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30+ Years of water safety through proven, revolutionary technology

LiquiSafe - Comprehensive Water Solutions

Uniquely Designed Solution for Your Facility
Multi-Barrier Approach
Water Management Plans
Testing

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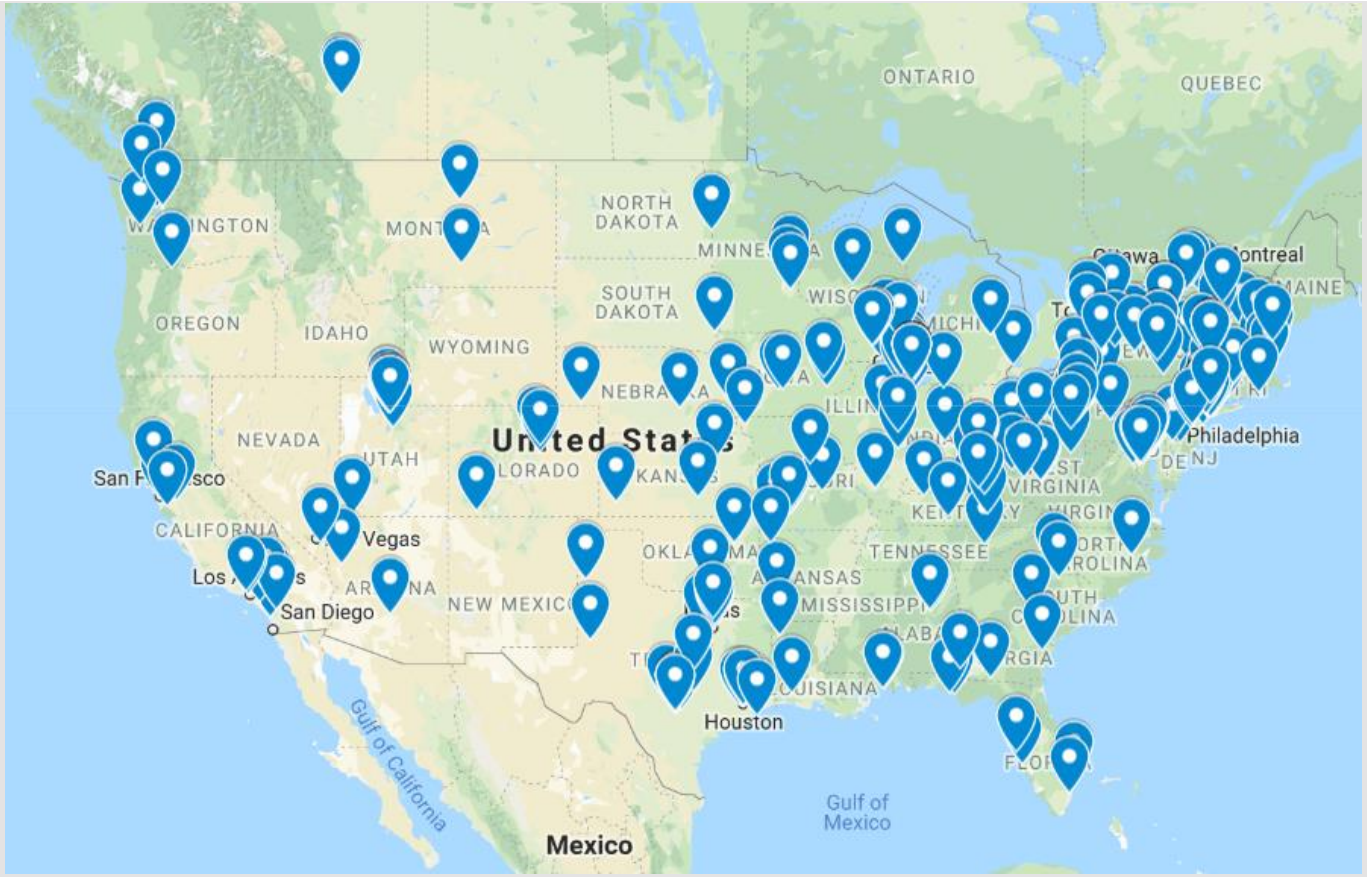
Partnering with Top Health Systems – Including Life Care Services
Over 2,000 Systems Installed

Community Health Network
Northwestern Memorial HealthCare
HCA Healthcare
RUSH UNIVERSITY MEDICAL CENTER
SynergyHealth St. Joseph's Hospital
THE UNIVERSITY OF TEXAS MD Anderson Cancer Center
Making Cancer History
NYU Hospital for Joint Diseases Orthopaedic Surgery
MATAGORDA REGIONAL MEDICAL CENTER
CBRE
NewYork-Presbyterian
NYU Medical Center
NYU School of Medicine & NYU Hospitals Center
KAISER PERMANENTE
Memorial Sloan Kettering Cancer Center
Lucile Packard Children's Hospital Stanford
Life Care Services
An LCS Company
UCLA Health
CookChildren's



COVID-19 Crisis Impact on Water

Headlines

QUARTZ

GLOBAL BUSINESS NEWS

Vacant sublet space in New York's office market is up 91% since mid-2019. By Michelle Cheng & Karen Ho

Published February 2, 2021Last updated on April 1, 2021

In another stark sign of the pandemic's impact on office-space demand, data from Costar Group, a commercial real estate firm, shows there is 12.2 million square feet of vacant sublet space in New York City as of late January 2021, up 91% from the 6.4 million square feet that was vacant and available in the second quarter of 2019.

That brings the total amount of available sublease space, including space that is currently still occupied, to 28.2 million square feet, an 82% increase from mid-2019

NYC job losses proportionately greatest among largest U.S. cities

THE NEW SCHOOL Center for New York City Affairs

By James Parrott April 9, 2021

New York City's Covid-19 payroll job loss was 13.6 percent over the first year of the pandemic, more than twice the 5.9 percent national job decline and greater than the job losses experienced in the next 14 largest U.S. cities...

GlobeSt.com™

Manhattan Office Leasing in on a Winning Streak

August was the fourth consecutive month that leasing activity increased in the market.

By Kelsi Maree Borland | September 02, 2021

Things are starting to look up in Manhattan's office market. For the fourth consecutive month, leasing activity has improved in the market, according to a new report from Colliers. In August, leasing activity totaled 2.5 million square feet, an increase of 3.9% over July and the highest since January 2020, when leasing volume totaled 3.7 million square feet……

These gains represent an exciting and rapid recovery for the city, which was crippled by the pandemic. A report from Colliers at the beginning of the year showed that Manhattan's office leasing volume in 2020 was the lowest in two decades, with full-year activity down 55.9% over the prior year and 13.4% quarter-over-quarter. As an example, only 4.16 million square feet was leased in the fourth quarter of 2020, two-thirds lower than the volume recorded in the same period in 2019…

THE WALL STREET JOURNAL.

A New Setback for Big Cities as Return to the Office Fades

The low level of employees back at their workplaces is intensifying pain for cities geared toward office life *By* Peter Grant, Dec. 1, 2020

U.S. employees started heading back to the office in greater numbers after Labor Day but that pace is stalling now, delivering another blow to economic-recovery hopes in many cities.

The recent surge in Covid-19 cases across the country has led to an uptick in Americans resuming work at home after some momentum had been building .....

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COVID: Is Your Building Ready for the Return to the New Normal?

Two issues that need to be evaluated before the return:

1

Stagnation

2

Distribution System Pattern Changes

- **Municipal**
- **Building Systems**

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COVID-19 causing Municipal Water Changes

- Stagnant Water
- Water Age
- Risk Amplification
- Bacterial Amplification

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Stagnation

“Stagnant or standing water in a plumbing system can increase the risk for growth and spread of *Legionella* and other *biofilm-associated bacteria* . When water is stagnant, hot water temperatures can decrease to the *Legionella* growth range (77°–113°F, 25°–42°C). Stagnant water can also lead to low or undetectable levels of disinfectant, such as chlorine.

A temporary shutdown or reduced operation of a building (for example, a school or a childcare facility) and reductions in normal water use can create hazards for returning occupants.

Check for hazards before reopening after a prolonged period of building inactivity. Hazards include ***Legionella*** (the cause of Legionnaires’ disease) and other *biofilm-associated bacteria*, **mold**, and **lead and copper contamination** from corroded plumbing.”

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

https://www.cdc.gov/nceh/ehs/water/legionella/building-water-system.html

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COVID Causing Decline in Water Quality

Building Water Systems

Impact on all building types:
Hospitality, Commercial and Healthcare

- As usage increases, new building water issues are being discovered:

- **Scouring effect**
  - There was a lazy-river scenario and now there is a wave pool
  - Biofilm is breaking off (fire-hose) and going downstream full of bacteria including Legionella
  - Disturbing sediment and biofilm

Major Decline in Water Quality

- Increase in discoloration-events
- Notably – An increase in detecting Legionella in cold-water
  - ❖ Detection in cold-water used to be transient
  - ❖ Before: Hard to find/Not Consistent
  - ❖ **Now,** Legionella is being detected in cold water, *even below 68 degrees*
    - Due to the disruption of biofilm and greater propensity for sediment accumulation
    - Exposing biofilms have been disruptive, fall apart and distribute biofilm and bacteria
- *Extremely important to have a re-opening plan*

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COVID Causing Decline in Water Quality

Municipal Supply

Black Swan event

- COVID created something the designers of the municipality infrastructure never anticipated
  - Immediate and drastic reduction in usage
  - Cities were designed for growth, designed for increasing capacity for the future
  - Massive building shutdowns has changed usage patterns and quality of water coming from municipalities

Results on Municipal Supply

- A disruptive event to the system
- Underutilization of the municipal distribution systems
- Sediment accumulation that hasn't happened in the past
- Decrease in water quality

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Widespread Impact:

Why it Matters

Water is the Causal Factor 30% of HAI Costs

-The Centers for Medicare and Medicaid (CMS)

LEGIONELLA

Sources of Infection:

