California Association of Long Term Care Medicine (CALTCM)

Emergency Preparedness Webinar Series

Legionellosis 101

Introduction, Prevention, & Response

Arranged by

Fire Life & Safety, Inc. (Stan the Fireman)

Presented by

Derrick A. Denis, CIEC, CIAQP, CAC, CEOP

February 22, 2024

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SEWER GAS SOLUTIONS

Derrick A. Denis

Indoor Environmental Quality (IEQ) Professional, Industrial Hygienist, Presenter, Teacher, Author, Inventor, & Expert Witness

(Serving the nation (and sometimes the globe) from our office in Arizona and our multiple California office locations)

- Proud Father & Happy Husband
- Eagle Scout
- Weapons & Open-Handed Combat Instructor
- Industrial Hygienist & IEQ Specialist for >30 years
- Inventor of Sewer Gas Solutions, an evaporation inhibitor for plumbing traps to stop sewer gas infiltration
  - (www.SewerGasSolutions.com)
- Inventor of Disposable Fit Test Hood, a product to expedite qualitative fit testing (QLFT), reduces infections & stop the "ick" factor of shared hoods
  - https://www.emsl.com/ProdCatSearchResults.aspx?Action=Search&Text=fit%20test
- Senior Vice President for Clark Seif Clark, Inc. (CSC), environmental testing & consulting firm.
  - (www.csceng.com)
- Over 25,000 IEQ projects

- Various industry certifications (CIEC, CIAQP, CAC, CEOP, etc.)
- B.S Environmental Science, Phillips University or Ol' P.U.
- Active participant in the IEQ industry
  - Chapter Director for IAQA Phoenix Chapter
  - Previous BOD member for
    - Indoor Air Quality Association (IAQA)
    - EIA-AZ Chapter
  - Previous Advisor to AmIAQC (now ACAC)
- As an IEQ Expert
  - Appeared on television
  - Quoted in major & local newspapers
  - Published articles in trade and other periodicals
  - Published a peer reviewed scientific paper
  - Instructed numerous industry educational sessions around the world
  - Provided litigation support for both plaintiff & defense

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https://www.linkedin.com/in/derrick-a-denis-b466378/

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Importantly for today…

- Mr. Denis
  - Is a subject matter expert
  - With extensive experience in Legionellosis matters affecting vulnerable populations throughout the U.S. with many in California
  - Has educated many thousands of leaders like yourselves and line level staff regarding Legionellosis in the built environment

Whether you know it or not,
You are on the front line of providing good IEQ
for our vulnerable populations

Image source unknown

Your facility is first & foremost…

SHELTER

- No matter how amazing your clinical, administrative, environmental services, or public relations teams are…

if you ignore the facility, your people are in danger.

One topic that should be on your radar is

Legionella Disease Bacteria

or

(LDB)

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101

What is Legionellosis?

- An environmental disease.
  - Cannot be contracted from person-to-person
- Refers to 2 disease presentations:
  - **Pontiac Fever**
    - Flu-like symptoms
    - Self-resolving
    - Affects healthy adults
  - **Legionnaire's Disease (LD)**
    - Bacterial pneumonia
    - Can be fatal
    - Like most diseases it is more common and more significant for vulnerable populations
      - Immunocompromised, elderly, smokers, etc.

What Causes Legionellosis?

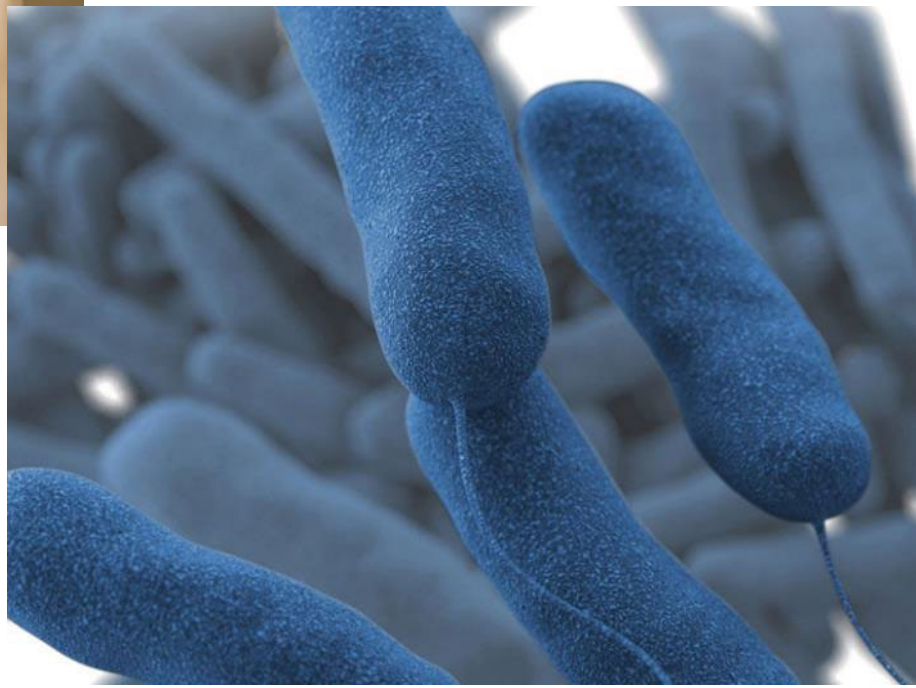
Legionnaire's Disease & Pontiac Fever

- Inhalation of water droplets (mist) containing a viable common waterborne bacteria
- Collectively these bacteria are commonly referred to as **Legionella Disease Bacteria (LDB)**
- *Legionella pneumophila* (90% of time)
  - Typically *L. pneumophila* serogroup 1, but sometimes serogroups 2-14
  - Non-pneumophila species can cause the disease
    - *L. longbeachae, L. feeleii, L. micdadei,* and *L. anisa.*

Legionella Fun Facts

- Scientists named the bacterial pathogen, *Legionella pneumophila,* after an outbreak affecting American Legion convention attendees in Philadelphia in 1976
- Thus, we have “Legionnaires’ Disease”
- “Pneumophila” is a combination of two words… “Pneumonia” & “Philadelphia”

Obligatory CDC Stock Images of LDB



A Disease of the Built Environment

- Naturally occurring LDB in freshwater is generally at insufficient quantities to cause disease
- The water reaching your facility or your home IS NOT STERILE, municipalities merely control microbes at delivery
- Pool example:

Photo credit to fatherly.com

DOMESTIC SUPPLY WATER IS NOT STERILE

- Disinfectants are added **to control** microorganisms, but domestic water supply is not sterile.
- After it leaves the treatment plant,
  - the disinfectant only lessen in concentration
  - the water contacts many nonsterile surfaces

The Journey of Water

- **After city disinfection, how many miles traveled and how much time passed before city water reaches your coffee pot?**

Is Legionellosis (Legionnaires' Disease & Pontiac Fever) reportable?

- **Yes, Legionellosis is a nationally notifiable disease.**
  - Lab-confirmed cases of Legionellosis should be reported to state health departments, who are to notify CDC.

The BAD News

- Is a serious matter
- Legionnaires' disease can be fatal
- In general population 1-in-10 people who contract Legionnaires' Disease will succumb
  - (10% mortality rate)
- In healthcare settings that ratio is 4-in-10
  - (40% mortality rate)

The GOOD News…

- Legionellosis is generally preventable through effective water management
- Your efforts make a difference in the safety of your staff and residents.
- How much of a difference?...
  - —(9-in-10 or 90%)

The News

- If you reinterpret “9-in-10 are preventable”… you conclude 1-in-10 are not preventable by efficient water management.

Legionnaires' Disease

- US Health Depts reported ~ 10,000 US cases of Legionnaires' disease in 2018 (CDC)
- Legionnaires' disease is underdiagnosed & so is underestimated.
- True number of Legionnaires' disease cases may be 1.8–2.7 times higher (CDC).
- Legionnaires' Disease is often merely misdiagnosed or underdiagnosed as "Atypical Pneumonia"

Exposure Occurs by the Inhalation of Water Droplets Containing Viable LDB

- Exposure Risk Hierarchy
  - High
    - Aerosol or mist inhalation
  - Moderate
    - Aspiration of water
  - Low
    - Ingestion of water

Where do water droplets containing LDB originate?

- Common Mist Sources:
  - Water Heater
  - Cooling Towers
  - Heated Spa (Hot Tub)
  - Evaporative Coolers (Swamp)
  - Mister Systems (common for outdoor patio cooling)
  - Showers
  - Humidifiers
  - Aerators
  - Nebulizers
  - Decorative water fountains
  - Commercial pass-through dish washers

- The most common exposure potential to water mist for your vulnerable SNF population & staff is during **showers**.

