift eliminator and test and treat water in accordance with a specific alternative source water plan. This plan is in addition to the MPP treatment requirements, *and must be approved by the Department*. The alternative water source plan must include provisions for adequate design of the treatment and control components and ongoing evaluation to eliminate any risk to public health (attach plan and proof of approval in Appendix D).

## **WATER QUALITY MONITORING PROCEDURES**

System monitoring and sampling locations must be representative of the entire cooling tower system. The system must be operating with water circulating in the system for at least one hour prior to water quality measurements or collection of samples. Additionally, you must conduct sampling, measurement and general observation at high risk locations within the cooling tower system, if identified by the risk management assessment conducted for that monitoring period, as outlined in Section 5 of the MPP.

The MPP must identify the procedures, responsible parties, required response time(s) and notification protocol for corrective actions and must include at the minimum bacteriological corrective actions that must be implemented according to Tables 1 and 2 in *Title 24, Chapters §8-05(f)*. Space for description of such protocol for corrective actions in response to high *Legionella* or bacteriological indicator sampling results is given in the tables below.

### **6.1 Water Quality Parameters**

***Requirement: Title 24, Chapter §8-05(f)(1)***

Water quality parameters, including but not limited to pH, temperature, conductivity and biocidal indicator, must be measured and recorded at least three times per week, with no more than 2 days between any measurement, when the cooling tower system is operating, unless the MPP explicitly states how automatic or remote measurement and recording will provide effective measurement of system process control. Any automatic measurement must be properly recorded and be made available at the time of inspection.

**Describe specific sampling plan, including monitoring location and time, along with corrective actions for abnormal values. Insert (blank) sample log sheet in Appendix C.**

### **6.2 Bacteriological Indicator Sampling**

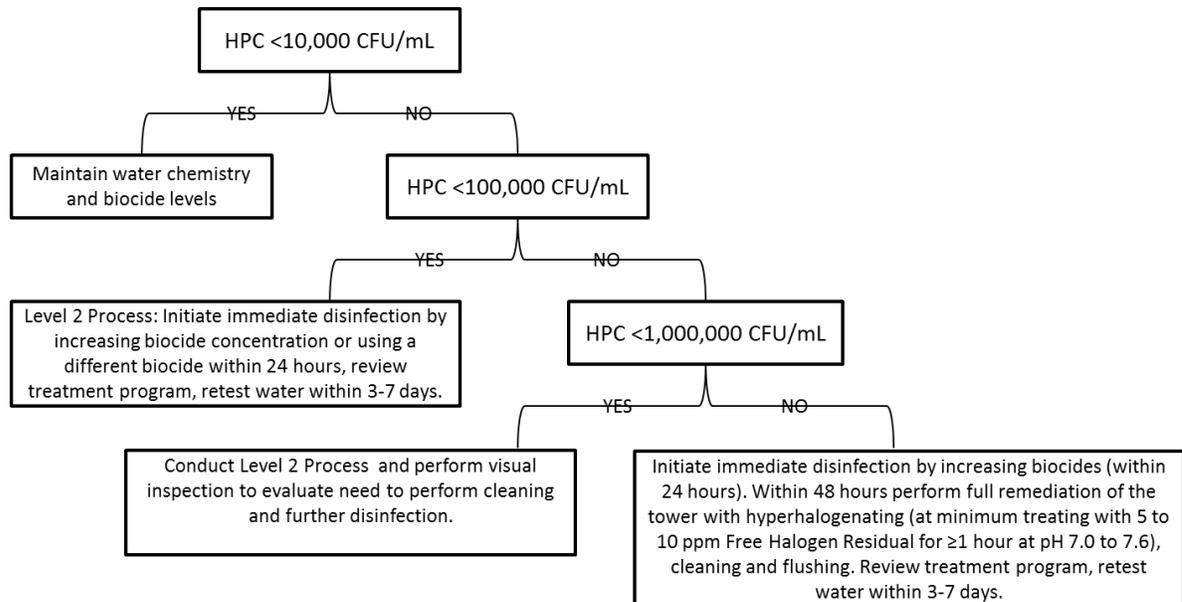
***Requirement: Title 24, Chapter §8-05(f)(2)***

A bacteriological indicator to estimate microbial content (such as HPC) of recirculating water must be collected and interpreted according to Table 2 of Chapter 8, at least once each week while the cooling tower system is operating. Indicators must be taken at times and from water sampling points, detailed in the MPP, that will be representative of water microbial content. Indicators may be taken at any time from constant chemical treatment systems. Indicators from systems that use intermittent biocide applications must be taken before biocide application and reflect normal cooling tower operating conditions.

