

Water Safety Program Assessment Report
for the
Edward Hines, Jr. VA Hospital

July 21, 2016



Summary

The purpose of this report is to provide feedback to management officials at the Edward Hines, Jr. VA Hospital, resulting from a review by the Water Safety Engineer from the William S. Middleton VA Hospital.

On July 12, 2016, an on-site review of the water safety management program was conducted by Matthew McKinley, Water Safety Engineer, to provide recommendations and clarity to management efforts.

A review of the campus was completed to describe the size and complexity of the systems that needed to be managed and treated. A total of seven buildings are tested for legionella per quarter including: Building 100 (Fisher House), Building 113 (Blind Rehabilitation Center), Building 128 (Spinal Cord Injury and Disorders Center), Building 200 (Main Hospital), Building 217 (Extended Care), Building 221 (RCF Long Term Spinal Cord Injury Unit), and Building 228 (Clinical Areas).

A total of 160 reoccurring water samples of 250 milliliters each are collected per quarter and sent, currently, to Criterion Laboratories Inc. There are 20 samples (10 hot/10 cold) taken from each of the 7 buildings (excluding Building 200, where 40 samples are collected). As these samples are collected, temperature, pH level and Chlorine concentration are measured. Once the samples are sent to Criterion Laboratories, they are tested for legionella with a detection limit of 0.4 CFU/mL and results are sent back to Edward Hines, Jr. VA Hospital. It should be noted that this review was very informal. Unsolicited verbal comments received from staff were generally positive overall.

Review Process

The on-site work review started by meeting individually with various key members from the Hines VA Hospital. This included D'Lorah Small (Chief Engineer), Maribel Alvarez-Cabrera (Acting Assistant Chief Project Planning), Sean Rosenfeld (Assistant Chief FMS), Martin Jensen (Energy Manager) and Douglas Crombie (FMS). The meeting allowed Matthew McKinley to become familiar with the overall process of the implementation of water safety practices at Hines.

The on-site water safety program review consisted of a tour by Sean Rosenfeld, Douglas Crombie and Matthew McKinley through Building 200. A recent positive legionella sample location was selected for review of location details (type of faucet, mixing valve, temperature hot/cold, etc.). In addition to conducting visual inspections, brief consultations were conducted with Hines staff, when available, to validate processes and systems used throughout each building. Matthew McKinley was also allowed access to view past legionella sample testing results to review the data presented by the testing laboratories. After the one day review, a debriefing meeting was conducted, which included the key members from the Hines VA Hospital, mentioned above, and members from Safety (William Hanley & Theresa Connell).

Review Results

- ❖ Buildings Tested
 - Building 100 (Fisher House)
 - Building 113 (Blind Rehabilitation Center)
 - Building 128 (Spinal Cord Injury and Disorders Center)
 - Building 200 (Main Hospital)
 - Building 217 (Extended Care)
 - Building 221 (RCF Long Term Spinal Cord Injury Unit)
 - Building 228 (Clinical Areas)
- ❖ Number of reoccurring quarterly samples
 - 160 Total
 - 20 per building (10 hot, 10 cold)
 - Extra 20 samples taken in building 200
- ❖ Age of pipe infrastructure(s)
 - 45 Years average
- ❖ Supplementary System(s)
 - Chlorine
 - Bromide has possibly been added
- ❖ Positive areas
 - More prevalent in Hot but also positive in cold
- ❖ Types of faucets
 - Hands Free mostly
- ❖ Testing Lab
 - Criterion Laboratories Inc.
 - Based out of Philadelphia, PA
 - Detection Limit of 0.4 CFL/mL
- ❖ Incoming Source Water
 - All comes from Lake Michigan
- ❖ Temperatures
 - Source Temperatures
 - Tanks $\geq 140^{\circ}$ F, Instant $\geq 130^{\circ}$ F
 - Outlet Temperatures
 - These are not monitored currently
- ❖ Flushing
 - Construction areas are not being flushed
 - Low flow areas are not identified and not being flushed
 - Will flush faucet/area daily if positive sample is found
- ❖ POU Filters
 - Are installed on locations after a positive sample is found
 - 30 day replacement
 - Have not been tested
- ❖ Accurate Distribution Pipe Drawings
 - Do not have
 - Dead legs not identified