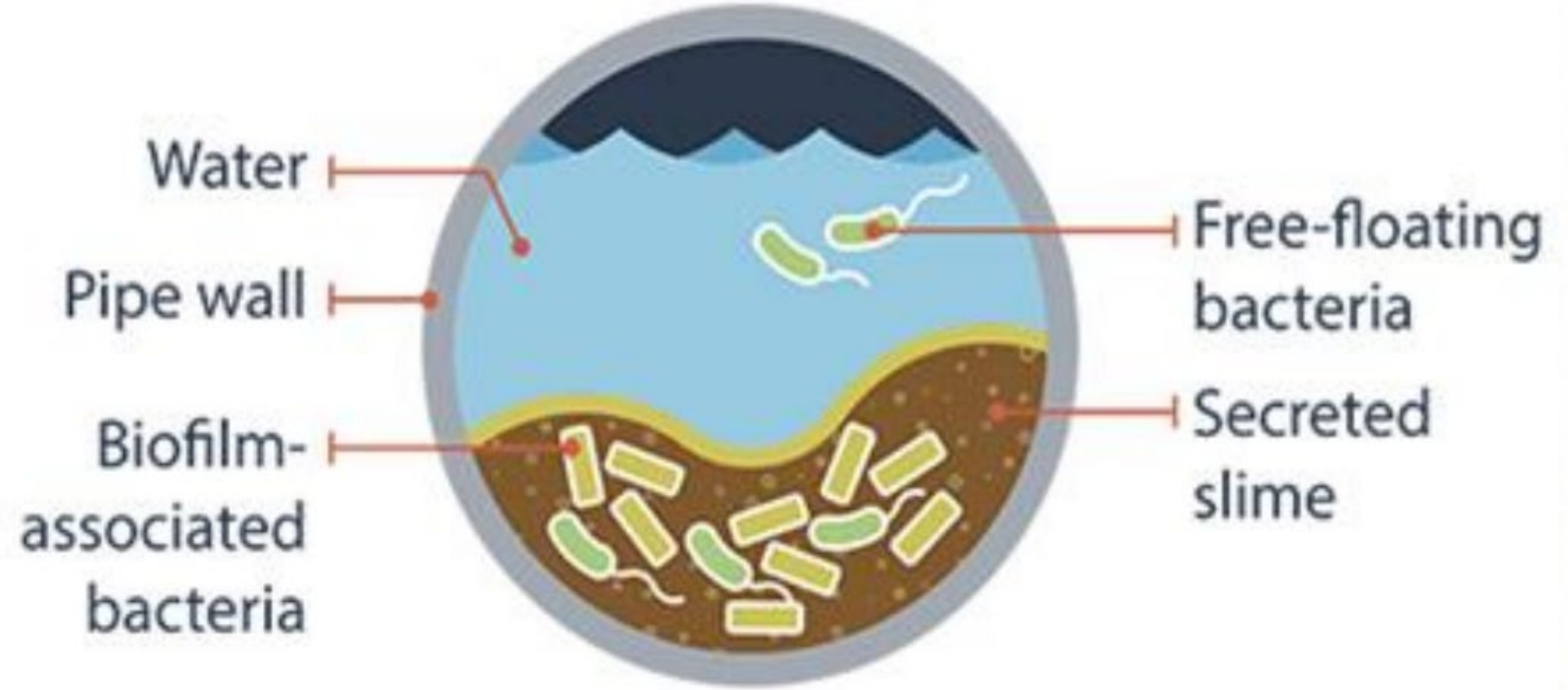
Higher Risk

- Examples
  - Healthcare settings
    - **Healthcare Associated Legionnaires Disease (HCALD)**
    - Hospitals
    - Senior living
    - Skilled Nursing
  - Institutions
    - Prisons,
    - Mental health facilities,
    - Boarding schools

Higher Risk

- Factors working against these facilities:
  - Complex water systems
  - 24 hour occupancy
    - No break in exposure, &
    - No ability to shut down for maintenance
  - Immunocompromised occupants
    - More susceptible occupants
  - Limited water turn over facility wide.
  - Increased de facto dead legs from low use/no use of fixtures (vacant units, wings, etc.).
  - Lack of compliance as a priority

Cross-section of pipe containing biofilm and Legionella



- Image from: https://www.cdc.gov/legionella/wmp/overview/growth-and-spread.html

Where are the exposures to LDB laden water droplets originating?

- Common sources:
  - Water Heater
  - Cooling Towers
  - Heated Spa
  - Evaporative Coolers (Swamp)
  - Mister Systems (common for outdoor patio cooling)
  - Humidifiers
  - Aerators
  - Nebulizers
  - Decorative water fountains
  - Commercial pass through dish washing machines
- The highest exposure potential to water mist for your vulnerable SNF population is during showers.

Legionella

- Derrick, can you share a 50 photo montage to help us better understand the complexity of water at our facilities?

Tan Water

Add a pandemic to the mix
and water quality suffers as the risk of infections skyrocket
Does the water in your water heater look like this? How would you know?

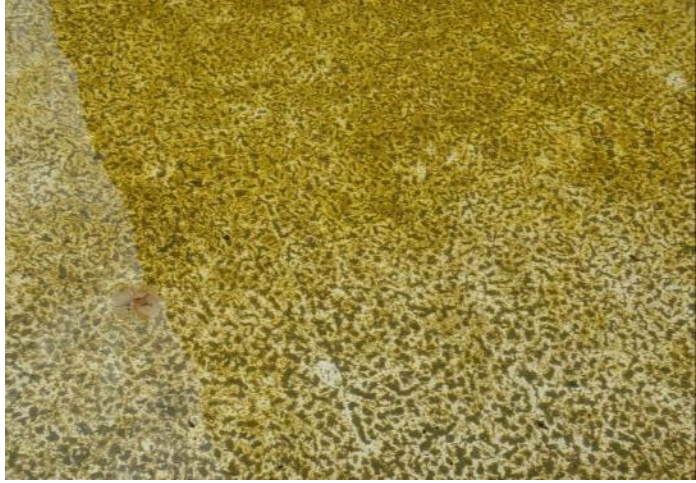
Water can be stored on site:
Water Tanks, Tank Farms, Water Towers

Water Main Outdoors

Water Main Indoors

Outdoor Fountains

Outdoor Fountains



Indoor Fountains

Indoor Fountains

Mister Systems

Outdoor Pools & Spas

Cooling Towers

Cooling Towers

Cooling towers must be maintained

(Redundant towers makes taking one off line easier in summer months)

Evaporative (Swamp) Cooler Housing must be maintained

Dead Legs (Pipes leading to nowhere)

De facto Dead Leg.
Simply and unused or underused plumbing run or fixture.
Example:
15 Year old fixture.
Never even used once.

Out of Sight. Out of Mind.

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Waterless Urinal Conversions

COVID-19 Urinals

COVID-19 Sink
De facto dead legs from COVID-19 pandemic vacancy buildings or social distancing underuse of fixtures

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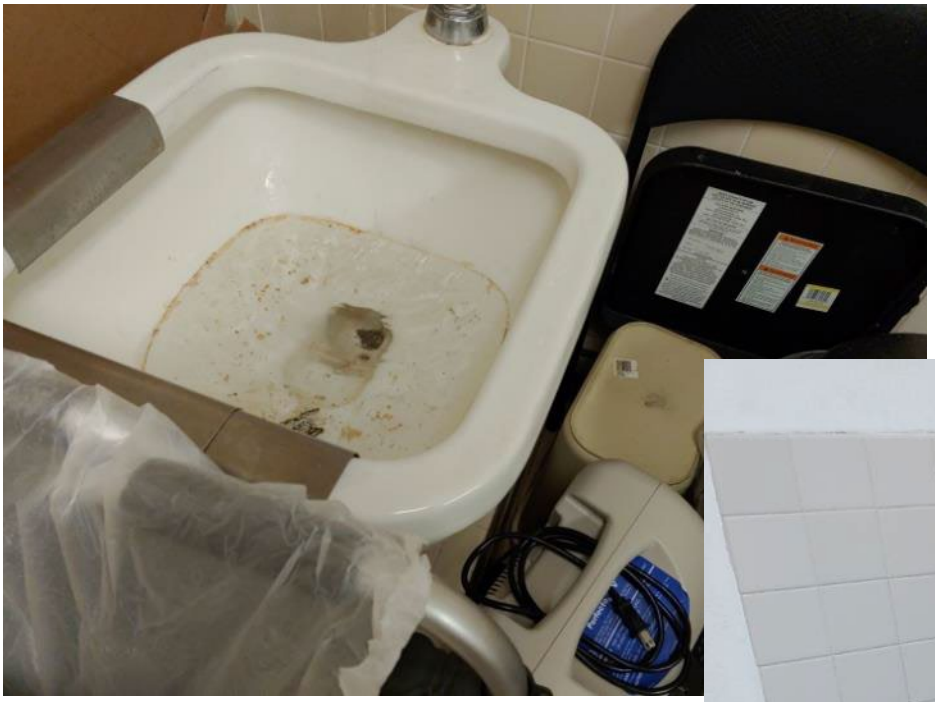
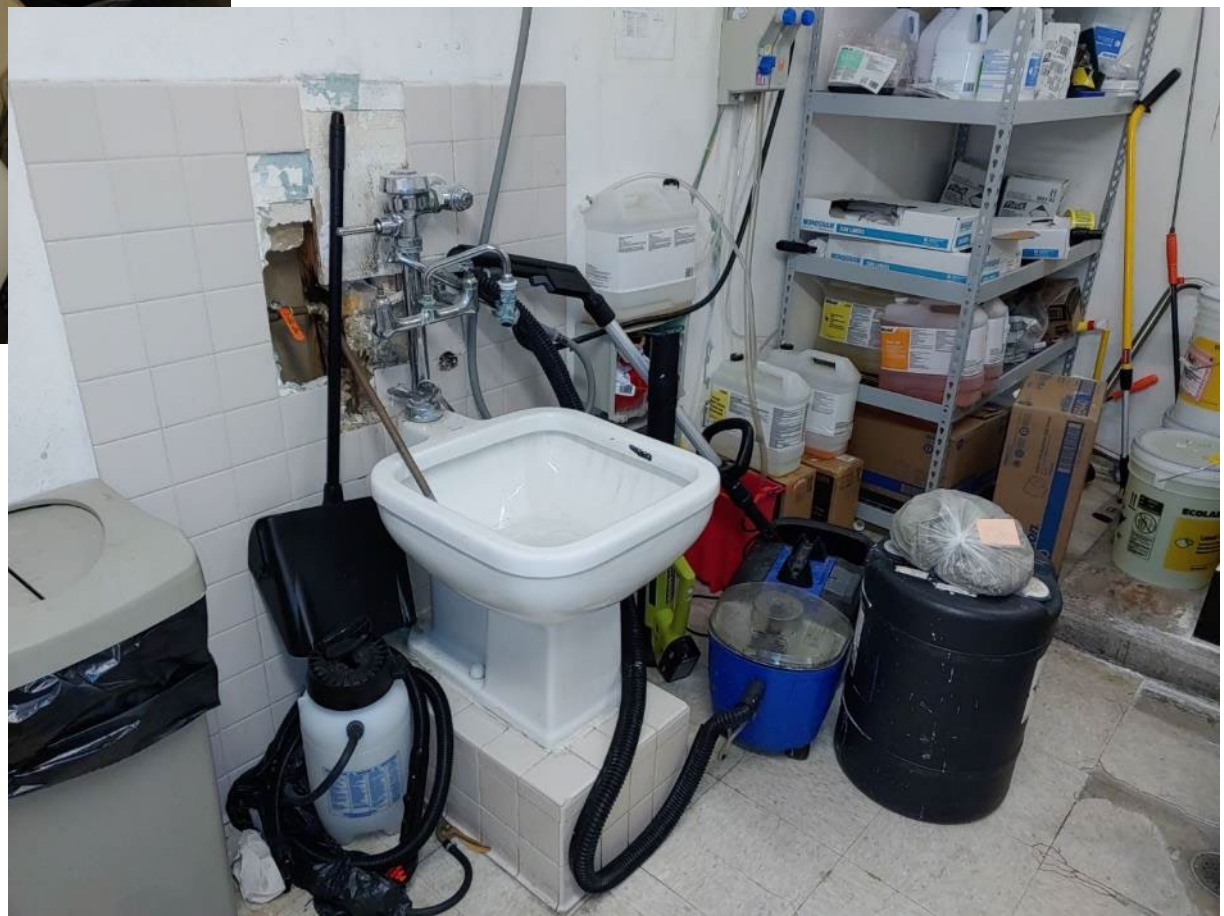
COVID-19 Water Fountain