**Will HPC be used as a bacteriological indicator?** (Yes or No) \_\_\_\_\_

**If HPC will not be used, state and justify what alternative test will be used:**

This decision tree describes the corrective actions that must be taken based on bacteriological indicator sampling (e.g., HPC) and re-sampling results (in conformance with Chapter 8)\*.



\* If 2 consecutive bacteriological indicator sample results are at least 1,000,000 CFU/mL, *Legionella* culture testing is required.

<b>Bacteriological Indicator Sampling Summary</b>	
Responsible Party for Indicator Collection	Describe who is responsible for indicator collection.
Indicator Collection Location(s)	Describe where in the cooling tower system the sample(s) will be taken from.
Indicator Sample Protocol	Describe how the sample will be managed (e.g. incubated onsite or sent to a lab).
Responsible Party for Corrective Action(s)	Describe who is responsible for interpreting results/performing corrective action(s).
Corrective Action(s) and Timeline	Describe corrective action(s) and timeline including at minimum those described in Table 2 of §8-05, along with documentation procedure.

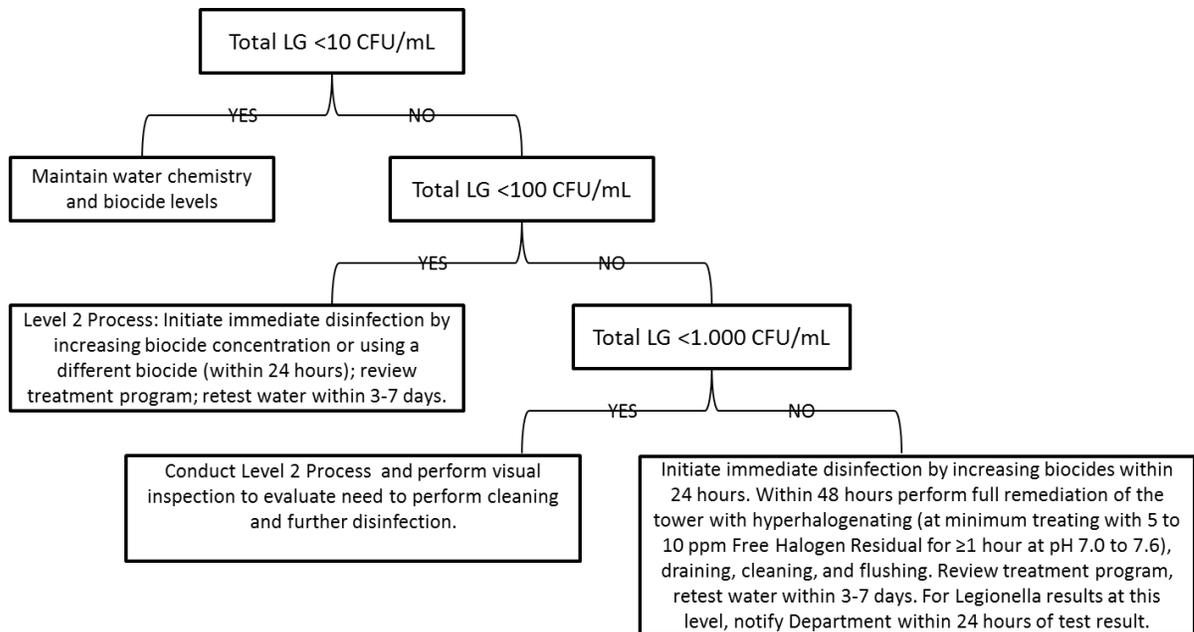
### 6.3 Legionella Culture Testing

**Requirement: Title 24, Chapter §8-05(f)(3)**

*Legionella* culture testing must be conducted no less frequently than every ninety (90) days during cooling tower system operation, and before the startup of a cooling tower that has been shut down for five or more days. A *Legionella* sample must be analyzed by a US Centers for Disease Control and Prevention ELITE Program certified laboratory, by the New York State Department of Health Wadsworth Center or other laboratory approved by the Department. You must report test results of all *Legionella* species at or above the magnitude of level 4, as indicated in Table 1 of Chapter 8, to the Department within 24 hours of receiving the test results. If any of these occur, additional emergency *Legionella* sampling must be conducted:

- power failure of sufficient duration to allow for growth of bacteria;
- loss of biocide treatment sufficient to allow for growth of bacteria;
- failure of conductivity controls to maintain proper cycles of concentration;
- at the request of the Department upon a determination that one or more cases of legionellosis is or may be associated with the cooling tower, based on epidemiological data or laboratory testing;
- any time two consecutive bacteriological indicator sample results are at least 1,000,000 CFU/mL; or
- any other conditions specified by the Department.

This decision tree describes the corrective actions that must be taken based on *Legionella* (LG) sampling and re-sampling results (in conformance with Chapter 8, with the result representing total LG species concentration).



<b>Legionella Sampling Summary</b>	
Responsible Party for <i>Legionella</i> sample collection	Describe who is responsible for <i>Legionella</i> sample collection.
<i>Legionella</i> Sample Collection Location(s)	Describe where in the cooling tower system the sample(s) will be taken from.