Hot & cold-water system

Site of Infection:

Lung (pneumonia), high mortality

PSEUDOMONAS

Sources of Infection:

Potable water, contaminated liquid solutions & disinfectants

Site of Infection:

Blood, catheter site, lungs, urinary, *high mortality*

S. MALTOPHILIA

Sources of Infection:

Potable & distilled water, contaminated liquid solutions, & disinfectants

Site of Infection:

Blood, pneumonia, UTI, wound infections, skin, stools, throat

MYCOBACTERIA

Sources of Infection:

Hot water system, shower

Site of Infection:

Lungs, lymph nodes, bones and joints, the skin, and wounds

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Legionella: Facts

- Legionella is a Water-borne Pathogen
- Occurs naturally in surface water in small numbers and is dormant
- To thrive in water, Legionella requires the right growth conditions
  - Warm water, optimal temperature around 98.6 degrees
  - Presence of nutrients in water – soil or organic materials
  - Presence of other microbes (bacteria/protozoa) in water
- Not Contagious
- Transmitted through contaminated water
  - Aerosolization – Mist
  - Aspiration – accidentally swallowing water - *common with older persons*
  - Installation – ex. Medical equipment Ex. CPAP rinsed in tap water

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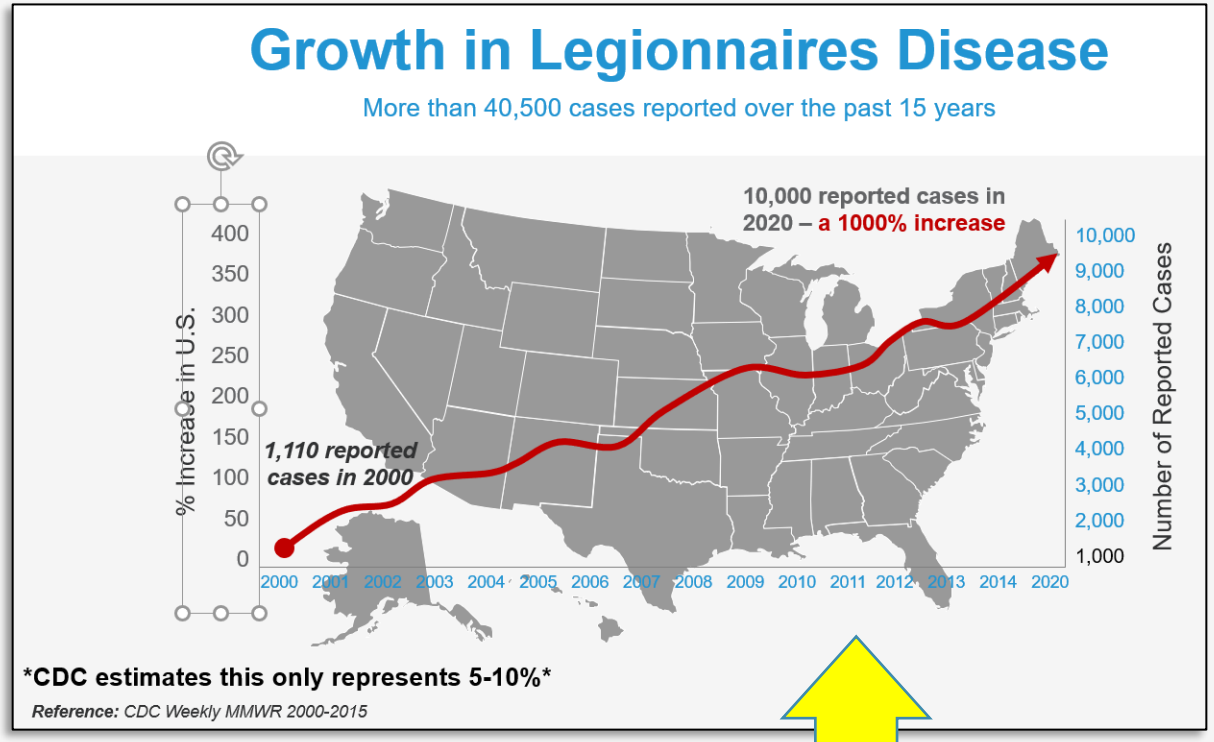
Legionella: Facts

- Legionnaire's Disease is a severe infection caused by Legionella bacteria
- Affects 10,000+ Americans each year.
- 10% Succumb each year
- CDC investigated Legionella outbreaks and found 56% of all cases and 67% of cases in healthcare facilities were linked to exposure to the building's hot water distribution system.
- **50%** of all buildings systems contain Legionella – both older buildings and new construction



PRE-PANDEMIC!

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Returning Workers: Who is Susceptible?

- Smokers
- Age – Over 50 Years Old
- Chronic Lung Disease
  - **Post COVID Syndromes**
  - **Long COVID**
- Immunocompromised Patients
  - Diabetes
  - Cancer
  - Cardio-Pulmonary
  - Taking High-Dose Steroids

25% of Cases occur without any of the typical risk factors

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COVID & Plumbing Risk Factors

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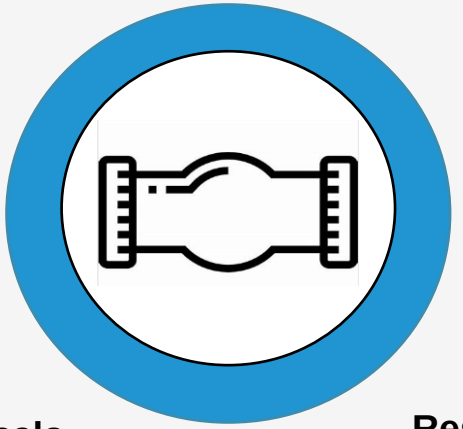
Complex Factors Which Increase Risk

Warm water

Stagnation

Dead legs



Scale

Sediment

Bacteria

Chemicals

Residual

Biofilm

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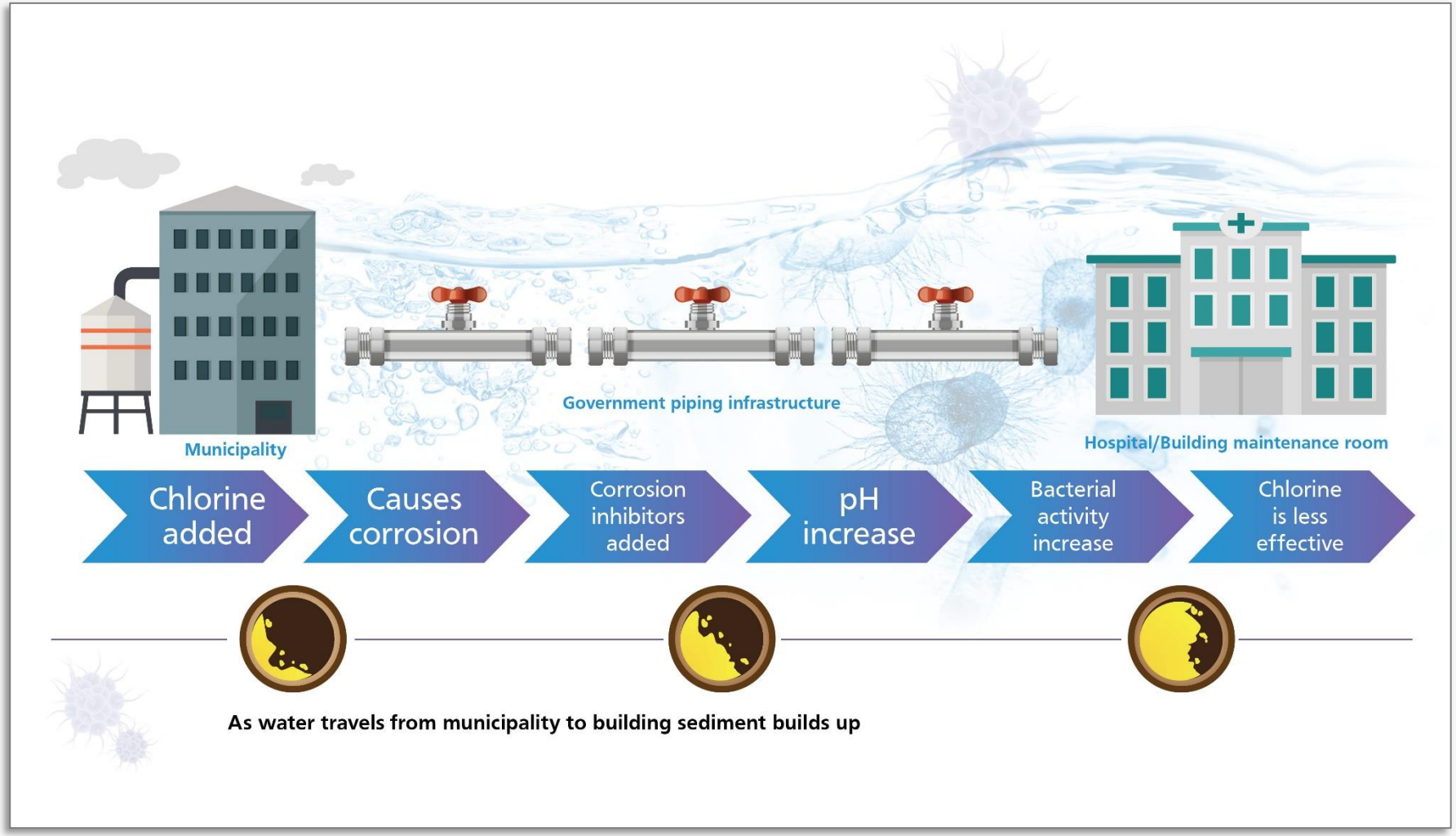
The Battle Begins Before the Building



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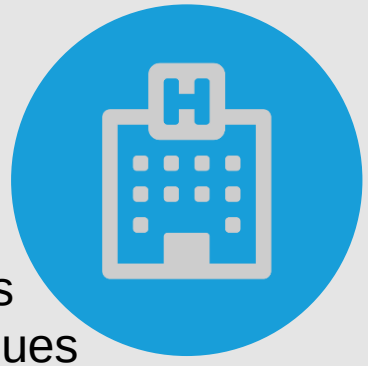
Water in the Built Environment