COVID-19 Water Fountain

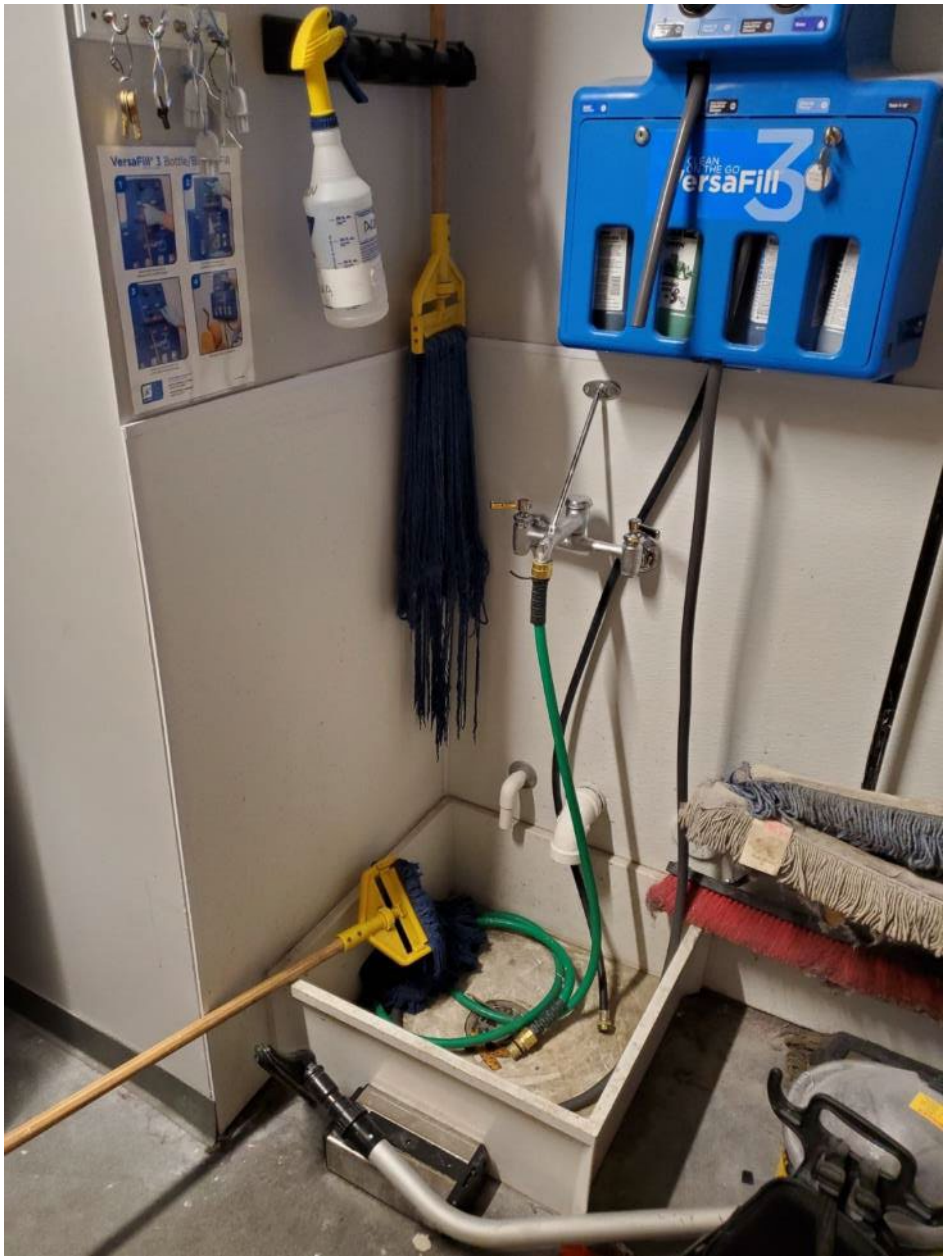
AIIRs set up. Ready for infection control. Growing LDB while waiting