<i>Legionella</i> Sample Protocol	Describe how the <i>Legionella</i> sample(s) will be taken and managed (identify lab).
Responsible Party for Corrective Action(s)	Describe who is responsible for interpreting results/performing corrective action(s).
Corrective Action(s) and Timeline	Describe corrective action(s) and timeline including at minimum those described in Table 1 of §8-05, along with documentation procedure.

## SUMMARY TABLE OF ACTIVITY FREQUENCY

You must record the frequency of cooling tower operational procedures such as inspection, maintenance, monitoring, cleaning and treatment activities. This table provides an outline of these requirements. Minimum frequencies are marked with 'X' and should be adjusted to higher frequencies, if necessary.

You can attach separate plans published by the cooling tower manufacturer within the "Operation and Maintenance Manual" or related materials in the Appendix.

Activity Title (Rule Section)	Description of Service (if applicable)	Seasonal Start-up	Daily	Weekly	Quarterly (every 90 days)	Biannual
<b>Routine Monitoring</b> (8-04(a)(3))	Check all wetted surfaces (safely visible during cooling tower operation), cooling tower basins and drift eliminators for the presence of organic material, biofilm, algae, scale, sediment and silt/dust deposits, organics (oil and grease), and other visible contaminants. Check sufficiency of chemical dosing and control equipment, of storage and delivery of treatment chemicals, and the bleed-off system.			X		
<b>Compliance Inspection</b> (8-04(b))	Inspect for the presence of visible contaminants, the general condition of the cooling tower, the basin packing material and drift eliminator; the quality of the water make-up connections and control; the proper functioning of the conductivity control; the proper functioning of all dosing equipment (pumps and strain gauges); and the review of routine maintenance records to ensure proper implementation of required activities (including those specified in 8-04(b)) and corrective actions as needed.	X**			X	
<b>Cleaning</b> (8-04(d))	Clean water contact areas such as the basin, sump, fill, spray nozzles and fittings, drift eliminators, air intake louvres in accordance with manufacturer's recommendations, after properly accessing and/or removing equipment.					X
<b>Tower Start-up</b> (8-06(b)(1))	Fully clean and disinfect OR drain to waste and disinfect OR sufficiently hyperhalogenate the recirculated water before start-up; in all cases sample <i>Legionella</i> .	X				
<b>Water Quality Monitoring</b> (8-05(f))	Measure the water quality parameters pH, conductivity, temperature, and biocidal indicator.		X*			
<b>Bacteriological Indicator Sampling</b> (8-05(f))	Sample bacteriological indicator at given point and time of day.			X		
<b>Legionella Sampling</b> (8-05(f))	Sample <i>Legionella</i> during regular operation and emergency events	X**			X	
* At least 3 times per week, with no more than 2 days between any measurement **Counts as one of the required quarterly compliance inspections and <i>Legionella</i> samples						