- ❖ Mitigation plans SOP
 - Need to be reviewed
- ❖ Concerns with Superheat & Flush
 - Failures with system that cannot handle it

Review Recommendations

Supplementary Systems

Minimum concentrations of various biocides (e.g. oxidizing agents such as chlorine used at the Hines VA) can inhibit the growth of Legionella in the water distribution system. Chlorine should be maintained at a certain level throughout the entire water distribution for proper treatment and to not affect the safety of consumption or the taste. The Environmental Protection Agency (EPA) regulates contaminant levels and disinfectant treatment for use under the Safe Drinking Water Act.

The FY17 3rd Quarter legionella sample report showed that there were at least 22 sample locations that had a biocide concentration of ≤ 0.05 ppm chlorine (with many of them 0.00 ppm).

- **Recommendation:** Determine a Legionella prevention goal range for the chlorine concentration levels while remaining in compliance with EPA standards. Once this goal range is determined, the sample location biocide levels can be compared to see what areas are out of this range. This can help you locate areas with issues (low flow, backflow, cross connections, etc.).

Note: The use of one or more installed systemic water treatment system(s) may be necessary to supplement any residual disinfectant present in incoming water. If you want to add or change treatment systems, do research on what the positives/negatives of different treatment systems and what would be the most effective method for each building.

Types of Faucets

Hands-Free, Low-Flow faucets are for the majority of what is installed in patient care areas. These faucets allow for reduced risk of infection control (related to hand hygiene) and they greatly help conserve water consumption, but the Madison VA Hospital has found that these faucets have a higher risk of positive legionella. The hands-free faucets have more internal components which create a greater surface area for biofilm and Legionella growth. In addition, with the low-flow that comes with the hands-free faucets, there is not the proper circulation provided in areas to supply fresh water with the proper amount of chlorine. Also, with the low-flow fixtures, it is harder to keep proper temperatures (above 124°F for hot and below 67°F for cold) throughout the distribution lines.

- **Recommendation:** With prioritizing higher risk areas first, replace the hands-free, low-flow faucets with dual levered or other type of fixture. There are multiple types and you can research on what would best suit your needs. See pictures below:



Testing Lab

Criterion Laboratories Inc. is currently the lab testing the Hines VA Hospital's legionella quarterly results. They provide a legionella detection limit of 0.4 CFU/mL. Previously, NALCO Inc. was utilized and they had a legionella detection limit of 10 CFU/mL. This change in detection limits has provided the Hines VA Hospital with more positive legionella results with many samples coming back below 10 CFU/mL. The Madison, WI VA Hospital is currently using Phigenics, which provide a detection limit of 1 CFU/mL.

- **Recommendation:** Do research on different water testing laboratories and what would be the best option for the hospital. While you are researching, determine what detection limit is appropriate and if location of lab is important (closer to the facility may be a benefit). Other testing labs may also provide better recommendations for remediating legionella.

Incoming Source Water

All of the water used at the Hines VA Medical Hospital is sourced from Lake Michigan.

- **Recommendation:** To have a better understanding of what quality the water coming through the water distribution system is, this incoming source water needs to be continuously monitored for incoming water pressure, temperature, pH, dissolved solids and oxidant/biocide residual. This will provide data to properly treat the incoming water based on what may be needed (e.g. more chlorine).

Temperature

Temperature is the primary prevention method to inhibit the growth of Legionella throughout the water distribution system. Water temperatures at 124°F or higher are necessary to inhibit Legionella growth in hot water systems. If a building utilizes domestic hot water storage tanks, the water temperature of all such storage tanks must be maintained at a minimum of 140°F to prevent Legionella growth. If a building utilizes instantaneous heat exchangers, the minimum discharge temperature must be 130°F.

Cold water systems 67°F or lower tend to be too cold to foster growth of Legionella. The cold water temperature should be maintained to the greatest extent practicable to inhibit growth.

The temperatures taken from the FY16 3rd Quarter legionella samples were all between 68.4°F and 98.7°F. Meaning, there was not one water sample temperature that was in range (hot or cold). These temperatures are taken as the samples are drawn out of the selected faucets. If the samples are first draw, the out of range temperatures could be plausible (but not likely), but if they are not first draw, then there are issues that need to be rectified.

