RE-opening Your Buildings

Checklist

COVID-19 “stay-at-home” orders have reduced water usage in facilities across the globe as buildings are shutdown or operated with low occupancy. The resulting stagnation in building water system equipment, piping, and fixtures can increase the risk for Legionella and other biofilm associated bacteria, contribute to unsafe levels of lead and copper in domestic water systems, and other problems.

This checklist was developed to provide facility managers, building owners and operators with an overview of strategies that can be taken now and when buildings reopen to help address the Legionella risks associated with stagnation. However, due to the complexity of building water systems, the impact of operational and maintenance practices, and the universal nature of Legionella bacteria, no plan, program, or maintenance measures can guarantee the absence Legionella or other problems.

Stagnation Increases Health Risks

- Stay-at-home measures have dramatically reduced water usage in buildings across the globe (commercial, hospitality, dorms, arenas, etc.)
- The resulting stagnation in water system equipment, piping, and fixtures:
    - Increases risk for Legionella and other biofilm associated bacteria to grow
    - May contribute to unsafe levels of lead and copper in potable water
    - Microbiologically influenced corrosion and biofouling
    - Contribute to aesthetic issues with water at points of use

- Important for facility managers, building owners and operators to understand the actions they can take while buildings are shut-down and when buildings re-open to help reduce health risks
- If you have developed a WMP, consult with the Program Team and follow the Plan
- Impossible to guarantee the absence of Legionella and other health risks
    - Complexity of building water systems
    - Impact of operational and maintenance practices
    - Universal nature of Legionella bacteria

Why Stagnation Increases Legionella Risks

- Building water systems can present significant *Legionella* risks even when fully occupied
- Stagnant water increases these risks by favoring the growth of biofilms
    - Microscopic colonies of surface-attached bacteria
    - Biofilms are directly linked to the growth of *Legionella* bacteria
- Without flow:
    - Chlorine added to the building water supply degrades as the it stagnates in potable water system piping, causing residuals to drop to ineffective levels
    - Biocide and disinfectant additions to cooling tower systems, decorative fountains, and hot tubs cannot effectively control microbial growth
    - Water temperatures can stabilize into the ideal range for *Legionella* growth (77° to 108°F).

CDC Guidance

The CDC Bulletin: Guidance for Building Water Systems is posted on IDEAConnect. Be sure you have the version that was updated April 22, 2020. This bulletin provides a good list of **WHAT** to do, this checklist is designed to give you some practical suggestions on **HOW** to do the things that the CDC recommends

Many facilities have a Water Risk Management Plan, such as an ASHRAE 188 or other, to provide guidance and protocols to minimize the risk of water borne pathogens, such as legionella pneumophila in their utility water systems. **If you have a plan, and it addresses shut down and restarts of this magnitude, you should follow it.** If you do NOT have a plan, or it does not address shut downs of this magnitude, here is a checklist to help guide you through some of the key steps you may need to take.

1. Make Sure You Have Enough Disinfectant in Your City Water
    a. For chlorine, most areas of the country have 0.2 to 2.0 ppm of free chlorine normally being supplied to campus
        i. Up to 4.0 ppm is allowed
        ii. If it is below 0.2 ppm ask your PWS to increase disinfectant levels
    b. For monochloramine most PWS are delivering 1.0 to 3.0 ppm as total chlorine
        i. Up to 5.0 ppm is allowed
        ii. If it is below 0.5ppm ask your PWS to increase disinfectant levels
    c. Consider asking your PWS to increase disinfectant levels in their water supply during the period when you are going to be recommissioning your buildings, they should be able to accommodate you.

i. 2.0 to 4.0 ppm of free chlorine or 2.5 ppm to 5.0 ppm of monochloramine as total chlorine would be ideal

2. Flushing Your Systems: Flush and Verify
    a. Goal is to replicate normal use of the system while not wasting water
        i. Keep P-traps wet to prevent sewer gasses from entering buildings
        ii. Routine flushing helps minimize risk for elevated lead and copper levels
    b. Establish a verification method (1 or more)
        i. Calculate volume of water in piping and flow rate at fixtures, replace 1-2 volumes of water in all piping
        ii. Good aesthetic quality (no discoloration or smell)
        iii. Disinfectant residual
        iv. Temperature (not always reliable)
    c. Documentation is critical!

3. Practical Flushing Advice
    a. Don't open too many faucets at once, you can suck air into the system which causes water hammer in piping
        i. This can lead to broken pipes and/or discolored water due to rattling of pipes
    b. Start at the service line to each building with high volume/velocity flush, and move towards the furthest runs.
        i. May be a good idea to keep one sink open at the end of each run to pull water that direction
    c. If the system has been stagnant, start flushing with sinks and hose bibs to remove debris then proceed to devices with diaphragms and smaller valve openings (e.g., toilets, automatic faucets, etc.).