Unused Hoppers



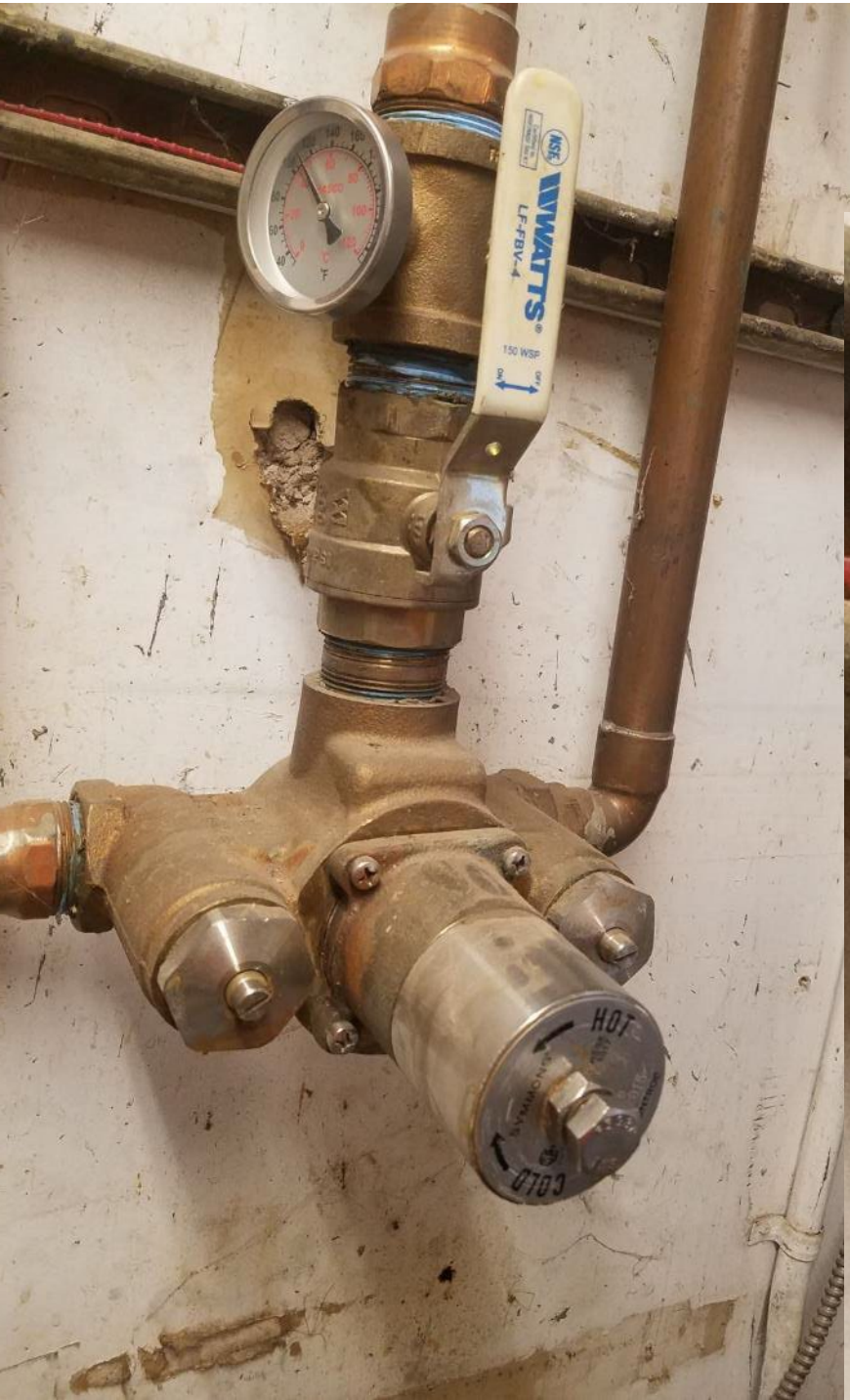


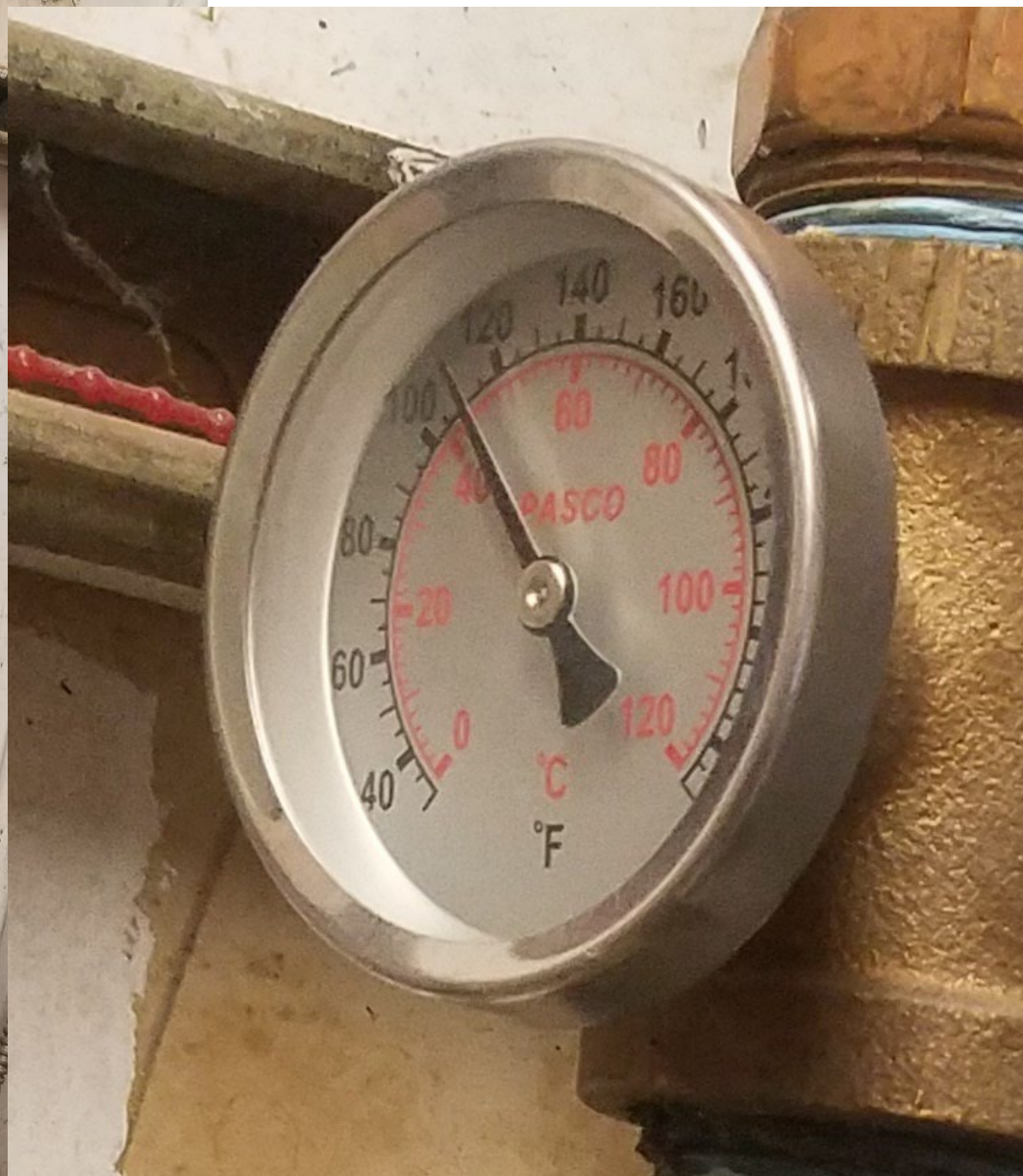
Mop Sink



Sink, Hidden Away

Mixing Valves





Showers, Un or Under-Used

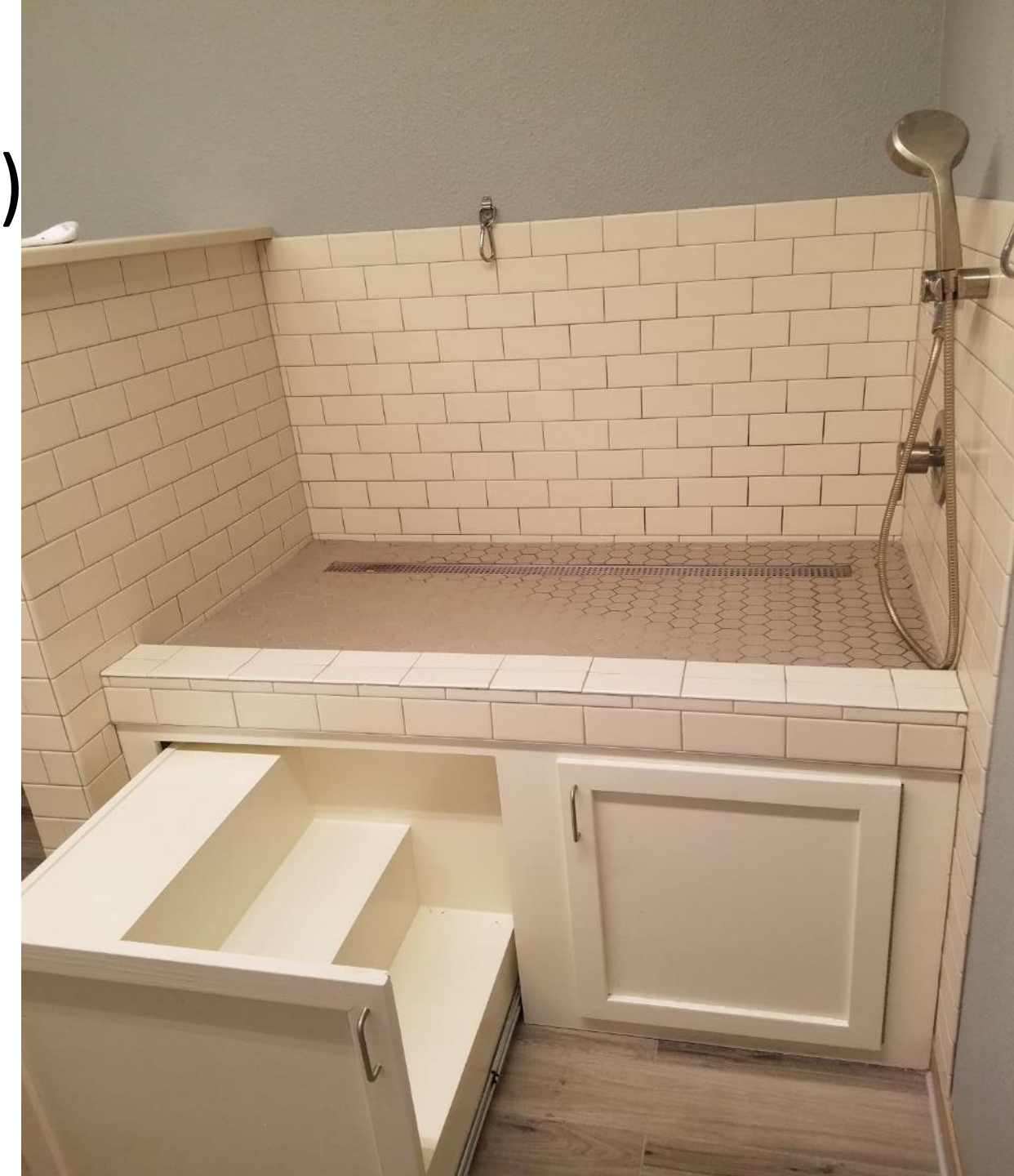
Hard water. Wand hose. Scale.

Tubs
Un or Under-Used

Walk-In Tubs (Low Use)

Jetted Spa (Low Use, Higher Risk of Water Droplet Aerosolization)

Pet Wash
(Cute, Low Use)

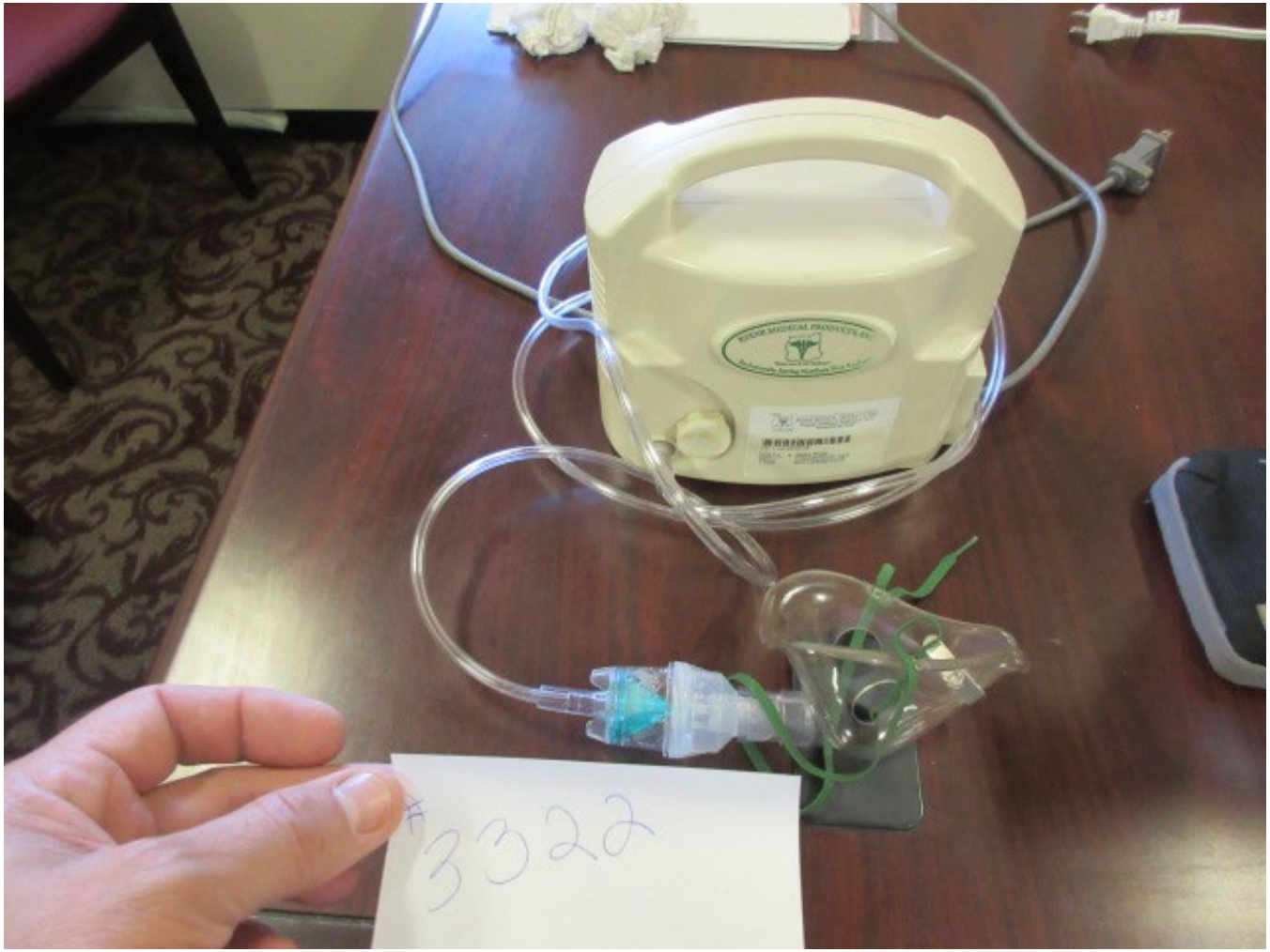


Icemaker
(Requires Regular PM, Including Filter)