When water enters the building

- Water quality is variable
- No confidence in disinfectant level
- No confidence in bacteria level
- Do not know how far it traveled
- Increased pH levels
- Increased corrosion inhibitor
- Increased microbiological activity

After water enters the building



- Water continues to age
- Temperatures fluctuate
- Pre-existing contamination remains
- Design can minimize or amplify issues
- Green initiatives increase water age and decrease velocity

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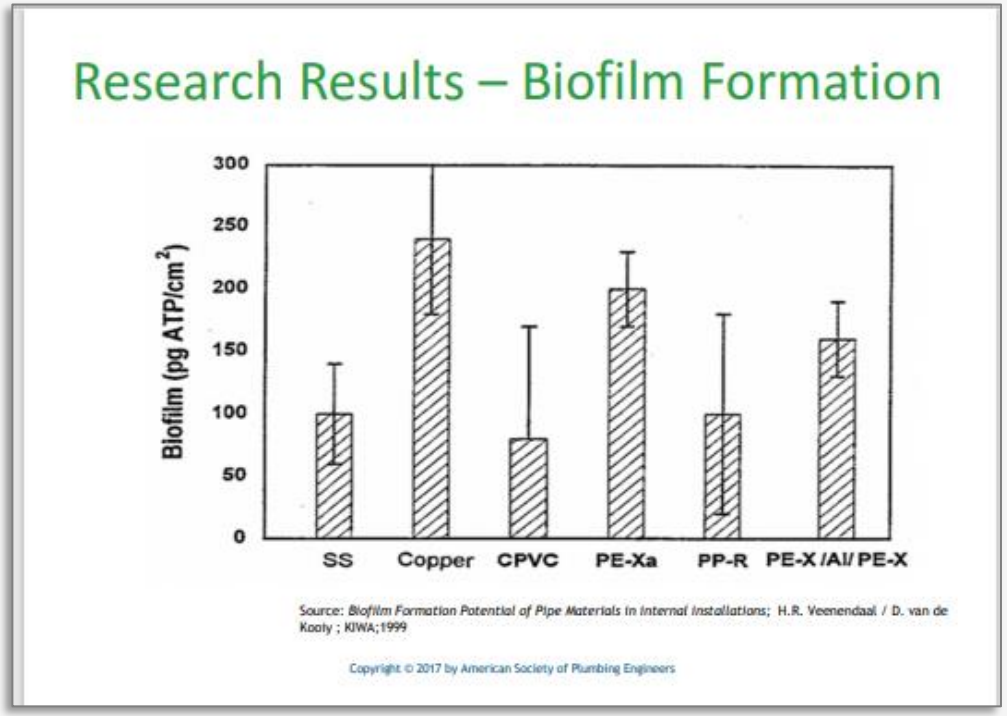
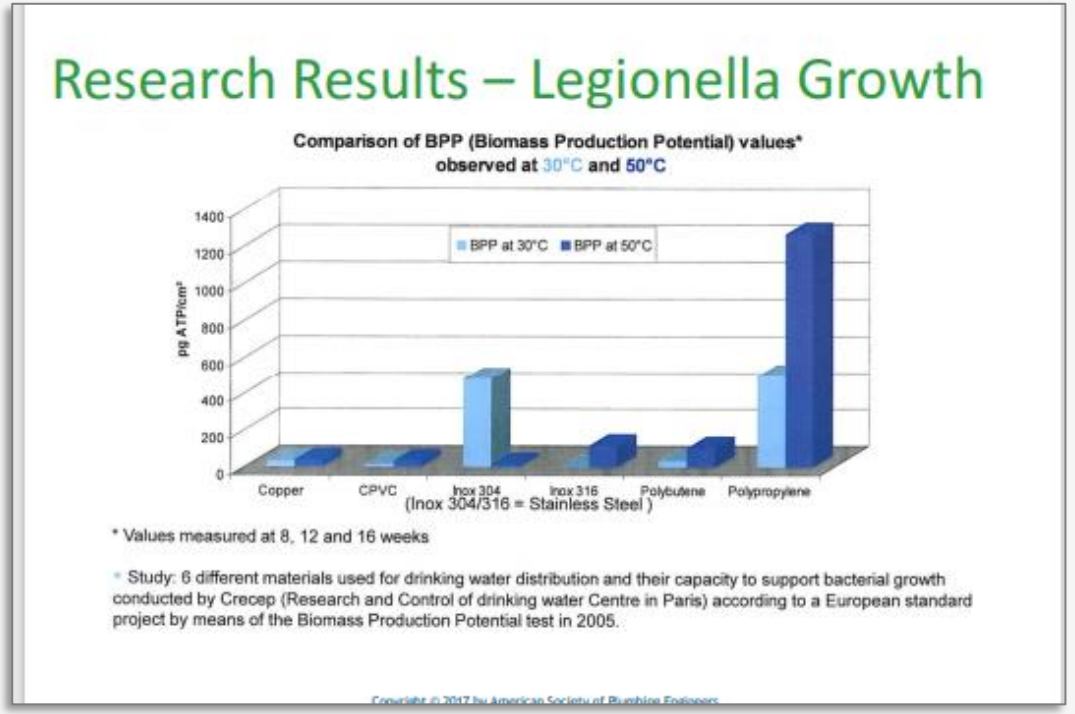
Engineering Considerations





- **Pipe material selection** – bacteria and biofilm growth; effect of chemical disinfection
- **Sizing of the overall plumbing system**
- **Pipe insulation**
- **Recirc design**
- **Flow restrictions; low-flow fixtures**
- **Treat hot and cold-water**
- **POU TMV**

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COVID & Sediment Accumulation

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Three Cornerstones of Sediment

Sediment wreaks havoc on piping systems

Heterotroph is a carbon eating organism. Most sediment is high in carbon and provides a constant food source for bacteria and pathogens.

Sediment consumes disinfectants including CuAg

The Trojan Horse – Sediment can block pathogens from disinfectant. The pathogen travels unaffected and multiplies

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Water Filtration 101

- Are you aware of the Total Suspended Solids (TSS) coming into your facility?
- Do you understand the impact sediment has on plumbing domestic water systems?
- Can you identify how sediment impacts various disinfectant modalities?

- Sediment in the water can have drastic impacts on various water quality parameters and system performance.
- By filtering the water various plumbing system components are positively impacted and efficiency is improved,

Total Suspended Solids (TSS)

Total suspended solids (TSS) is the dry-weight of suspended particles, that are not dissolved, in a sample of water that can be trapped by a filter that is analyzed using a filtration apparatus.

It is a water quality parameter used to assess the quality of a specimen of any type of water or water body.

TSS is listed as a conventional pollutant in the U.S. Clean Water Act.

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COVID & Biofilm Growth in New Places

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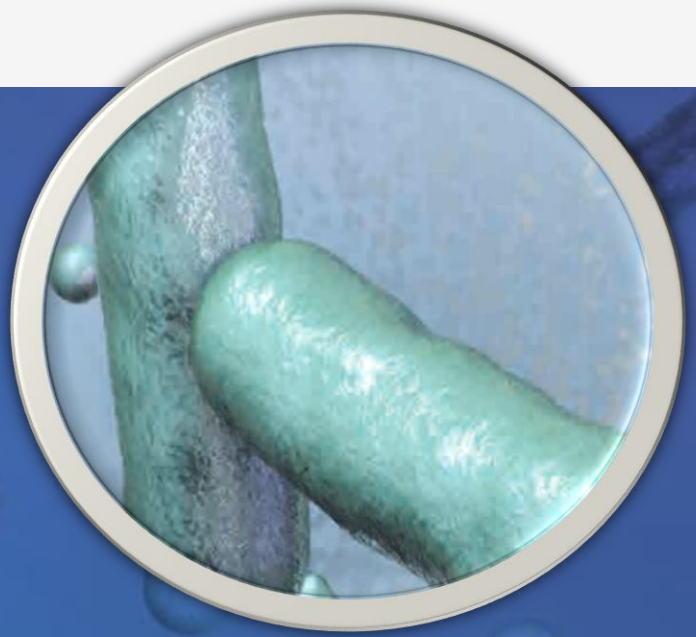
What is biofilm?

Biofilm is a collection of different types of bacteria, fungi, and protists in a colony enveloped in secreted slime that allows them to adhere to moist surfaces ideal for growth. Biofilm is one of the most common techniques for growth and protection for these microorganisms, and is not only a nuisance, but a potential hazard.



