HSS-304 Legionella Control Program

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1.0 INTRODUCTION

1.1 Purpose

HSS-304 provides procedures that Marathon and contract employees must utilize when engaged in activities working with or around cooling towers at LAR.

HSS-304 outlines the practices and controls to be utilized to limit employee exposure to the *Legionella* bacterium, potentially present in cooling water system mist, while working on a cooling water system deck when at least one (1) cell is in service, in accordance with Company Policy and established Health and Safety Standards.

1.2 Scope

The procedures and information apply to all Marathon employees and contractors.

2.0 REFERENCES

All applicable requirements from Marathon Procedures and Standards shall be considered an integral part of this Program. Applicable Procedures and Standards, as well as, Resources utilized are listed below. Short titles will be used herein when appropriate.

2.1 Marathon LAR Procedures and Standards

- HSS 110, Medical Emergencies and First Aid
- HSS 215, Confined Space
- SWP Form C28, Confined Space Entry Into Cooling Towers Mitigation
- HSS 306, Respiratory Protection Program

2.2 Resources

- American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) Standard 188-2015: Legionellosis: Risk Management for Building Water Systems (ANSI approved).
- ASHRAE Guideline 12-2000: Minimizing the Risk of Legionellosis Associated with Building Water Systems, 2000.
- Cooling Technology Institute: Legionellosis Guideline: Best Practices for Control of Legionella, July 2006.
- OSHA Technical Manual, Section III, Chapter 7: Legionnaires' Disease

3.0 DEFINITIONS

The following additional definitions are applicable to this Standard.

Table 1 Definitions

Term	Description
Legionella	Genus of common aquatic bacteria, which is found in natural and building water systems. It thrives in warm aquatic environments.
Legionellosis	Refers to any illness caused by exposure to *Legionella* bacteria, specifically, two distinct clinical illnesses: Legionnaires' disease and Pontiac fever. Most cases of legionellosis are the result of exposure to *Legionella* associated with building water systems.
Legionnaires' Disease (LD)	Diagnosed when the *Legionella* bacterium causes pneumonia. The presence of Legionella bacteria in building water systems is not in itself sufficient to cause LD. The disease is contracted by aerosol generation of colonized water and exposure to susceptible persons by means of inhalation or pulmonary aspiration. Symptoms, such as high fever, chills, and headaches, may arise between two (2) to ten (10) days. Treatment of LD involves antibiotics, if left untreated, LD may be fatal.

Table 1 Definitions

Term	Description
Pontiac Fever	A less-severe influenza like illness, which is contracted from inhaling mist or respirable water droplets containing viable *Legionella* bacteria. Symptoms, similar to moderate to severe influenza and not accompanied by pneumonia, may arise in one (1) to two (2) days and pass in five (5) to ten (10) days regardless of treatment. No fatalities have been associated with Pontiac fever.
Cooling Water Systems	The Los Angeles Refinery (LAR) employs a total of twenty (20) cooling water systems, which utilize re-circulating induced draft cooling towers.
Continuous Halogenation	This is the recommended practice for minimizing bacterial count in cooling water systems. Bleach is preferred for continuous treatment in cooling water systems. A free chlorine residual (as Cl_2) of 0.2 to 0.5 ppm is necessary to minimize bacterial populations.
Non-Oxidizing Biocide	Non-oxidizing biocides, such as glutaraldehyde, are a group of chemicals which have been known to effectively minimize *Legionella* population when water system is treated with continuous halogenation.
Regulated Respiratory Protection Area	The cooling water system deck when at least one (1) cell is in service becomes a Regulated Respiratory Protection Area when tasks last thirty (30) minutes or more per shift. A minimum half mask air-purifying respirator with HEPA cartridges is required. If water drift does not follow the induced draft flow, then the affected area becomes a Regulated Respiratory Protection Area.

4.0 BACKGROUND AND TEST METHODS

4.1 Background

The potential for Legionellosis may be present in various water systems throughout the refinery, including the cooling water systems. Cooling water systems are the first to be assessed. Cooling water systems undergo routine monitoring and chemical treatment to minimize general microbiological growth.