Water Filters

Water Dispensers

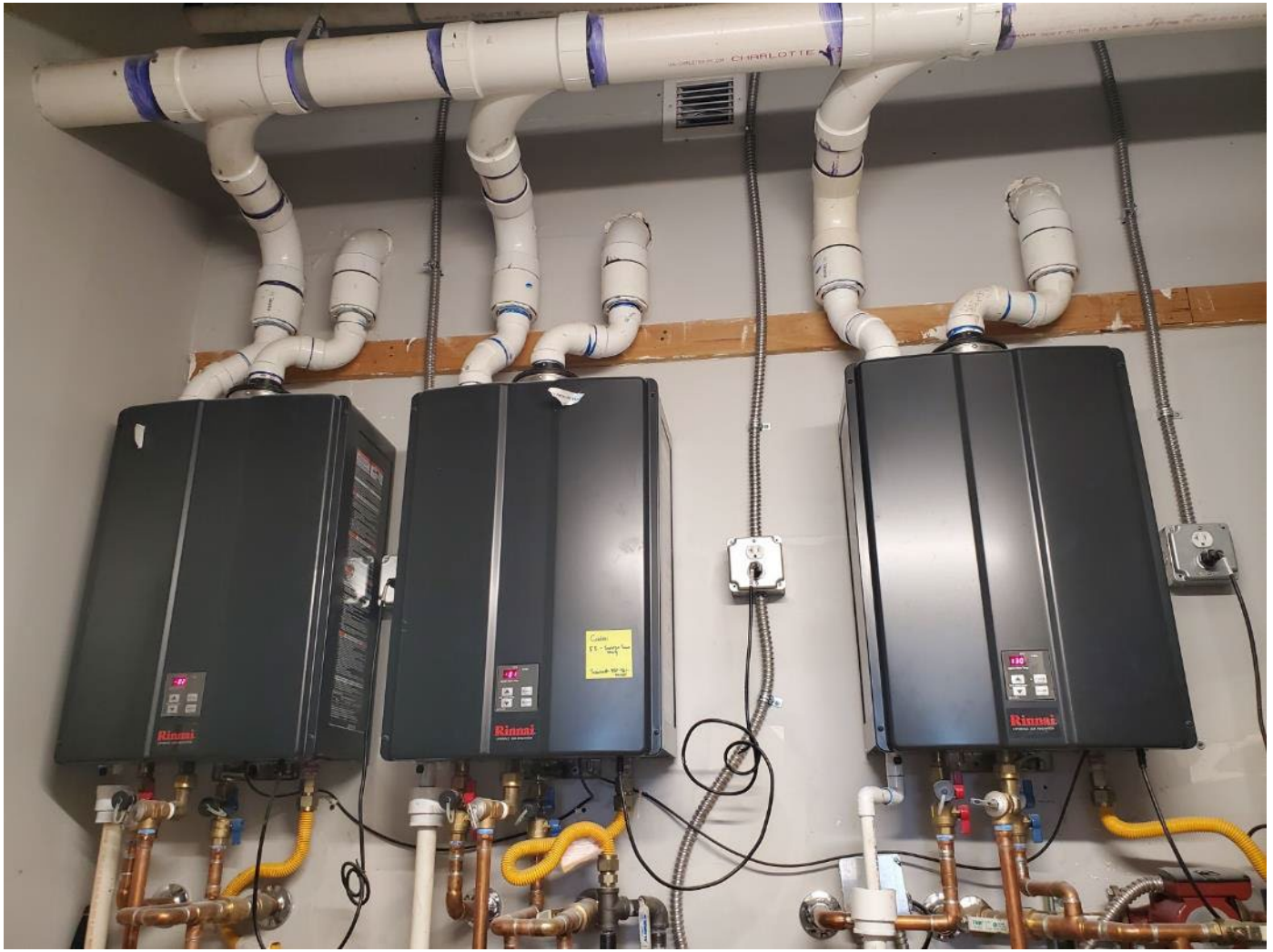
Nebulizer



Humidifier

Water Heaters

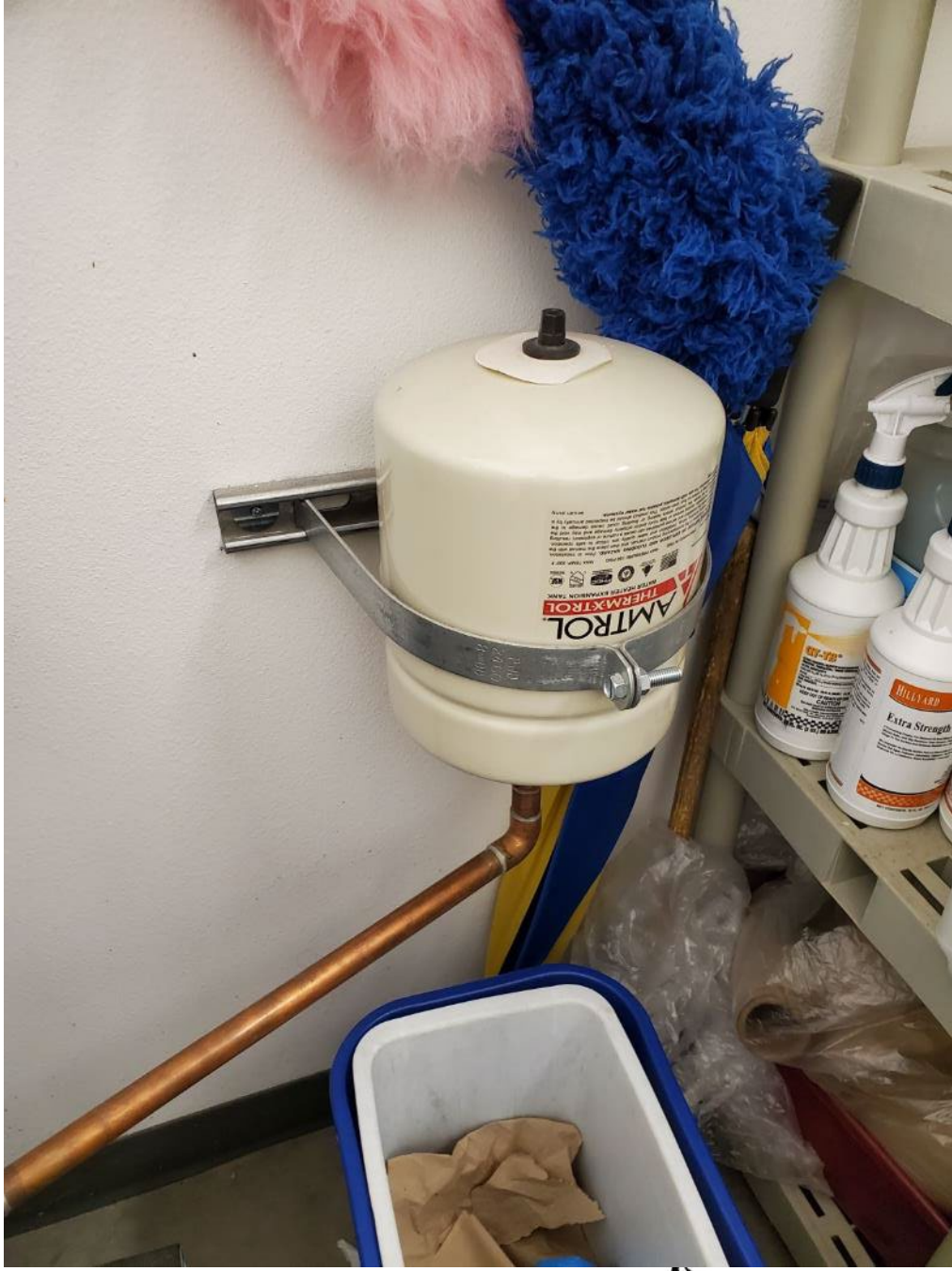
Water Heaters (Tankless)



Water Heaters, Sub-sink Insta-hot

Hot Water Storage

Expansion Tanks



Control Points

(ID them. Understand them. Exercise them. Use them in emergent & non-emergent situations)

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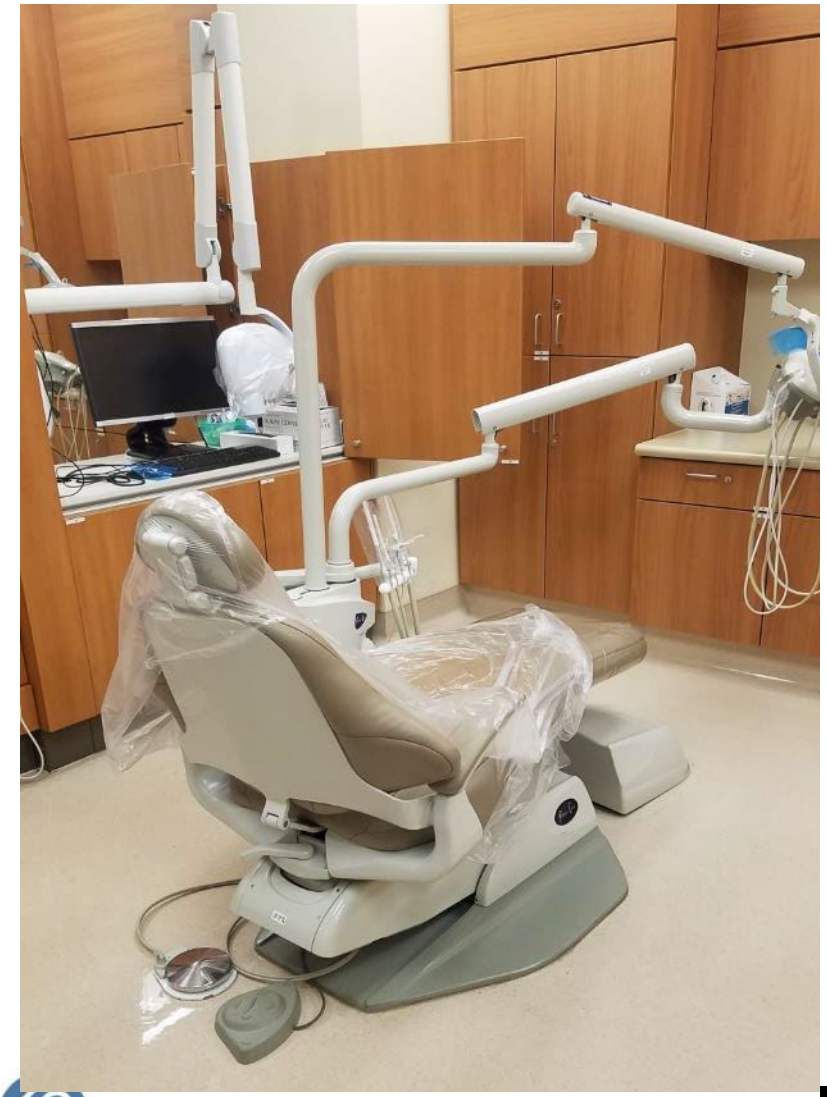
Dental water is not immune to LDB or other microbes