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Common areas for biofilm growth

Common areas for biofilm growth

Plumbing Infrastructure

Building premise plumbing

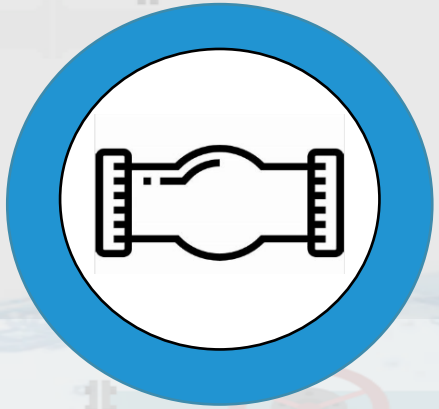
Municipal infrastructure

Variables for increased growth

Warm water

Stagnation

Dead legs



Scale

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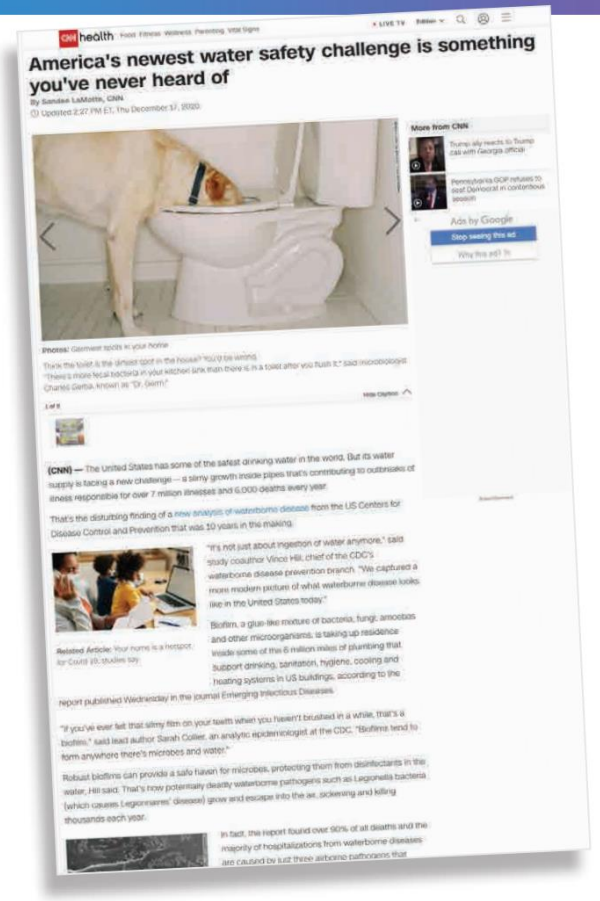
Why is biofilm making the headlines?

Why is biofilm making the headlines?



CNN health

America's newest water safety challenge is something you've never heard of

By Sandee LaMotte, CNN

Updated 2:27 PM ET, Thu December 17, 2020

(CNN) — The United States has some of the safest drinking water in the world. But its water supply is facing a new challenge — a slimy growth inside pipes that's contributing to outbreaks of illness responsible for over 7 million illnesses and 6,000 deaths every year.

That's the disturbing finding of a new analysis of waterborne disease from the US Centers for Disease Control and Prevention that was 10 years in the making.

"It's not just about ingestion of water anymore," said study coauthor Vince Hill, chief of the CDC's waterborne disease prevention branch. "We captured a more modern picture of what waterborne disease looks like in the United States today."

Biofilm, a glue-like mixture of bacteria, fungi, amoebas and other microorganisms, is taking up residence inside some of the 6 million miles of plumbing that support drinking, sanitation, hygiene, cooling and heating systems in US buildings, according to the report published Wednesday in the journal Emerging Infectious Diseases.

"If you've ever felt that slimy film on your teeth when you haven't brushed in a while, that's a biofilm," said lead author Sarah Collier, an analytic epidemiologist at the CDC. "Biofilms tend to form anywhere there's microbes and water."

Robust biofilms can provide a safe haven for microbes, protecting them from disinfectants in the water, Hill said. That's how potentially deadly waterborne pathogens such as Legionella bacteria (which causes Legionnaires' disease) grow and escape into the air, sickening and killing thousands each year.

In fact, the report found over 90% of all deaths and the majority of hospitalizations from waterborne diseases are caused by just three airborne pathogens that

- Biofilm contributes to illness outbreaks for over 7 million illnesses and 6,000 deaths every year
- According to National Institutes of Health (NIH), about 65% of all microbial infections, and 80% of all chronic infections are associated with biofilms
- Biofilm is taking up residence inside 6 million miles of plumbing infrastructure that support drinking, sanitation, hygiene, cooling and heating systems in US buildings
- Biofilms provide a safe haven for microbes to grow and thrive creating the perfect environment for waterborne pathogens such as Legionella to proliferate
- Biofilms block disinfectants such as chlorine from reaching pathogens making them ineffective
- Biofilm is a big problem

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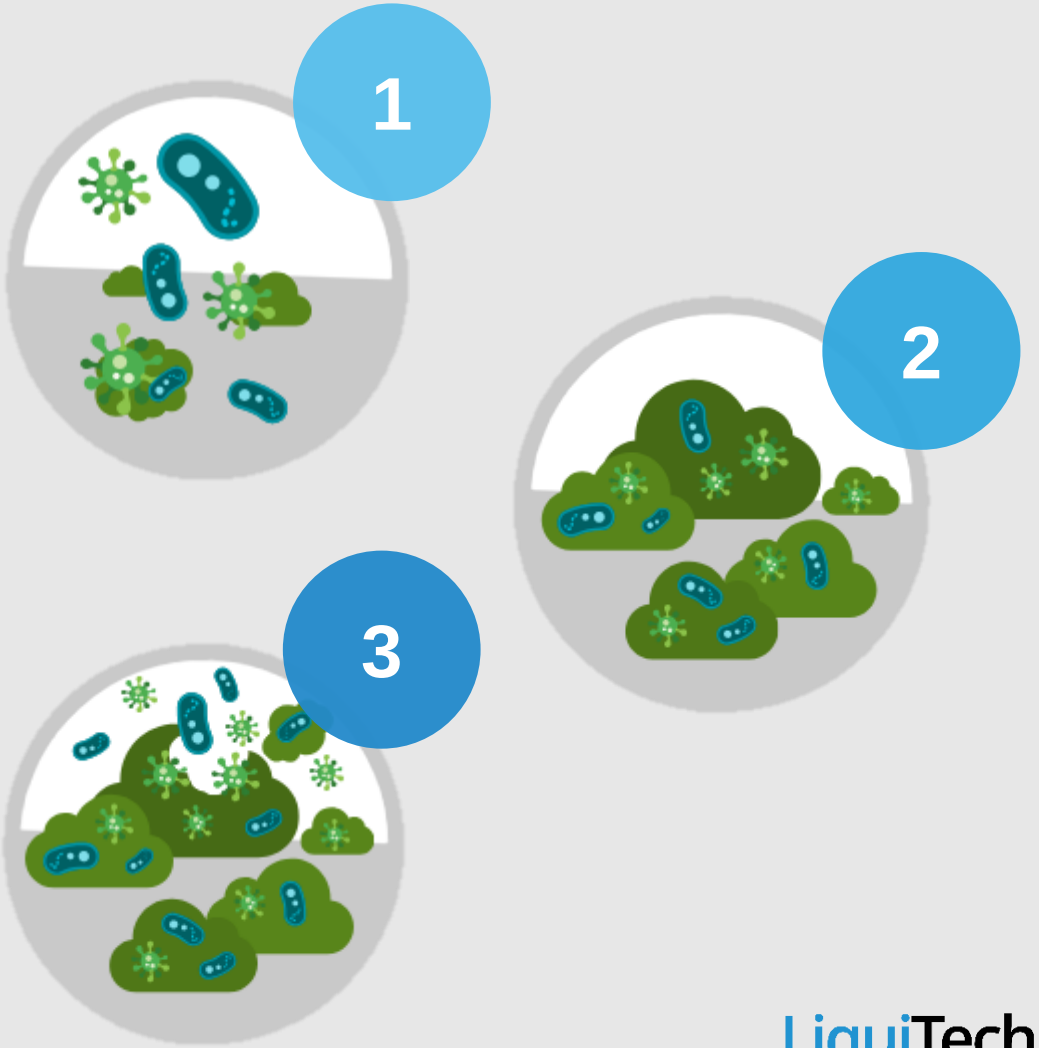
How does biofilm affect waterborne pathogens?

BACTERIAL RESISTANCE Bacteria in biofilm can be up to a thousand times more resistant to typical disinfectants and antibiotics than the same microorganisms grown in suspension.

RAPID RECOLONIZATION Even if all free-floating bacteria are eliminated at a given time, biofilms allow for quick growth and recontamination of a surface or area if the associated biofilm is not treated.

RAPID AMPLIFICATION Biofilm acts as an ideal breeding ground for rapid amplification of bacteria and dangerous pathogens by providing ideal environments and nutrient deposits.

Like Blood Vessels, Pipes Can Develop Plaque, Which Can Harbor Bacteria



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Biofilm: Best Mode of Growth for Waterborne Pathogens

DEFENSE

Biofilm is a Great Hiding Place

- Physical forces
- Phagocytosis
- Penetration of antimicrobials

MICRONICHE

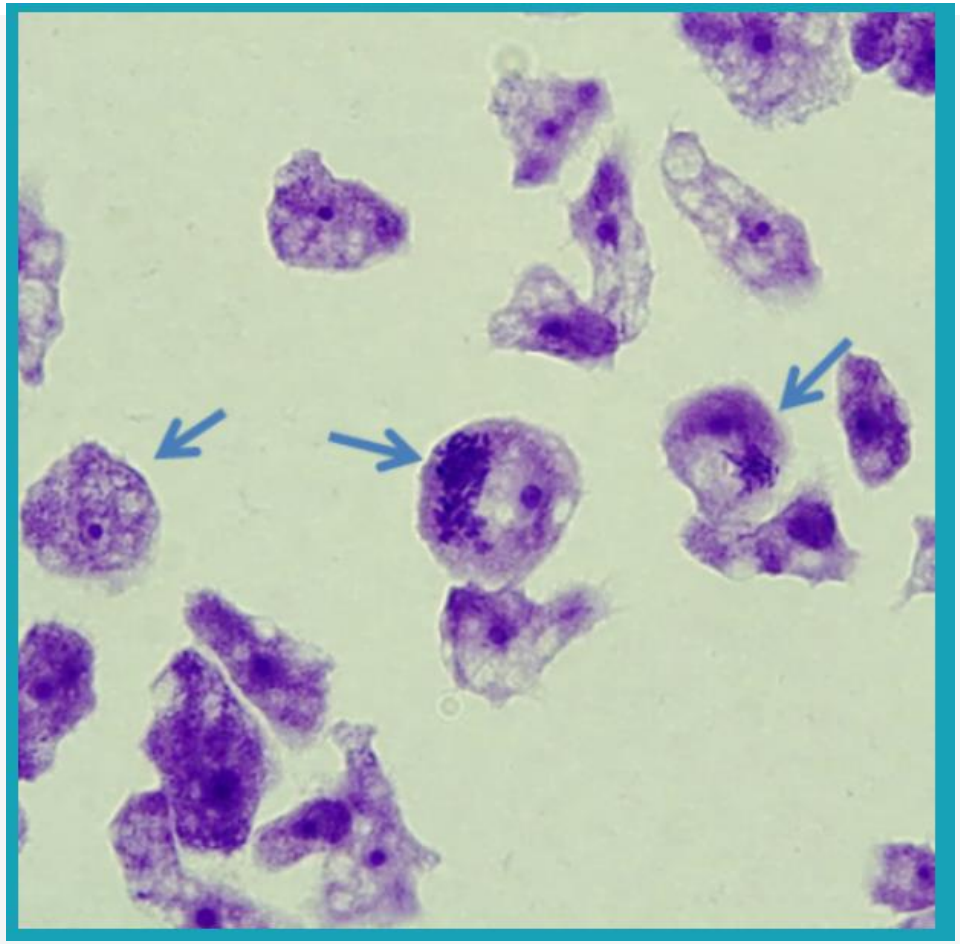
Provides Favorable Conditions

- Can attach to nutrient rich surfaces
- Can attach to surface in flowing systems
- Fixes the bacterial cells where the nutrients are either abundant or often replenished