- **Recommendation:** There needs to be monitoring/alarms on all of the building's hot water systems to track/monitor each of the system's temperatures. If the water temperature goes out of range (below 140°F for tanks, below 130°F for instantaneous) for too long an alarm should notify personnel and the reason for the alarm must be investigated.

Outlet temperature checks need to be randomly performed quarterly in pre-selected areas to confirm water distribution temperatures. These temperatures should be above 124°F for hot and below 67°F for cold. If a sink has a mixing valve, the temperature should be between 100°F (Madison's determined low limit) and 110°F (VA Directive maximum limit) to prevent scalding. Track how long it takes to get to these temperature set-points to help determine if there are any issues (backflow, cross connections, low flow, etc.). This ultimately confirms whether or not the proper temperatures are maintained to inhibit the growth of legionella throughout the system.

Note: Use of piping system insulation, automatic drain devices and recirculation can limit the rate and duration of increased temperatures within the cold water distribution system.

Flushing

Regular flushing of hot and cold water outlets that are not in routine use (construction areas) or which experience low flow, is necessary to insure engineering controls are maintained at sufficient levels to inhibit Legionella growth throughout the water

distribution system and fixtures. These irregular use fixtures must be flushed at least twice per week to prevent water stagnation for extended periods of time.

Currently, Hines VA is not flushing construction areas/low flow areas twice a week. Flushing is only utilized if a positive legionella sample is found. This reactive flushing to positive legionella samples is done daily until results come back negative.

- **Recommendation:** Be proactive instead of reactive! Instead of flushing after receiving positive legionella sample in areas, do a risk assessment on patient care areas and identify locations of low flow in the water distribution and flush the outlets in that area 2 times a week (at a minimum) for a determined amount of time. There is no set amount of time in the VA Directive of length of flush (Madison does 5 minutes/flush).

Construction areas with active water lines must also be flushed 2 times a week for a determined amount of time. This eliminates legs in the water system that become stagnate and helps inhibit a growth area of Legionella.

Flushing is an easy way to help prevent Legionella. By providing fresh water in the lines, biocide levels should be maintained at the proper concentration and water temperatures should also be sustained in the appropriate range.

POU Filters

POU Filters are currently being used in locations where positive Legionella samples are found. These 30 day POU filters are being taken off after the location is found to be negative.

- **Recommendation:** Test these POU filters by taking a quarterly legionella sample to make sure the specific brand of filters is effective. Ensure that the POU filters are taken off while the faucet is being flushed daily. The filters are not designed to last the full 30 days with being flushed daily.

Accurate Distribution Pipe Drawings

There are currently not any accurate distribution pipe drawings available at the Hines VA Medical Hospital. These are needed to correct issues with dead legs throughout the water distribution to prevent water stagnation

- **Recommendation:** It is required to have accurate distribution pipe drawings to identify and cap dead legs. This will be a long-term process, but it could be very beneficial to help prevent conditions for Legionella growth and to provide information for any water distribution projects.

Start the process of creating accurate drawings in the highest risk building first and then move to others. As the drawings are developed and dead legs are identified, repair any deficiencies found in the water distribution system.

Mitigation Plan SOP

Emergency remediation of a building's potable water distribution system(s) is triggered, at a minimum, by certain occurrences: identification of a definite HCA LD case, identification of a possible HCA LD case and Legionella-positive water results, or identification of Legionella-positive water results during routine environmental testing.

Emergency remediation is to include any or all of the following immediate procedures:

- Thermal Eradication
 - Shock Chlorination
- **Recommendation:** Review the VHA Directive 1061 and the mitigation flow charts. These flow charts will help determine what process needs to be done if samples are positive for Legionella.

Perform a risk assessment and create an SOP to carry out the emergency remediation procedures for each building.

Trending

Currently the Hines VA Medical Hospital is not doing any data trending.

- **Recommendation:** Trending data (chlorine levels, positive locations, types of faucets with positive samples, water temperatures) can be very beneficial to finding reasons of why certain areas are coming back positive with Legionella. This process also helps to be proactive in preventing Legionella by finding these trends and remediating them.

End of Report