## ***RECORD KEEPING***

***Requirement: Title 24, Chapter §8-07***

The owner must keep a record of any maintenance, inspection, deficiency, corrective action, water treatment, test result, cleaning or disinfection performed on the cooling tower for at least the past 3 years. This information must be maintained in the building where the cooling tower is located or in an adjacent building or structure on the same campus, complex, lot, mall or on-site central engineering division.

All of the required records should be attached to the MPP. Include a summary checklist of the records or protocols provided in Appendix C.

**COOLING TOWER  
MAINTENANCE PROGRAM AND  
PLAN**

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Appendices

## ***Appendix A: REFERENCES***

One can search the New York State Cooling Tower website [www.health.ny.gov/](http://www.health.ny.gov/) to find the most up-to-date reference information and links.

**ASHRAE Standard 188-2015, Legionellosis: Risk Management for Building Water Systems:**

<https://www.ashrae.org/standards-research--technology/standards--guidelines/other-ashrae-standards-referenced-in-code#188>

**CTI WTP-148 (2008) Legionellosis Guideline: Best Practices for Control of Legionella:**

<http://www.cti.org/downloads/WTP-148.pdf>

**New York City DOHMH Legionnaires' Disease Main Page:**

<http://www1.nyc.gov/site/doh/health/health-topics/legionnaires-disease-commissioners-order.page>

**New York State DOH Legionnaires' Disease Main Page:**

<https://www.health.ny.gov/diseases/communicable/legionellosis/>

**US Centers for Disease Control (2015) Environmental Investigation Tools:**

<http://www.cdc.gov/legionella/health-depts/inv-tools-cluster/environmental-inv-tools.html>

*This list was compiled in January 2016.*

## Appendix B: DEFINITIONS

When used in this document, in accordance with Title 24, Chapter 8 (Cooling Towers) of the Rules of the City of New York, the following terms have these meanings:

**ANSI/ASHRAE Standard 188-2015** means *ANSI/ASHRAE Standard 188-2015 Legionellosis: Risk Management for Building Water Systems* a publication issued by the American Society of Heating, Refrigeration and Air-Conditioning Engineers and the American National Standards Institute (ASHRAE/ANSI), final approval date June 26, 2015, at pages 4-8.

**Building** means any structure or premises used or intended for supporting or sheltering any use or occupancy. The term shall be construed as if followed by the phrase “structure, premises, lot or part thereof” unless otherwise indicated by the text.

**Bacteriological Indicator** means a biological process control indicator that estimates microbial content in the circulating water of a cooling tower system, such as heterotrophic plate count (HPC) as measured in a water sample or by a dip slide.

**Biocidal Indicator** means a direct or indirect measurement of biocide in the cooling tower recirculating water, such as free halogen residual concentration or oxidation reduction potential (ORP).

**Building Identification Number (BIN)** means a unique 7-digit number, assigned by NYC City Planning, to a specific building.

**Chain of Command** means a supervisory structure for MPP personnel to follow in carrying out their duties.

**Cleaning** means physical, mechanical or other removal of biofilm, scale, debris, rust, other corrosion products, sludge, algae and other potential sources of contamination.

**Cleaning/Chemical Application Person** means the service provider who performs biannual and seasonal start-up (if applicable) cleaning and oversees application of daily or other approved chemical treatment procedures.

**Cooling Tower** means a cooling tower, evaporative condenser or fluid cooler that is part of a recirculated water system incorporated into a building’s cooling, industrial process, refrigeration, or energy production system.

**Cooling Tower System** means one or more cooling towers and all of the recirculating water system components, process instruments and appurtenances through which water flows or comes into contact with key parts consisting of biocide, anti-scaling and anti-corrosion chemical applicators, valves, pumps, the cooling tower superstructure, condensers and heat exchangers and other related components. The cooling tower system may comprise multiple cooling towers that share some or all superstructure components.