MICROBES

Microbes and Pathogens Live Synergistically

- Facilities communication and cooperation
- Can result in genetic exchange



Arrows pointing to Legionella bacteria within an Amoeba – Trojan Horse Effect

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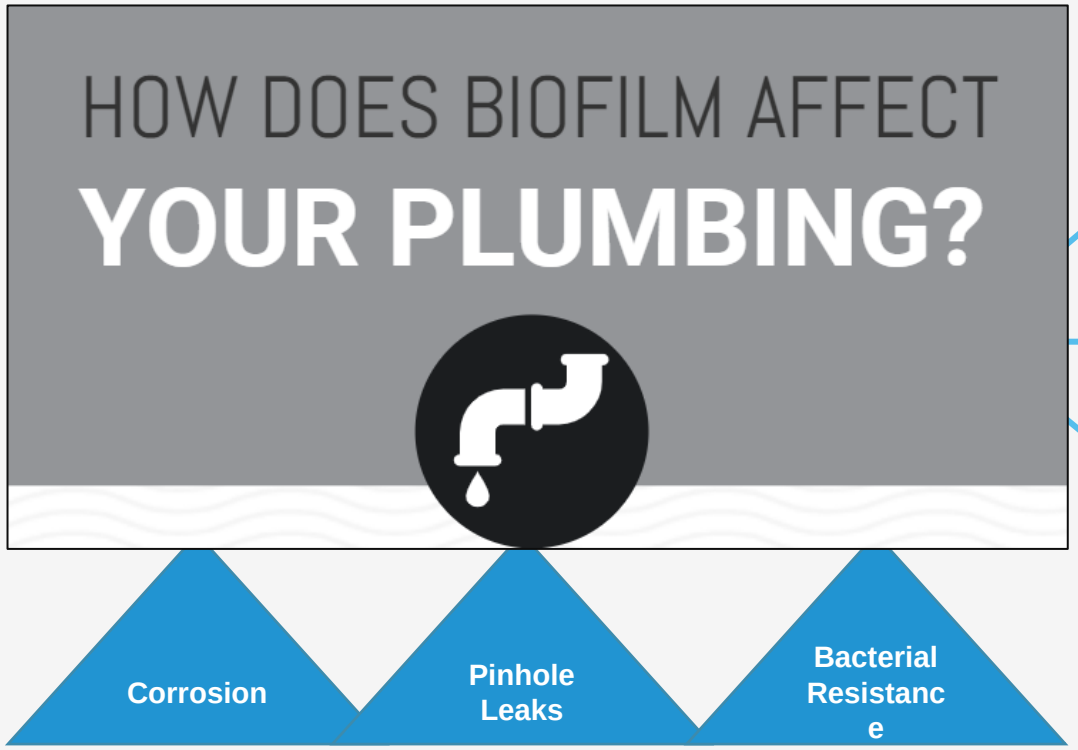
Biofilm Affects on Plumbing

Bacterial amplification, corrosion and buildup



BACTERIAL AMPLIFICATION

Biofilm acts as an ideal breeding round for bacteria and dangerous pathogens

CORROSION

Biofilm deposits can influence corrosion and lead to pinhole leaks and deposits from the bacteria and entrapped debris

BUILDUP

As the “slime” secreted by the bacteria increases, so does the buildup that causes blockages, corrosion, bacterial resistance, reduced flow, and energy and efficiency loss in water systems.

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COVID & Cold Water Observations

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Risk in Cold-Water is Underestimated

- Legionella is well documented to be resistant to chlorine

- Legionella is naturally occurring in the source water, and if it circumvents the municipal treatment, all it requires to amplify are a specific set of growth conditions

    - Correct temperature
    - Lack of disinfection residual
    - A food source
    - Stagnant water.

Legionella comes in through the cold water and is just looking for the right conditions to amplify.

The same water that can generate hot water Legionella amplification is also used for cold.

While traditionally a "hot water" bacteria, cold water can also serve to amplify Legionella when its growth conditions are met.

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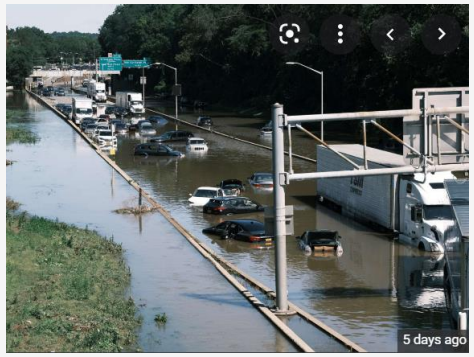
Cold-Water Risk Sources

Cold-Water Risk Sources

- Mistakes in the installation process
- Plumbing systems are complicated
- Chemicals can increase bacteria growth
- Warm climates
- A lack of pipe insulation coupled with low flow rates in over-sized pipe systems
- A common source of heat in cold-water pipes is heat loss from adjacent warm-water pipes
- Back siphonage, back pressure and cross contamination



Contamination can be extreme during upsets to the source water supply

- Water main breaks
- Nearby construction
- Boil orders
- High turbidity
- Other issues not known to building management until after the fact
  - Hurricanes
  - Flash Flooding

240,000 water main breaks per year in US

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Water Consumption / Water Conservation

- Water consumption per building occupant has gone down
- Plumbing code has not kept up with the changes
  - Still mandating large diameter pipes.
  - Hold large volumes of water that do not get readily turned over

Water conservation techniques include:

- Low flow fixtures
- Low or no flow toilets and urinals
- De-emphasis on hand washing in favor of hand sanitizers
- Lower patient stays resulting in minimal use of shower fixtures.

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COVID & Preparedness

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Aging Infrastructure

D

ASCE US Water Infrastructure drinking water report card grade in 2017

$1T

AWWA estimation to replace all pipes needing replacement

$384.2B

Needed for infrastructure improvements

240,000

Estimated water main breaks each year

1M miles

North America drinking water infrastructure

6M miles

Length of US water distribution system when you include premise plumbing

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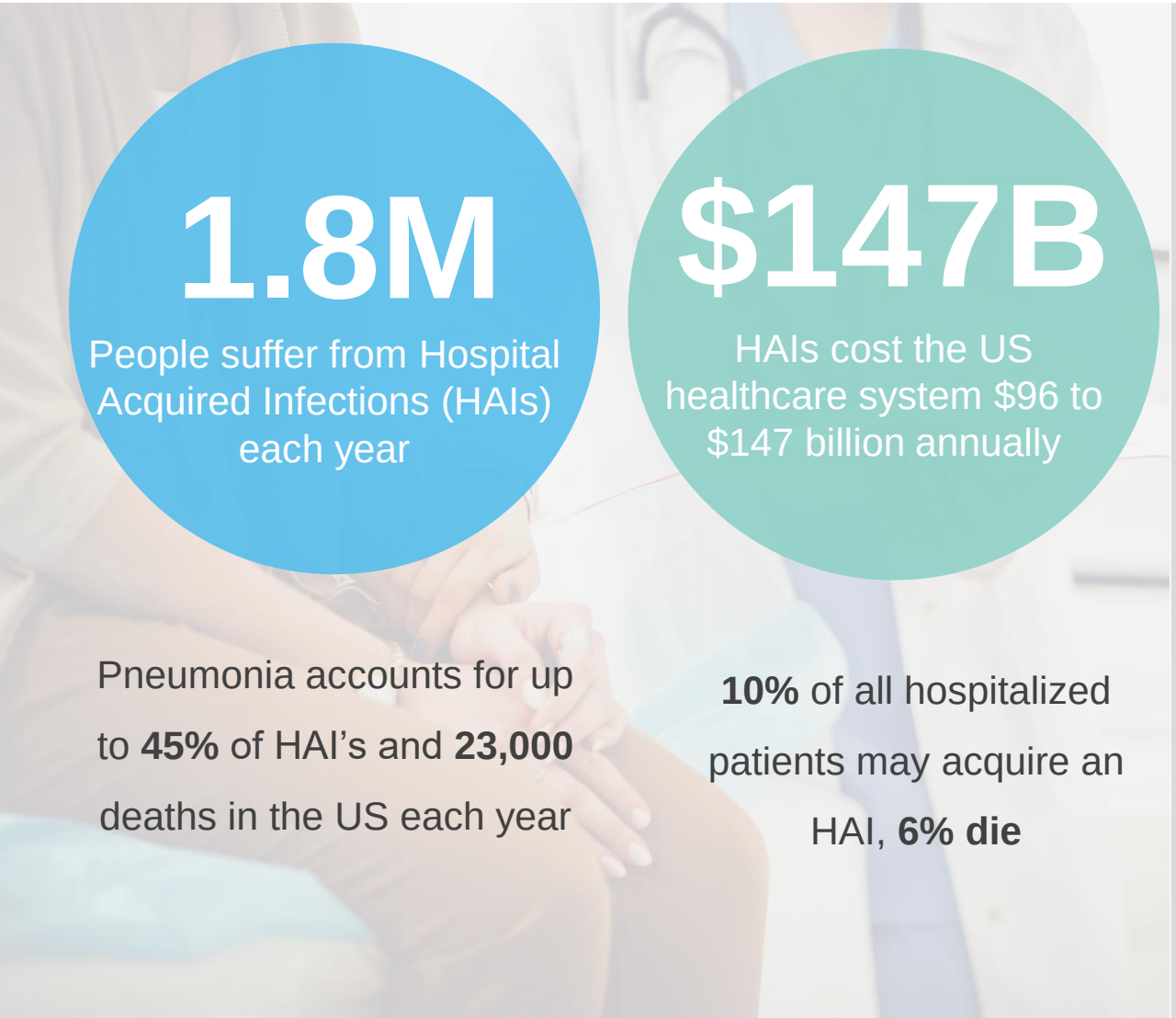
Financial Impact of Hospital Acquired Infections