4.2 Test Methods

a. Weekly samples for microbiological activity will be taken for routine management of cooling water systems (Refer to Appendix B).

b. A microbiological activity above the control limit (greater than 1,000 Colony Forming Units/ milliliter (CFU/mL)) results in an action plan to lower the biological activity and confirming by re-sampling.

c. Quarterly samples for *Legionella* will be taken at the cooling water return line, and analyzed by a laboratory using a *Legionella* Culture Method, which takes ten (10) to fourteen (14) days.

d. High *Legionella* activity (greater than 50 CFU/mL) triggers additional *Legionella* sampling (Refer to Appendix A).

5.0 RESPONSIBILITIES

5.1 All Personnel

a. Comply with the Regulated Respiratory Protection Area.

b. Wear required respiratory protection for tasks lasting longer than thirty (30) minutes per shift on a cooling tower.

c. Report symptoms of Legionellosis per F/S 110, Medical Emergencies and First Aid or SAF-002, Injury and Illness Reporting.

5.2 Occupational Health Group

a. Conduct initial risk assessment for cooling water systems.

b. Conduct periodic *Legionella* testing of cooling water systems based on a pre-determined schedule, upon positive results for *Legionella*, upon high biological activity results, and upon notification by Medical Department of personnel presenting symptoms of Legionellosis.

c. Initiate communication regarding information or results for *Legionella* to impacted locations, Water Engineer, and Water Treatment Company.

d. Develop awareness training program for employees who work on cooling water systems that may be impacted by *Legionella* bacteria.

e. Set respiratory protection requirements for cooling water systems.

5.3 Water Treatment Company

a. Oversee routine chemical treatment program of cooling water systems.

b. Include results of *Legionella* analysis in cooling tower Personal Service Reports to notify operating units.

c. Implement Action Plan upon receipt of *Legionella* growth above control limit. See Appendices.

5.4 Operations

a. Inspect cooling towers for build-up of scale, sediment, and bio-fouling.

b. Identify potential problems that may impact cooling tower water chemistry.

c. Support Water Treatment Company in maintaining cooling water systems.

d. Support Water Treatment Company with Action Plan upon receipt of *Legionella* threshold and/or high biological activity. See Appendices.

e. Inform personnel accessing cooling towers of the potential presence of *Legionella* at cooling towers.

f. Include respiratory requirements on permits for tasks that encompass the regulated respiratory protection area.

5.5 Maintenance

a. Support maintenance and repair of essential cooling tower water chemistry equipment.

5.6 Medical Department

a. Understand the symptoms of Legionellosis and any required follow-up testing to be performed.

b. Notify the Health group of personnel presenting symptoms of Legionellosis.

c. Inform state and county officials in the event of a confirmed case of Legionellosis.

5.7 Learning & Development Department

a. Maintain records for Legionella training.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 Respiratory Protection

a. A half-mask respirator with HEPA cartridges is the minimum respiratory protection requirement.

b. Respirators must be worn within the Regulated Respiratory Protection Area for tasks lasting thirty (30) minutes or more per shift.

7.0 TREATMENT OF NON-COMPLIANT COOLING WATER SYSTEMS

Non-compliant cooling towers will be treated using an action plan created utilizing the guidelines set forth by ASHRAE and the Cooling Technology Institute. See Appendices.

8.0 TRAINING

Employees that work on and around cooling towers that may contain *Legionella* bacteria will receive awareness training every two (2) years.

9.0 RECORDKEEPING

The Occupational Health group will keep the results of the quarterly scheduled and required *Legionella* analysis for all LAR cooling water systems on file.

10.0 APPENDICES

APPENDIX A

RESPONSE TO POSITIVE *LEGIONELLA* RESULTS		
***Legionella* Count (CFU/mL)**	**Action**	**Communication**
Greater than 50 but less than 100 from the Return Sample	<u>Dose the tower with non-oxidizing biocide.</u> 1. Raise chlorine residual target to 0.7 ppm. 2. Add non-oxidizing biocide 100 ppm for Glutaraldehyde or 125 ppm for Isothiazolin. 3. Inspect tower basin and fill where exposed for any indication of biofilms. If observed, apply biocides as practical to sterilize material. 4. Retest for Legionella (10-14 days turnaround).	• Notify Health Group. • Notify Operations Specialist. • Notify water engineer. • Notify lead process engineer.