Portable Eye Wash

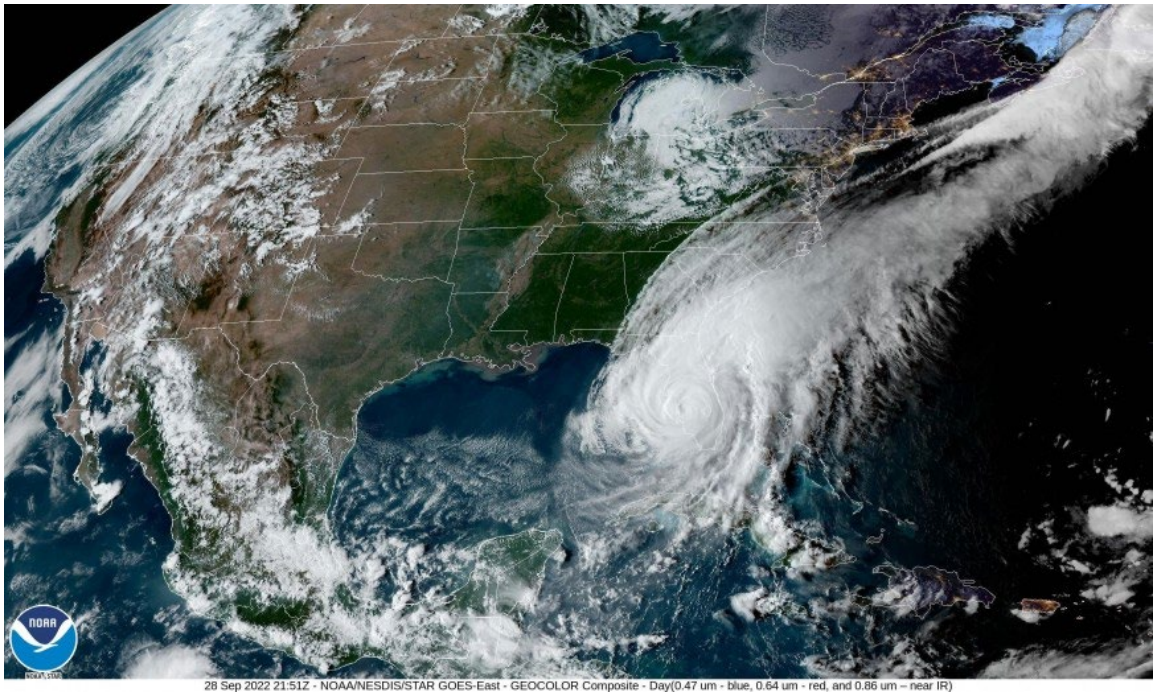
Emergency Showers & Eye Washes

Atypical Water Sources

Emergency/Disaster Water Supply & Fixture Management Cannot be Overlooked (Temp RRs, Showers & Water Vessels) (CO alert!)

Hurricane/ Earthquake/ Power Loss

- Disruption of Water Treatment
- Stagnation of water
- Contamination of water supply
- Increased biological activity in domestic water (LDB and other)



Prevention

You are not preventing LDB in your water system. You must work to control it.

- Presume LDB in ALL FACILITY WATER
- Work to Prevent Colonization.
- Continuously Manage Using a Purposeful Plan

LDB are ubiquitous, so what should we do?

- LDB is omnipresent in our water supply
- So, we take purposeful, proactive & recurring steps in line with general infection control guidelines.
- We comply with ASHRAE Standard 188-2015: Legionellosis: Risk Management for Building Water Systems June 26, 2015 (ASHRAE 188):

What Do You Need

- **Water Management Plan (WMP) or Water Management Program (WMP)** for **Legionella risk assessment** and **control**.
  - Most will follow state of the art **ANSI/ASHRAE Standard 188 Legionellosis: Risk Management for Building Water Systems**
  - It **protects** residents and staff
  - It keeps your facility in **compliance**.

Federal Compliance

42 CFR §483.80 Infection Control for Skilled Nursing Facilities & Nursing Facilities:

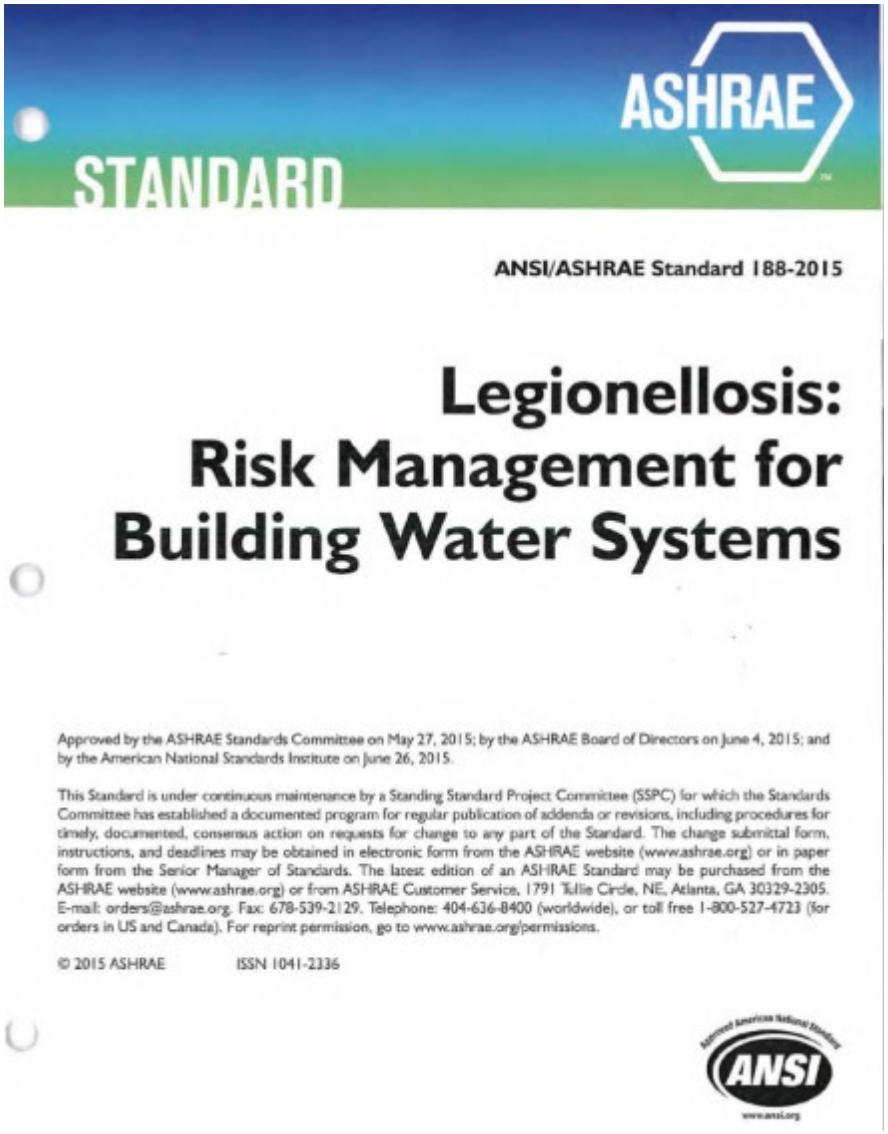
- "The facility must
  - establish and maintain an infection prevention and control program
  - designed to provide a safe, sanitary, & comfortable environment, and
  - to help prevent the development and transmission of communicable diseases & infections."

CMS Compliance

- Facilities receiving Medicare & Medicaid funding required to incorporate Legionella controls in a WMP
  - Per the CMS memo QSO-17-30-Hospitals/CAHs/NHs, released on June 2, 2017 (Updated July 6, 2018), titled, **"Requirement to Reduce Legionella Risk in Healthcare Facility Water Systems to Prevent Cases & Outbreaks of Legionnaires' Disease (LD)",**
  - "Facilities must develop and adhere to policies and procedures that inhibit microbial growth in building water systems that reduce the risk of growth and spread of Legionella and other opportunistic pathogens in water."
  - This memo references the ASHRAE Standard 188-2015: *Legionellosis: Risk Management for Building Water Systems*

The Program

- The purpose of this standard is to establish minimum Legionellosis risk management requirements for building water systems.