1.8M

People suffer from Hospital Acquired Infections (HAIs) each year

Pneumonia accounts for up to **45%** of HAI's and **23,000** deaths in the US each year

$147B

HAIs cost the US healthcare system $96 to $147 billion annually

10% of all hospitalized patients may acquire an HAI, **6% die**

$500k

Prevention of a single HAI can provide a net profit gain of $500k

There are **113,000** potential cases of Legionnaires' disease each year

70%

70% of all building water systems contain Legionella

51,000 Infections attributed to *Pseudomonas*

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CDC estimated total illnesses, emergency department (ED) visits, hospitalizations, deaths and direct healthcare costs for 17 waterborne infectious diseases. Most common hospitalizations and deaths were caused by biofilm-associated pathogens – Nontuberculous Mycobacteria, Pseudomonas and Legionella, costing US $2.39 Billion Annually.

LEGIONELLA

Sources of Infection:

Hot & cold-water system

Site of Infection:

Lung (pneumonia), high mortality

PSEUDOMONAS

Sources of Infection:

Potable water, contaminated liquid solutions & disinfectants

Site of Infection:

Blood, catheter site, lungs, urinary, *high mortality*

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Blood, pneumonia, UTI, wound infections, skin, stools, throat

MYCOBACTERIA

Sources of Infection:

Hot water system, shower

Site of Infection:

Lungs, lymph nodes, bones and joints, the skin, and wounds

7.15 Million Waterborne Illnesses ◦ 601,000 Emergency Room Visits ◦ 118,000 Hospitalizations ◦ 6,630 Deaths

$3.33 BILLION in Direct Healthcare Costs

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Stagnation – Legionnaires' on the Rise

NEW JERSEY: "As of July 30, New Jersey Department of Health is aware of **eight suspected cases** of Legionnaires' disease in individuals who reside in or visited Essex County, NJ. The cases were reported to NJDOH between **July 16 through July 26, 2021."**

MICHIGAN: "Between July 1 and July 14, **107 cases of Legionnaires' disease** have been reported in 25 counties. While increases in cases are often related to environmental factors, including heat and rainfall, this represents a **569% increase** from referrals from the same period in 2020 (16 cases) and a 161% increase from referrals from the same period in 2019 (41 cases)."

ILLINOIS: "In the first three weeks of July, the Chicago Department of Public Health said **49 cases have been reported**. It is an increase from 16 cases last year and 13 in 2019, during the same time period. Among the 49 people with Legionnaires' disease, 15 were admitted to the ICU and two individuals died."

RHODE ISLAND: Department of Health reported, "There have been **30 cases reported since June 2**. Of those, 28 people have required hospitalization. The state has had an average of 10 cases per month in June and July since 2014.

NEW YORK: In a **Health Advisory** issued on July 16th to Healthcare Facilities, Providers, Clinical Laboratories, and Local Health Departments (LHDs), the Department of Health (DOH) **alerted providers to be aware of the possibility of Legionella infection** in hospitalized or at-risk patients with suspected pneumonia, especially if the individual tests negative for COVID-19.

MISSOURI: The City of St. Louis Department of Health recommends building owners and property managers consult CDC published voluntary guidelines and American Society of Heating, Refrigerating and Air Conditioning Engineers guidance to assist in preventing Legionella from spreading at their facilities.

Legionella Lawsuits on the Rise

In November, 2010, a Calhoun County, Alabama, a jury awarded a combined $4.5 million judgment in a case stemming from a hotel hot tub contaminated with Legionella bacteria. Two hotel guests were staying at the Wingate Inn and both of them developed Legionnaires' disease and had to be hospitalized. The trial lasted four days and the jury took only 50 minutes to return a guilty verdict against DEVI, LLC, the owner of the hotel.

$4.5 million

$3.8 million

PREMISES LIABILITY

The highest legionella verdict in state history, this was a jury verdict against JW Marriott in Chicago for a 64-year-old attorney exposed to legionella bacteria from negligently maintained hotel fountain causing Legionnaire's disease and neurocognitive deficits, forcing ear...

$2.3 million

PREMISES LIABILITY

Jury verdict against JW Marriott in Chicago for wrongful death of an 80 year old physician exposed to legionella bacteria from negligently maintained hotel fountain causing Legionnaires' disease and death a few weeks later

Illinois Will Pay Nearly $6.4 Million To The Families Of Vets Who Died In State Home

April 10, 2020

DAVE MCKINNEY TONY ARNOLD

FROM WBEZCHICAGO Your NPR news source

Parents of a child who died from Legionnaires' disease filed a lawsuit against the University of California, San Francisco **Medical Center**. The child was at the hospital for a month in early 2013, after a transplant. Tests performed after the baby's death found Legionella bacteria in the plumbing system of the hospital, including the room where the baby had been staying.

$3 million

A $3 million settlement was obtained, recently, for the family of a woman who died after contracting Legionnaires' disease at a Las Vegas Hotel. The victim was celebrating her 40th wedding anniversary with her husband and inhaled the Legionella bacteria while using the hotel suite's Jacuzzi. Lawyers for the victim's family were able to prove that the hotel knew that the bacteria was present in the building's water system months prior to the victim's stay.

Lawsuit: Negligence caused Legionnaires' outbreak at hotel

By KATE BRUMBACK August 12, 2019

In November, 2012, a wrongful-death lawsuit was filed against Marriott International, claiming that one of its hotels in downtown Chicago was responsible for infecting Thomas Keane, an Irish tourist, with Legionnaires' disease. Legionella bacteria were found in a decorative fountain of the main lobby and Keane, who was visiting Chicago with his wife, inhaled vapor from the fountain. The lawsuit charged that the hotel failed to create and implement "appropriate control measures" to ensure the fountain was bacteria-free, and didn't maintain appropriate water temperatures and biocide levels in the fountain. Keane was diagnosed with Legionnaires' disease and died on August 29, 2012.

Family sues Mount Carmel Grove City alleging wrongful death amid Legionnaires' outbreak

Anne-Marie Kommers - Friday, June 28th, 2019 Print | Email

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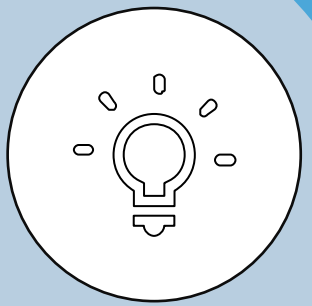
Are you liable?

To Incur Liability

Must prove negligence by establishing a breach of the standard of care



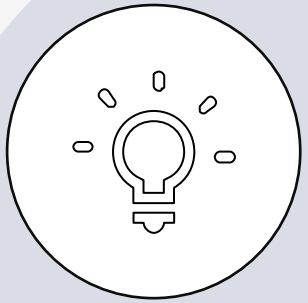
With preventability comes liability

- ASHRAE 188 is the standard of care for maintaining water quality in buildings subject to the regulation
- Healthcare/Hospitality are held to a higher standard of care since they have the burden of proof to demonstrate they did everything possible to protect an invitee from harm
- Negligence may be found based upon the failure to adopt technologies, products, practices, which may have prevented *legionella* occurrence and results in a breach of the standard of care

To Minimize Liability

Compliance with ASHRAE 188:

- Will provide additional protection from allegations of negligence and failure to maintain water systems and protect occupants
- Will be a valid defense particularly in cases where the precise exposure point and/or source of *Legionella* cannot be identified
- Will establish benchmarks for threshold, type, level, intensity and may impact claim validation or dismissal
- May be used by insurance carriers as an indication of water quality management but **Must Demonstrate On-going Implementation and Successful Results**



Plaintiffs can use non-compliance as proof of negligence

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COVID: Do You Have a Strategy