**Corrective Actions** mean disinfection, cleaning, flushing, and other activities to remedy biofilm growth, *Legionella* proliferation, or other system mechanical problems identified through monitoring, inspections and/or other activities as determined by the Department.

**Compliance Inspection** means the observations and other activities that are required on a regular basis (at least every 90 days) in accordance with the MPP and Chapter 8, including the completion of a written or electronic checklist, which must be conducted and certified by a qualified person.

**Dead legs** mean lengths of pipe normally closed at one end or ending in a fitting within the cooling tower system that limits water circulation and is likely to result in stagnation.

**Department** means the New York City Department of Health and Mental Hygiene.

**Dip Slide** means a method to test for microorganisms (such as HPC) consisting of a sterile culture medium affixed to a sterile slide, that is dipped directly into the liquid that is to be sampled.

**Disinfection** means using one or more biocides at a defined concentration, under specific conditions and for an established period that will kill or inactivate pathogenic microorganisms.

**Drift Eliminator** means a system of baffles or cells that cause separation of entrained water, designed to remove aerosols from cooling tower exhaust.

**Heterotrophic Plate Count** or **HPC** means a measure of the concentration of microorganisms that require an external source of organic carbon for growth including bacteria, yeasts and mold in water samples.

**Idling** means turning off or limiting water circulation within the cooling tower system but not draining the system water.

**Legionella** means the genus of bacteria which is ubiquitous in aqueous environments, including the recirculated water of cooling tower systems that are not properly or regularly maintained. There are more than 50 different species of *Legionella*, all of which are potentially pathogenic.

**Legionella Sample** means water or other sample to be examined for the presence of viable *Legionella* species using semi-selective culture media and procedures specific to the cultivation and detection of *Legionella* species, such as those outlined in International Organization for Standardization (ISO) Standards 11731-1:1998 and 11731-2:2004.

**Maintenance Program and Plan (MPP)** means a written set of measures describing monitoring, cleaning, disinfection and all other activities for the prevention and control of *Legionella* growth in a cooling tower system, that is in accordance with section 5, 6 and 7.2 of ANSI/ASHRAE 188-2015 and with the manufacturer's instructions, and is developed by a qualified person.

**Make-up Water** means water added to the cooling tower system on a regular basis to replace water lost by evaporation, drift or leakage and to maintain optimal system operation and process control.

**Management and Maintenance Team** means the individuals who are legally and practically responsible for the continued effective and safe operation of a cooling tower system.

**Owner** means any person, agent, firm, partnership, corporation or other legal entity having a legal or equitable interest in, or control of a building or other premises.

**Plan Preparer** means the lead author who is responsible for preparing this plan.

**Plan Model** means the document prepared above giving the major required elements of the MPP, to be modified by the plan preparer for each facility.

**Process Control Measures** mean actions that must be taken to evaluate internal functioning of the cooling tower system, including monitoring pH, temperature, biocidal indicator, bacteriological indicators and other parameters, and observing phenomenon such as scaling, corrosion and biofilm.

**Qualified Person** means a New York State licensed professional engineer; a certified industrial hygienist; a certified water technologist with training and experience developing management plans and performing inspections in accordance with current standard industry protocols including, but not limited to ASHRAE 188-2015; or an environmental consultant who has at least two (2) years of operational experience in water management planning and operation.

**Responsible Person** means a person employed or whose services are retained by an owner, who understands and is capable of performing the required daily water quality measurements, weekly system monitoring and operation and maintenance of a cooling tower system in accordance with the MPP, and making recommendations for diagnosing anomalous conditions that require corrective actions, under the guidance of a qualified person. The responsible person should be capable of: measuring water pH, temperature and disinfectant residual levels at proper locations/frequencies; checking biocide storage container levels; recording dates, amounts and times of biocide injection; and logging all other relevant data and comments.

**Risk Management Assessment** means a process for comprehensively identifying, describing and evaluating in detail all aspects of a cooling tower system that may potentially contribute to the growth and dissemination of *Legionella* bacteria.