4. Building Potable Cold Water Systems: Sinks, Showers etc.
    a. If you have been regularly flushing the POUs, storage tanks, and hot water heaters in your building, this may be adequate for the main system.
    b. Follow the equipment-specific procedures outlined elsewhere in this presentation.
    c. If you have not been flushing regularly, you should take additional more aggressive measures as follows:
        i. Heavy system flush with verified disinfectant residual and aesthetic quality verified at all POUs (may be more challenging in hot systems)
        ii. System disinfection (supplemental chlorine feed and/or superheat and flush)
        iii. Consider long-term supplemental disinfection
        iv. Other methods as determined by the Team to be appropriate

5. Electric and Manual Faucets
    a. Before returning to operation, hot and cold water fixtures should be disinfected in one of the following ways:
        i. By flowing hot and cold water through the fixtures during a full system disinfection
        ii. By performing extensive flushing with documented disinfectant residuals, temperatures, and aesthetic quality
        iii. By disassembling, disinfecting, and cleaning internal components
        iv. By replacing of fixtures and piping from the wall to the POU
    b. Routine documented flushing may mitigate the necessity of disinfecting the potable water system before the building is reoccupied. A water treatment professional should be consulted to provide a site specific plan.

6. Aerators and Flow Restrictors
    a. All faucet aerators and flow restrictors should be disinfected prior to use according to one of the following protocols:
        i. Disinfect in place by flushing water through the aerators and flow restrictors during a disinfection of the entire potable water system. Following disinfection procedure, remove equipment and clean or replace.
        ii. Remove, physically clean, and disinfecting all faucet aerators and flow restrictors by soaking in bleach before reinstalling it back onto the fixture.
    b. Where disinfection is not practical, consider replacing faucet aerators and flow restrictors.

7. Showers, Hoses & Wands
    a. All showerheads, hoses, and wands should be disinfected prior to use:
        i. In place by flushing water through the all components during a disinfection of the entire potable water system.
        ii. By removing the showerhead, shower wand and hose assembly, cleaning it, and manually disinfecting it with bleach before reinstalling it back onto the fixture.
    b. Where disinfection is not practical, consider replacing the showerhead or shower wand and hose assembly.
        i.
8. Drinking Fountains and Water Coolers
    a. Wall mounted drinking fountains that are NOT refrigerated and draw directly from the potable cold water system should be treated the same as a cold water faucet.
    b. Refrigerated water coolers:
        i. Water reservoirs should cleaned and disinfected
        ii. Disinfect the inlet water supply line

iii. install new filters prior to start up.
iv. Consider replacing inlet piping from the wall
v. Using water with a confirmed disinfectant level flush and discard a volume of water equal to the capacity of the reservoir, but not less than 1 gallon

9. Ice Machines
    a. Disinfect the inlet water supply line and install new filters prior to start up. Consider replacing inlet piping from the wall.
    b. Ice machines should be cleaned, descaled, and sanitized before placing back in service.
        i. Cleaning and descaling can be done anytime during shutdown, disinfection should occur as near as possible to re-opening.
    c. Upon start up, the first 1-3 batch(es) of ice should be dumped and discarded before resuming ice making for human consumption.

10. Point of Use Water Filters
    a. POU Water filters are often installed before drinking fountains, refrigerators, soda machines, coffee filters, lab equipment, ice machines, and other equipment
    b. The majority of these filters are intended to remove chlorine for taste and odor concerns
    c. All inlet lines to devices should be disinfected, and new POU filters should be installed prior to these devices being placed back into routine service
        i. Consider replacing associated tubing
    d. If performing full system disinfection, filters should be removed to ensure water with disinfectant is passed to POU

11. Coffee Machines and Drink Dispensers

a. Coffee and other hot beverage machines
    i. Water reservoirs should cleaned and disinfected
    ii. Disinfect the inlet water supply line
    iii. Install new filters prior to start up.
    iv. Consider replacing inlet piping from the wall
    v. Prepare and discard the first several cups/pots of hot beverage
        - Equivalent to the volume of the reservoir or 1 gallon, whichever is greater
b. Cold Drink Dispensers
    i. Water reservoirs should cleaned and disinfected
    ii. Disinfect the inlet water supply line
    iii. Install new filters prior to start up.
    iv. Consider replacing inlet piping from the wall
    v. Using water with a confirmed disinfectant level prepare and discard the first several cups of cold beverage
        - Equivalent to the volume of the reservoir or 1 gallon, whichever is greater

12. Eyewash Stations and Safety Showers
    a. Eyewash stations should be flushed weekly in accordance with manufacturer, ANSI, and OSHA guidance.
    b. Safety showers should be flushed monthly in accordance with manufacturer, ANSI, and OSHA guidance

13. Decorative Fountains
    a. Ideally all decorative fountains were completely drained unless approved treatment and monitoring protocols are maintained
    b. All indoor and outdoor decorative fountains and man-made aesthetic fountains, water walls, cascades, etc., not in operation for 3 or more days must be drained and all components cleaned

and disinfected before start up.

14. Swimming Pools, Hot Tubs, Spas
    a. All swimming pools, hot tubs, and whirlpool spas must be operated and maintained in accordance with manufacturer's recommendations, state & local licensure and health permitting processes, and the CDC Model Aquatic Health Code.
    b. If one of these systems was out of service for greater than three days, it should be completely drained unless approved treatment and monitoring protocols are maintained.
    c. All systems should be properly cleaned and disinfected prior to placing back into use.

15. Misters, Atomizers, Sprayers
    a. All misters/atomizers/cold-water humidifiers must be cleaned, disinfected, and have their filters changed (where installed) before being placed back into service.