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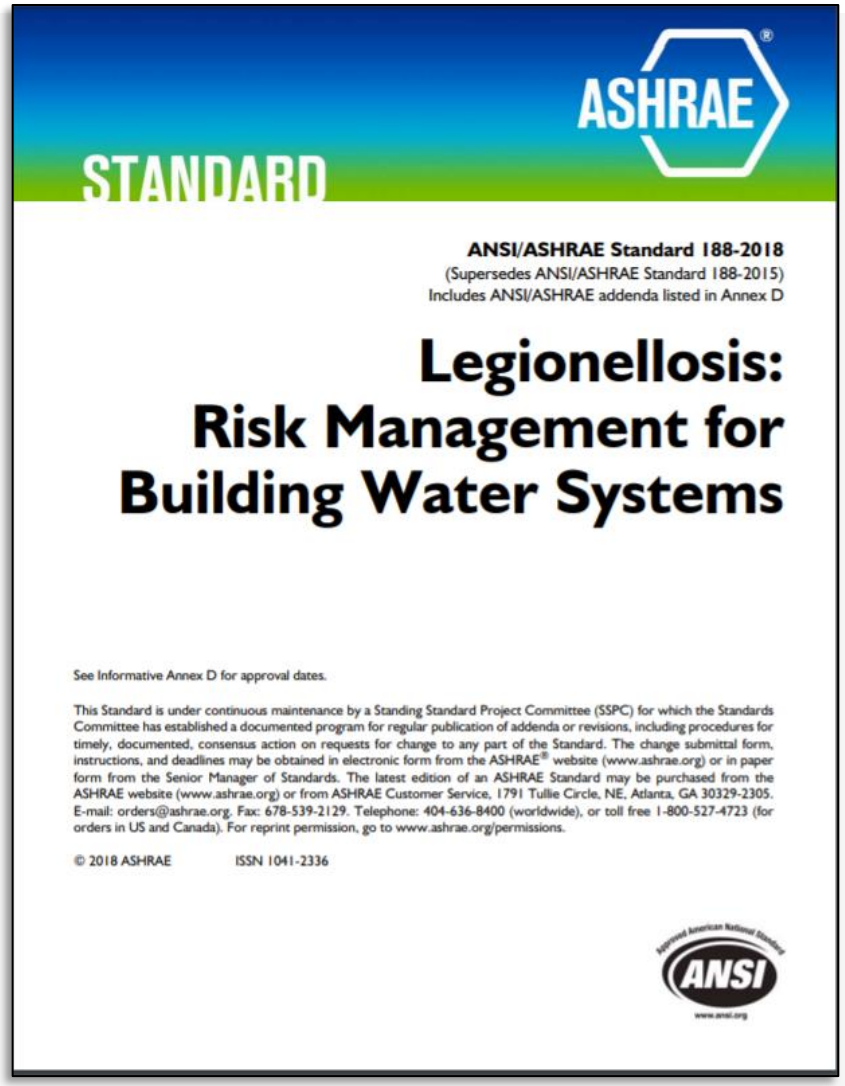
Government and Industry Guidance



ASHRAE

STANDARD

ANSI/ASHRAE Standard 188-2018
(Supersedes ANSI/ASHRAE Standard 188-2015)
Includes ANSI/ASHRAE addenda listed in Annex D

Legionellosis: Risk Management for Building Water Systems

See Informative Annex D for approval dates.

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.

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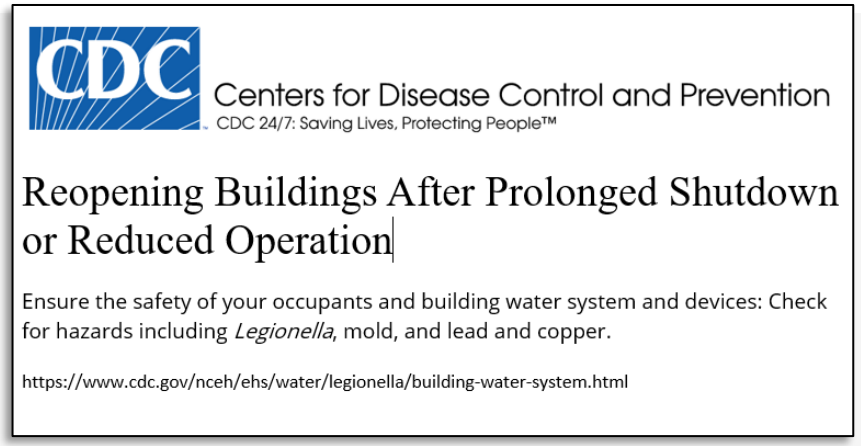
ANSI

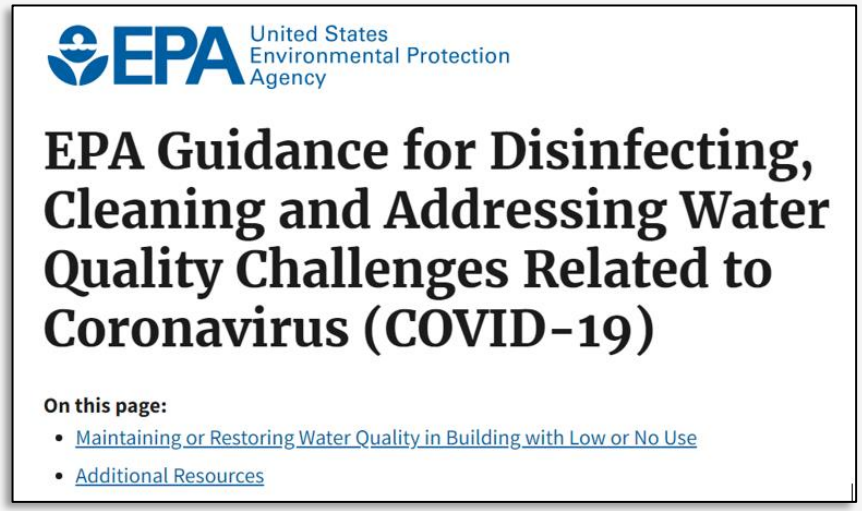


CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Reopening Buildings After Prolonged Shutdown or Reduced Operation

Ensure the safety of your occupants and building water system and devices: Check for hazards including *Legionella*, mold, and lead and copper.

https://www.cdc.gov/nceh/ehs/water/legionella/building-water-system.html

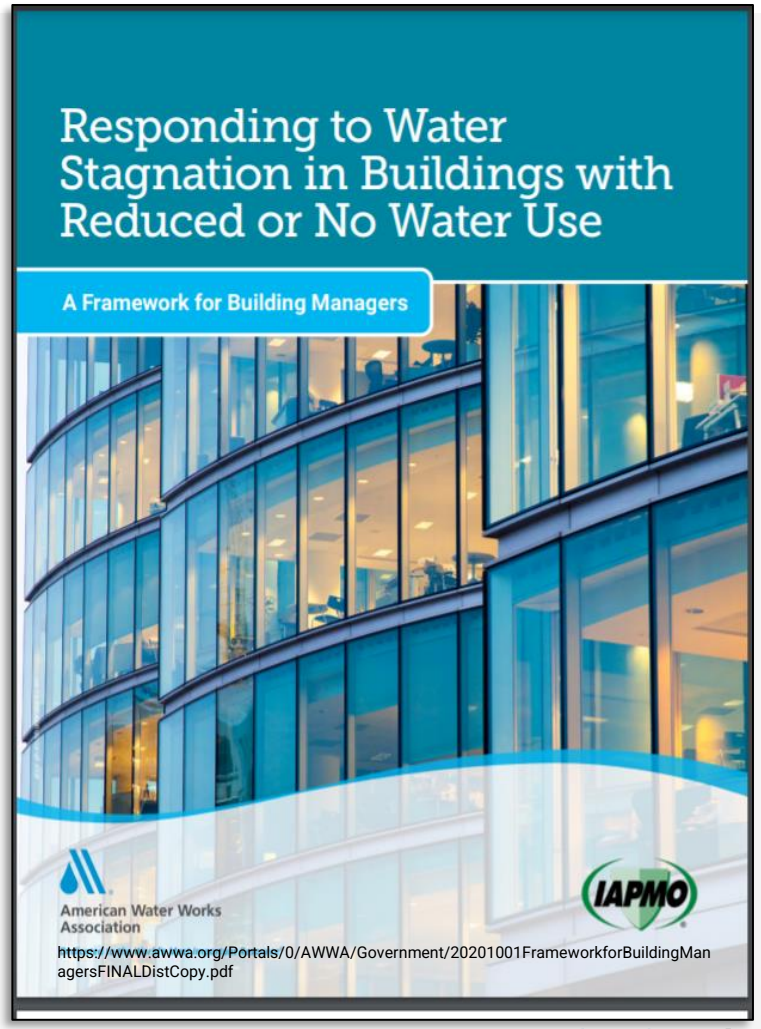


EPA United States Environmental Protection Agency

EPA Guidance for Disinfecting, Cleaning and Addressing Water Quality Challenges Related to Coronavirus (COVID-19)

On this page:

- Maintaining or Restoring Water Quality in Building with Low or No Use
- Additional Resources



Responding to Water Stagnation in Buildings with Reduced or No Water Use

A Framework for Building Managers

American Water Works Association

IAPMO

https://www.awwa.org/Portals/0/AWWA/Government/20201001FrameworkforBuildingManagersFINALDistCopy.pdf

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What is Your Plan?

1. **Testing & Flushing**
2. **Water Management Plan**
3. **Include Cold-Water**
4. **Use a Multi-Barrier Approach**