STANDARD

ASHRAE

ANSI/ASHRAE Standard 188-2015

Legionellosis: Risk Management for Building Water Systems

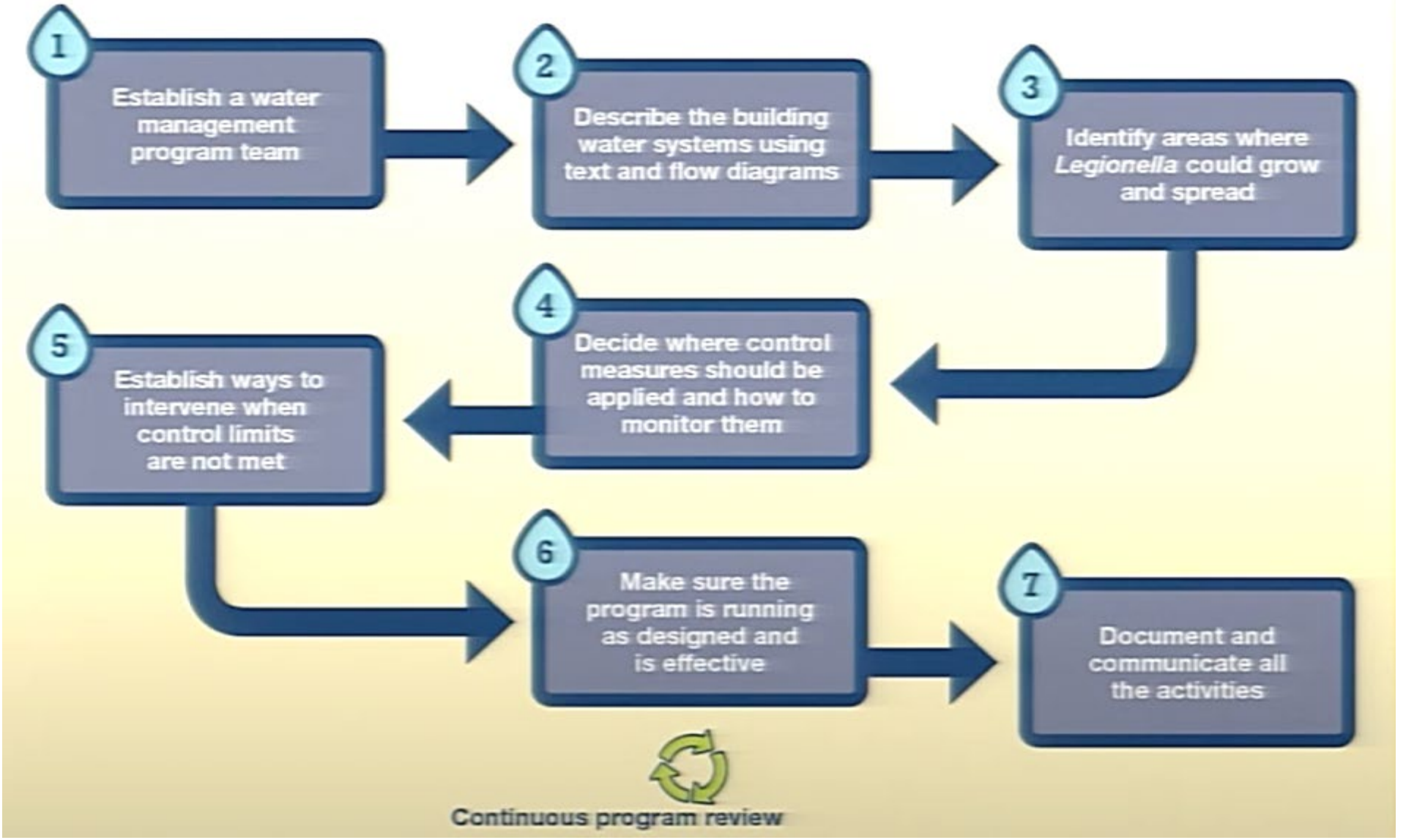
Approved by the ASHRAE Standards Committee on May 27, 2015; by the ASHRAE Board of Directors on June 4, 2015; and by the American National Standards Institute on June 26, 2015.

This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE website (www.ashrae.org) or in paper form from the Senior Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

 ISSN 1041-2336

ANSI

8 Elements of a WMP



Teamwork Makes the Dream Work

8 Elements of a WMP

1. Program Team

a) Identify persons responsible for Program development and implementation.

2. Describe Water System/Flow Diagrams

a) Describe the potable and nonpotable water systems within the building and on the building site and develop water system schematics.

8 Elements of a WMP

3. **Analysis of Building Water** Systems
   a) Conduct a systematic evaluation of hazardous conditions in the building water systems and determine where control measures shall be applied.
4. **Control Measures**
   a) Determine locations where control measures shall be applied and maintained in order to stay within established control limits.
5. **Monitoring/Corrective Actions**
   a) Establish procedures for monitoring whether control measures are operating within established limits, and if not, take corrective actions.

8 Elements of a WMP

6. Confirmation

a) Establish procedures to confirm that:

- the Program is being implemented as designed
- The Program controls the hazardous conditions throughout the building water systems - {validation}

7. Documentation

a) Establish documentation and communication procedures for all activities of the Program.

8. Continuous Program Review & Management of Change

What can you start doing immediately to manage LBD risk?

- What can you do to help reduce the bacterial load?
  1. You can make sure you are using or flushing all of your water outlets on a regular basis.
     - That includes not only toilets and sinks and showers but also outdoor hose bibs, Whirlpool Spas, janitor mop sinks, vacant space, etc.
     - Measure your chlorine levels at the main and distal points.
  2. Line up a vendor to supply POU filters and/or buy enough to deploy to your facilities if/when needed?
  3. Align yourself with an IH (like me, or others) to be on your Water Mgt Team and to help guide you on this important journey towards a viable WMP

Response

Response Measures Examples to Legionellosis at Your Facility

- In the absence of a WMP you will have to figure out response actions on the fly.
- With a WMP, you just read and execute the playbook

An example response plan

- **Communicate**
  1. Management & Line Staff receive education on Legionellosis prevention, response, & recovery.
  2. Residents, & families thereof, receive updates.
  3. Interface with and update local health dept
  4. Prepare press releases I the event the situation become public
- **Point of Use (POU) Filters**
  1. Cease shower use util POU filters are available
  2. The community installs POU filter shower heads at all showers.
- **Flushing Regimen**
  1. Flush domestic supply water including plumbing lines, control points, treatment points, holding points and delivery points.
     a. Water Heaters drain and triple flushed.
     b. Water Main flushes.
     c. Repeated flushing of all outlets (Hot & Cold) are being flushed daily.

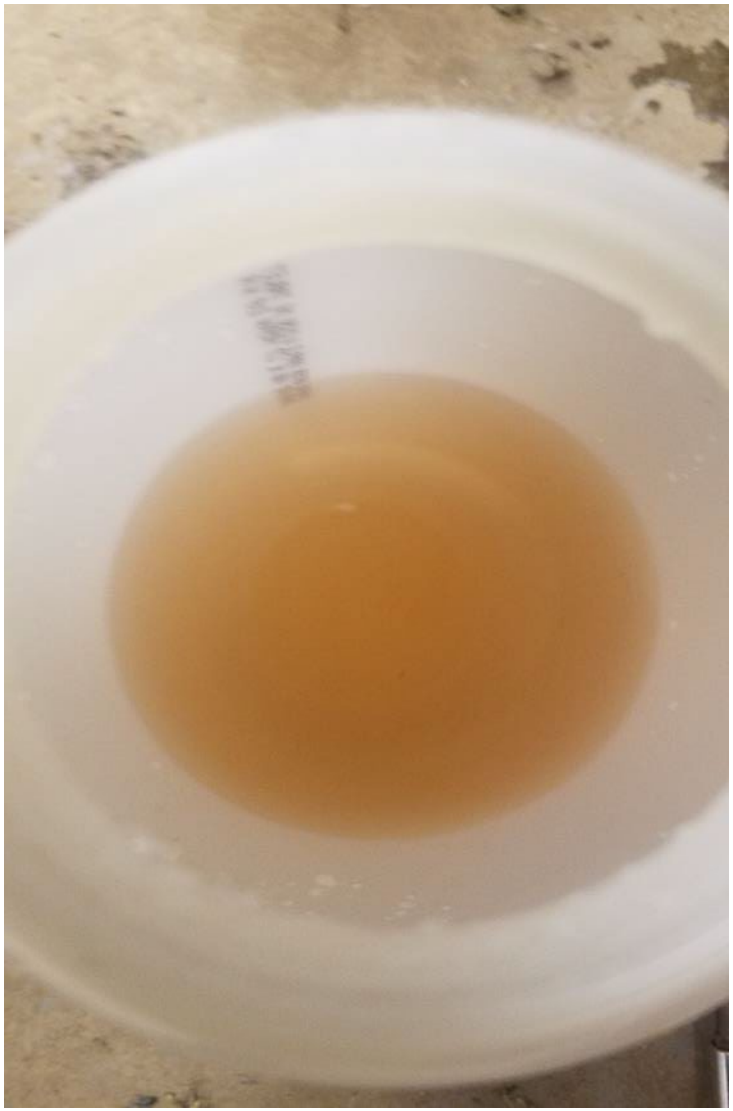
An example response plan

- **Site Response Activities Plan**
  1. Regular scheduled water or plumbing maintenance activities are all executed ahead of schedules (e.g. servicing ice makers, changing water filters, draining and flushing water heaters, etc.)
  2. Increased frequency and breadth of coverage temperature measurement
  3. Add chlorine measurement to the list of water quality measurements by the community.
- **Clinical Team Response**
  1. Staff keep eyes open for signs of, or reports of, respiratory illness.
- **Third Party Assessment and Testing**
  1. Provide subject matter expertise (education, strategy, navigating regularity framework)
  2. Walk the site with a fresh, but expert eye
  3. Measure chlorine concentrations
  4. Measure temperatures
  5. Total Heterotrophic Bacteria (THP) and/or Legionella Disease Bacteria (LDB) Testing