**Routine Monitoring** means the set of evaluation and other activities that must be completed periodically in accordance with the MPP and Chapter 8.

**Stagnant Water** means water that is confined, standing, experiencing period of low flow or usage, and not being actively circulated through the cooling tower system.

**Standard Methods** means accepted protocols for sampling, recording, laboratory testing, reporting and other procedures related to environmental and water quality sampling, including, but not limited to, those set forth in *Standard Methods for the Examination of Water and*

*Wastewater* 22nd Edition, 2012, a publication issued jointly by the American Public Health Association, the American Water Works Association and the Water Environment Federation and the *Standards Microbiological Methods* (TC 147/SC4) published by the International Organization for Standardization, or successor editions.

**System Shutdown** means shutting off or closing and draining the cooling tower system when cooling is no longer needed.

**System Start-up** means commissioning a new system, or putting the cooling tower system into operation after shutdown or idling.

**Water Quality Parameters** mean temperature, pH, conductivity, biocidal indicator, bacteriological indicator and other chemical and physical indicators of system process control.

## ***Appendix C: LOGS AND MAINTENANCE RECORDS***

### **Checklist of Attached Records**

<b>Record of Activity</b>	<b>Yes</b>	<b>No</b>	<b>Comments</b>
Water Quality Parameter Log			
Routine Monitoring Checklist			
Routine Maintenance Checklist (from Manufacturer)			
Compliance Inspection Checklist			
Other record, if applicable			
Other record, if applicable			

## Water Quality Parameter Log

(Insert a routine water quality parameter log sheet identical to the model below or develop your own record that includes this information)

Monitoring Staff (Responsible Person) Name:						Month, Year:		
Day	Location	Time Taken	pH	T(°F)	Biocidal Residual (ppm, or mV for ORP)	Conductivity (mS)	Staff Initials	Comment
1	(Such as CT basin, return water or point of injection)  (High risk Area #1 if applicable)							
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3								
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## Routine Monitoring Checklist

(Insert a weekly monitoring checklist identical to the model below or develop your own record that includes this information)

<b>Name of the Monitoring Staff (Responsible Person):</b>			<b>Date: (D/MM/YYYY)</b>
Aspect	Yes	No	Comments – Further Action Required
Wetted surfaces (safely visible during cooling tower operation) are free of organic material, biofilm, algae, scale, sediment and silt/dust deposits, organics (oil and grease), and other visible contaminants			
Tower basins are free of organic material, biofilm, algae, scale, sediment and silt/dust deposits, organics (oil and grease), and other visible contaminants			
Drift eliminators are free of organic material, biofilm, algae, scale, sediment and silt/dust deposits, organics (oil and grease), and other visible contaminants			
Chemical dosing and control equipment is sufficient			
Storage and delivery of treatment chemicals is sufficient			
Bleed-off system is sufficient			

## **Routine Maintenance Checklist**

(Insert the manufacturer's maintenance checklist from the "Operation and Maintenance Manual" or develop your own record that includes such information; attach if needed in Appendix D)

## Compliance Inspection Checklist

(Insert a compliance inspection checklist identical to the model below or develop your own record that includes this information)

<b>Inspection Staff (Qualified Person) Name:</b>			<b>Date:</b>
<b>Aspect</b>	<b>Yes</b>	<b>No</b>	<b>Comments – Further Action Required</b>
Cooling tower equipment and basin free of visible contaminants			
Cooling tower general condition observed as satisfactory			
Basin observed as satisfactory			
Packing material observed as satisfactory			
Drift eliminator observed as satisfactory			
Quality of the water make-up connections and control maintained			
Proper functioning of the conductivity control maintained			
Proper functioning of all dosing equipment (pumps and strain gauges) maintained			
Routine maintenance records reviewed to ensure proper implementation of required activities (including those specified in 8-04(b)) and corrective actions as needed			

## ***Appendix D: ADDITIONAL SYSTEM INFORMATION***

(Insert any additional relevant information about the cooling tower system and/or attach extra pages)