	5. If result is still in this range, repeat steps 1 – 4. 6. If result is below this range, return chlorine residual target to normal control range.	
Greater than 100 but less than 1,000 from the Return Sample	<u>Conduct a hyperhalogenation.</u> 1. Raise free halogen to a minimum of 5 ppm for six (6) hours. 2. Raise chlorine residual target to 0.7 ppm. 3. Add both non-oxidizing biocides. One (1) immediately and one (1) biocide 8 hours later. 100 ppm of Glutaraldehyde or 125 ppm of Isothiazolin. 4. Inspect tower basin and fill where exposed for any indication of biofilms. If observed, apply biocides as practical to sterilize material. 5. Retest for Legionella (10-14 days turnaround). 6. If result is still in this range, repeat steps 1 – 5. 7. If result is below this range, but greater than 50 CFU/mL, follow instructions for "Greater than 50 but less than 100." 8. If result is less than 50 CFU/mL, return chlorine residual target to normal control range.	• Notify Health Group. • Notify Operations Specialist. • Notify water engineer. • Notify lead process engineer. • Barricade tower at stairwells and ladders to stop access onto cooling tower deck. • Half-mask respirators with HEPA cartridges are required within barricaded area for any work regardless of time.
Greater than 1,000 from the Return Sample	<u>Conduct a hyperhalogenation.</u> 1. Raise free halogen to a minimum of 5 ppm for six (6) hours. 2. Raise chlorine residual target to 0.7 ppm. 3. Add both non-oxidizing biocides. One (1) immediately and one (1) biocide 8 hours later. 100 ppm of Glutaraldehyde or 125 ppm of Isothiazolin. 4. Inspect tower basin and fill where exposed for any indication of biofilms. If observed, apply biocides as practical to sterilize material. 5. Retest for Legionella (10-14 days turnaround).	• Notify Health Group. • Notify Operations Specialist. • Notify water engineer. • Notify lead process engineer. • Barricade tower at stairwells and ladders to stop access onto cooling tower deck. • Half mask respirators with HEPA cartridges are required within barricaded area for any work regardless of time.

	6. If result is still in greater than 1,000 CFU/mL, repeat steps 1 – 5. a. If after 2nd hyperhalogenation results are still great than 1,000 CFU/mL, conduct emergency disinfection procedure. 7. If result is below 1,000 but greater than 100 CFU/mL, follow instructions for "Greater than 100 but less than 1,000." 8. If result is below 100 but greater than 50 CFU/mL, follow instructions for "Greater than 50 but less than 100." 9. If result is less than 50 CFU/mL, return chlorine residual target to normal control range. <u>Emergency Disinfection Procedure</u> 1. Remove heat load from tower. 2. Shut down all fans. 3. Shut off blowdown but continue makeup and circulation through all equipment. 4. Raise free halogen residual to 5 – 50 ppm. 5. Add biodispersant and corrosion inhibitor (and anti-foam if necessary). 6. Maintain 10 ppm free halogen residual for twenty-four (24) hours. 7. Keep pH below 8.0 (for chlorine halogen systems, the biocide effectiveness reduces as pH increases above 8.0). 8. After twenty-four (24) hours, shut down circulation and drain system to sewer. 9. Refill system and repeat procedure. 10. Check tower for biofilms. a. If biofilms is found: i. Mechanically clean fill, tower supports, cell partitions, and sump. ii. Refill system and establish a 10 ppm free halogen residual for circulate for 6 hours and dump system. b. If no biofilms is apparent: i. Refill and return tower to normal operation.	

	11. Retest for *Legionella* as soon as possible. 12. Passivate cooling water system and tower.	

APPENDIX B

RESPONSE TO HIGH BIOLOGICAL ACTIVITY		
Total Bacteria Count (CFU/mL)	**Action**	**Communication**
Greater than or equal to 1000 CFU/mL	1. Dose with non-oxidizing biocide; 100 ppm for Glutaraldehyde or 125 ppm for Isothiazolin. 2. Retest for total bacteria. 3. Troubleshoot to determine and correct the cause of the microbial growth. 4. If retest results in a count greater than or equal to 1,000 cfu/mL, repeat steps 1 to 3 until bacteria counts are <1,000 CFU/mL.	• Notify Health Group. • Notify Operations Specialist. • Notify water engineer. • Notify lead process engineer.

11.0 REVISION HISTORY

The revision history of the standard is included below:

Revision Number	Description of Change	Custodian	Approved By	Approval Date
001	Modified to MPC document	Macario Perez, Industrial Hygienist	Sharon Callahan, Health Superintendent	04/02/2019