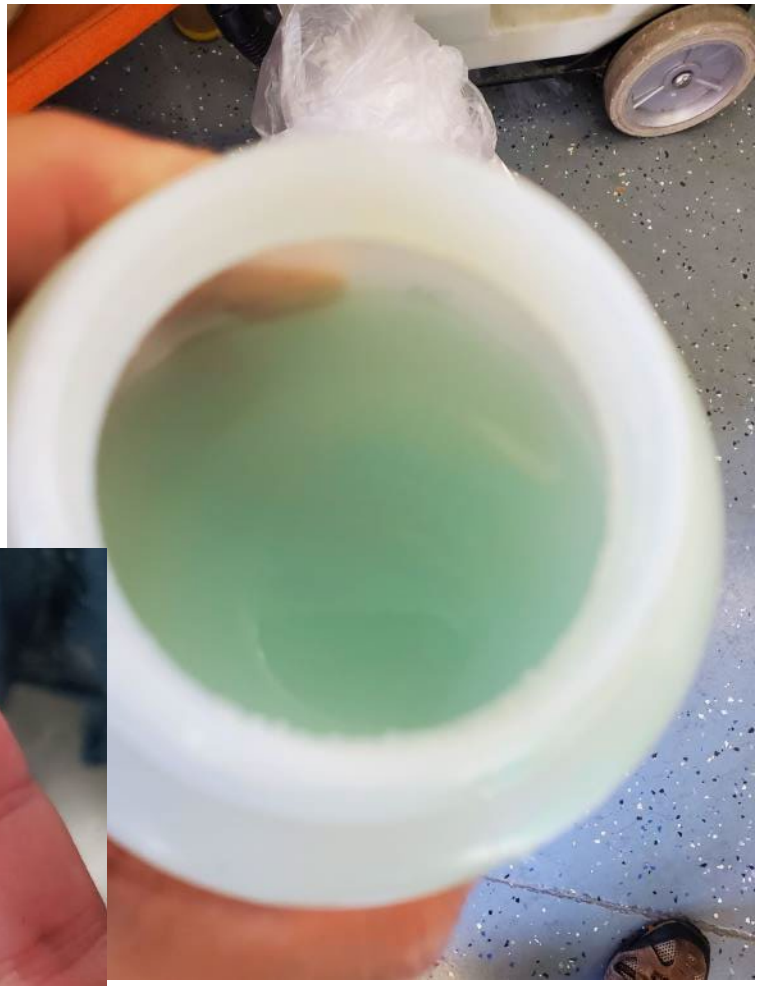
FLUSH

- All fixtures.
  - That is ALL as in ALL,
  - as in the ones you currently know,
  - and all the others you must discover.
- Regularly.
  - Until fresh city water reaches all outlets each flushing event

Flush Sediment



Flush Sediment



Flush Sediment

Don’t flood your building

- Cast Iron
  - Breaks
  - Releases sewer gas and sewer critters.
  - But, may not release water…until you overuse the system.

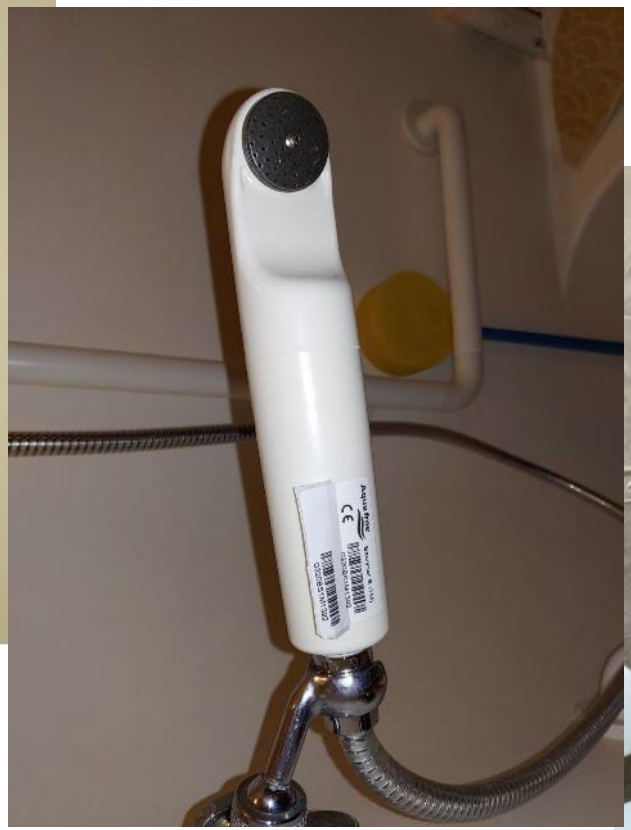
POU Stockpile

1 site, Co-op, Associations, Health Dept

(Medical Devices Expire)

Point of Use (POU) Filters

(Remove LDB & allow time to address the plumbing system issues)
Get a vendor with stock or buy a cache now.



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SEWER GAS SOLUTIONS

Measure Chlorine

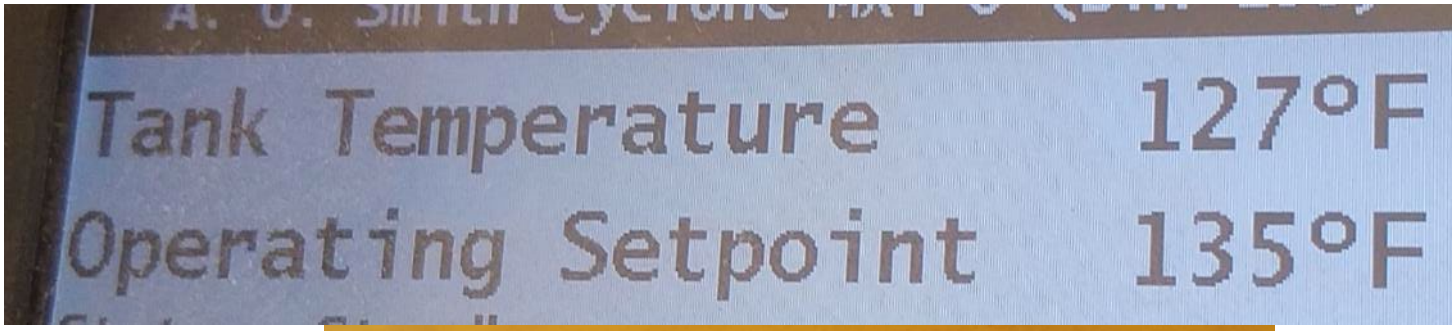
- Cheap and effective
- Low or Ultra-low test strips
- Check regularly with in-house team
- Record measurements
- Ensure chlorine at city
- Ensure your flushing is adequate.
- Representative outlets (water main, repeated locations & random locations indoors and outdoors)

Verify Actual Temperatures vs Set Points

- Liquid thermometer
  - Not IR
  - Not Hg
- Check regularly
- Record measurement
- All representative
  - Some recurring, some alternating

Verify your Gauges

Verify your Gauges



Cleaning & Disinfect Sink Aerators & Shower Wands/Heads

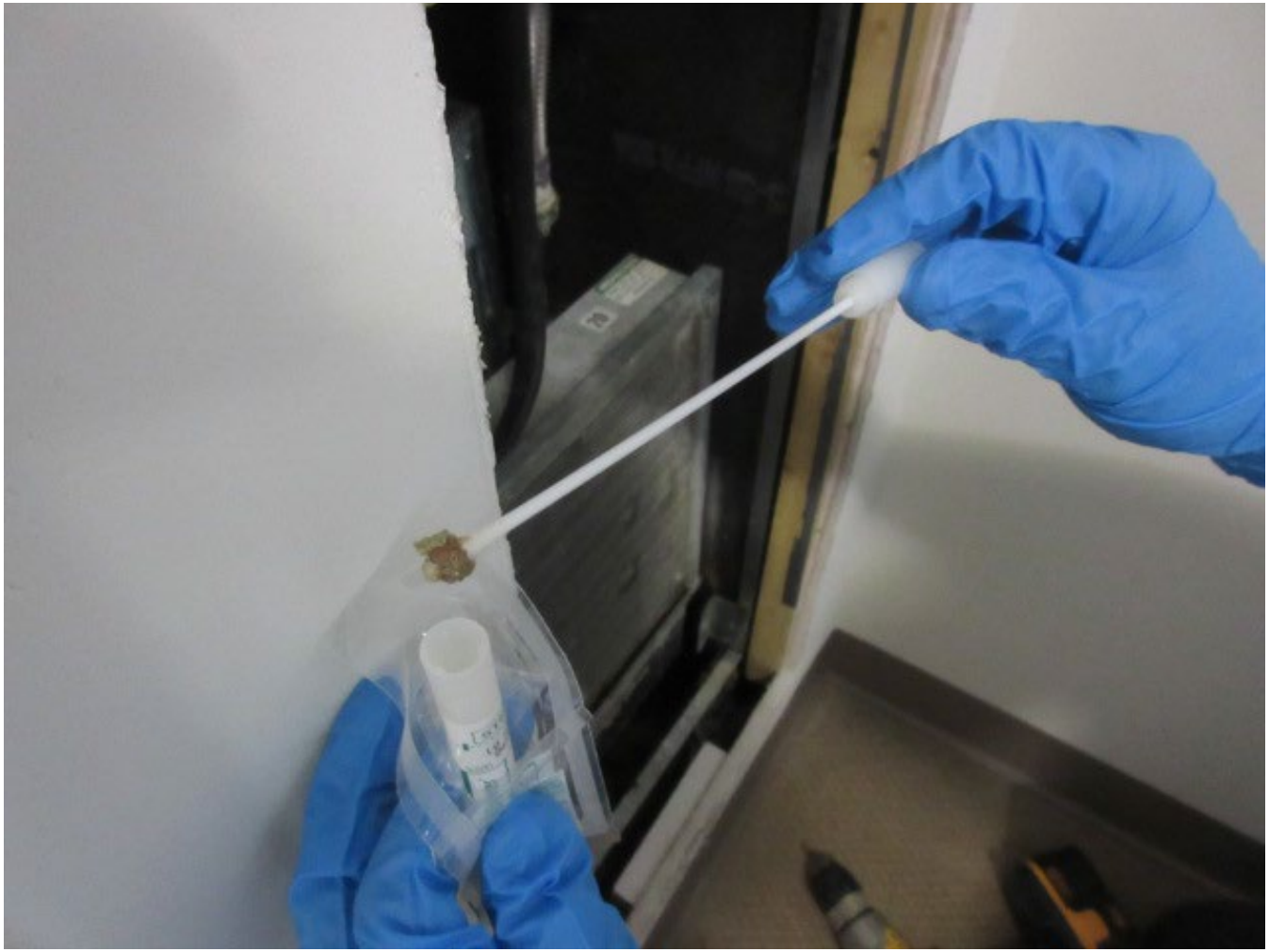
Legionella Testing

- Have an IH conduct sampling and use certified labs
- Do not use your water vendor (COI)
- As needed or per your WMP
- All representative
  - Some recurring, some alternating

Legionella Testing

Legionella Testing

Swab Sampling for LDB



When the standard fair does not achieve the LDB goals

Hyperchlorination as needed & per WMP

On Site Water Disinfection
On Site Water Treatment Facility
(Continuous Disinfection)

e.g. Chlorine Dioxide Injection

An option, but a serious consideration ($, time)

Questions?

Preguntas

Вопросы

Domande

問題

Maswali

الاسئله

imibuzo

mga tanong

Fragen

שאלות

Direct post-session questions to:

Derrick A. Denis

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  - www.csceng.com
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