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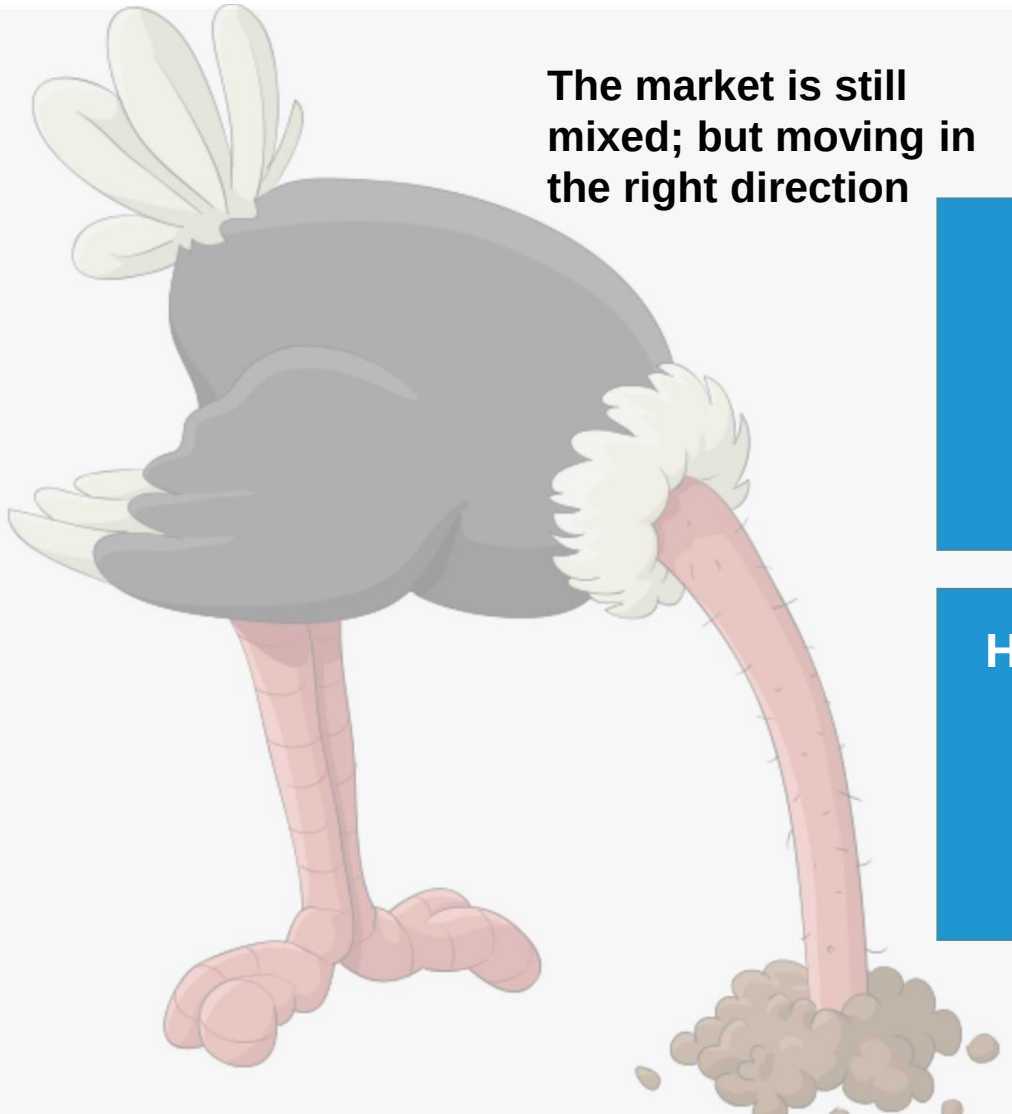
Testing & Monitoring



The market is still mixed; but moving in the right direction

Very Proactive

Test & Monitor Regularly

Head in the Sand

“If I don’t test I don’t have a problem”

Buildings Should Always Test Their Water

The only way to truly determine risk for a facility is to conduct routine Legionella water testing.

It is better to be proactive than reactive.

You can prevent Legionnaires’ or face lawsuits and bad press when Legionnaires’ occurs.

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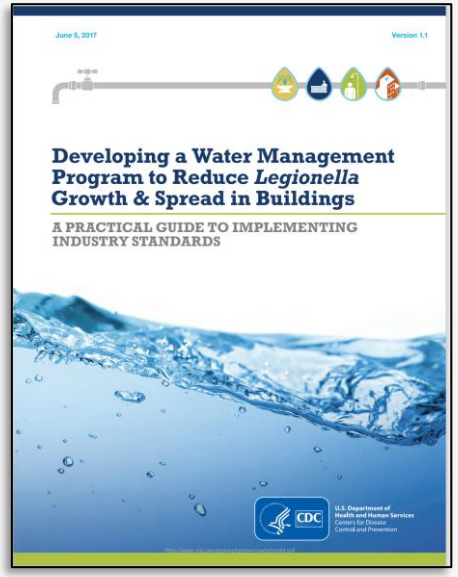
Flushing & Testing

Fire-hose effect

- Biofilm that has been “lodged” can break free
- Reduction in usage is also exposing biofilms that can be disruptive, fall apart and distribute biofilm and bacteria
- **Important to flush and test**

Water Management Plans

Regulations & Requirements



CDC Toolkit

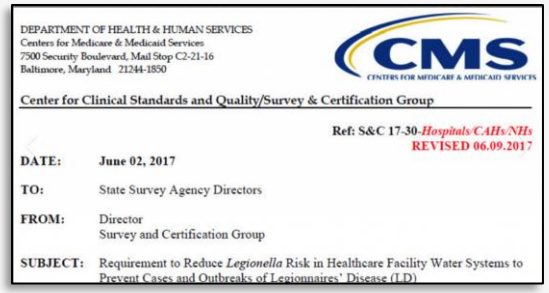
ASHRAE™

188

12

Based on ASHRAE Guidelines 188 & 12

CMS
CENTERS FOR MEDICARE & MEDICAID SERVICES



DEPARTMENT OF HEALTH & HUMAN SERVICES
Centers for Medicare & Medicaid Services
7500 Security Boulevard, Mail Stop C2-21-16
Baltimore, Maryland 21244-1850

CMS
CENTERS FOR MEDICARE & MEDICAID SERVICES

Center for Clinical Standards and Quality/Survey & Certification Group

Ref: S&C 17-30-*Hospitals/CAHs/NHs*
REVISED 06.09.2017

DATE: June 02, 2017

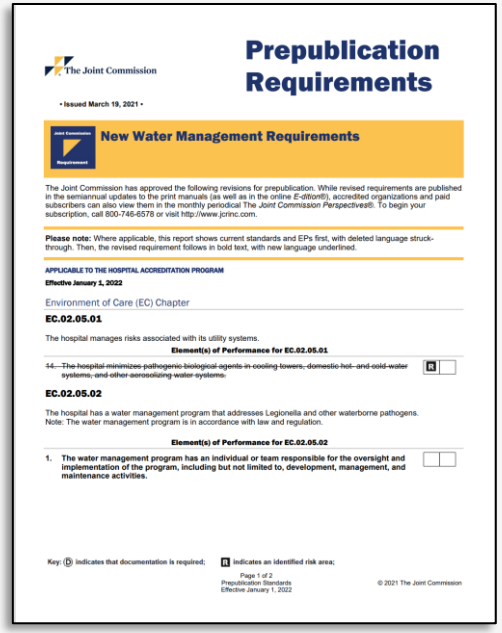
TO: State Survey Agency Directors

FROM: Director
Survey and Certification Group

SUBJECT: Requirement to Reduce *Legionella* Risk in Healthcare Facility Water Systems to Prevent Cases and Outbreaks of Legionnaires' Disease (LD)

Centers for Medicaid & Medicare require hospitals to have a water management plan

The Joint Commission



The Joint Commission

Prepublication Requirements

• Issued March 19, 2021 •

New Water Management Requirements

The Joint Commission has approved the following revisions for prepublication. While revised requirements are published in the semiannual updates to the print manuals (as well as in the online *E-dition*®), accredited organizations and paid subscribers can also view them in the monthly periodical The *Joint Commission Perspectives*®. To begin your subscription, call 800-746-6578 or visit http://www.jcrinc.com.

Please note: Where applicable, this report shows current standards and EPs first, with deleted language struck-through. Then, the revised requirement follows in bold text, with new language underlined.

APPLICABLE TO THE HOSPITAL ACCREDITATION PROGRAM

Effective January 1, 2022

Environment of Care (EC) Chapter

EC.02.05.01

The hospital manages risks associated with its utility systems.

Element(s) of Performance for EC.02.05.01

~~14. The hospital minimizes pathogenic biological agents in cooling towers, domestic hot- and cold-water systems, and other aerosolizing water systems.~~ R

EC.02.05.02

The hospital has a water management program that addresses Legionella and other waterborne pathogens.
Note: The water management program is in accordance with law and regulation.

Element(s) of Performance for EC.02.05.02

1. **The water management program has an individual or team responsible for the oversight and implementation of the program, including but not limited to, development, management, and maintenance activities.**

Key: D indicates that documentation is required; R indicates an identified risk area;

Page 1 of 2
Prepublication Standards
Effective January 1, 2022

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New requirements starting January 2022

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Water Management Plan

- **CDC** says to you need to review and revise your WMP at times when there are changes in water usage (high and low seasons for a hotel)
- **ASHRAE 188** states in 7.1.1 that you should have a system start-up and shut-down plan that includes (One could easily say that COVID shutdowns / low usage applies to this)
    - Flushing and disinfection before commission a new system
    - Shutdown, including draining, purging, cleaning treatment, and control settings.
    - Restarting from a drained shutdown condition and from an undrained shutdown condition
    - Monitoring and treatment following water supply interruptions or breaks in water supply piping
    - Reestablishing required temperatures throughout the hot-water distribution system

Joint Commission - Element(s) of Performance for EC.02.05.0

- The individual or team responsible for the water management program reviews the program annually **and when the following occurs:**
    - Changes have been made to the water system that **would add additional risk**.
    - New equipment or **at-risk water system(s)** has been added that could generate aerosols or be a potential source for Legionella.

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COVID: Industry Response

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Questions to Answer

How long does it take to gain control of Legionella?
Are there chemicals to store/handle?
Are there chemical hazards? Are there special precautions you must take?
Is it effective in cold-water?
Is it effective in hot-water?
Is it environmentally friendly and sustainable?
Can it be monitored and can results be recorded?
Does it provide residual protection?
Is it corrosive to plumbing?
Does it require air monitoring?

What are the life cycle costs / install costs?
Does it provide long-term Legionella protection?
Are there harmful by-products?
Is it effective regardless of time?
Is it effective regardless of distance?
Is it effective regardless of flow?
Does it penetrate biofilm?
Does it comply with your water management plan?
Does it comply with regulation?

The Industry – Multi-Barrier Approach

Industry Multi-barrier approach

- The term is used very loosely in the industry
- Everyone uses it
- Can mean a variety of things
- Each barrier is a hurdle
- Two solutions equals a multi-barrier approach
- It has lost its true meaning and value

Orchestrate [ˈôrkəˌstrāt]

Arrange or direct the elements of (a situation) to produce a desired effect, especially surreptitiously.

To arrange or control the elements of, as to achieve a desired overall effect

LiquiSafe

- Branded multi-barrier approach – only one in the industry
- Treating the approach as the solution
- Each solution is interconnected increasing the efficacy of each
- Both cold and hot-water systems

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First Line of Defense: Point-of-Entry Filtration

Remove the 'Food Source' for bacteria

What begins as sediment upon first entry, evolves into a hotbed for dangerous waterborne pathogens that can result in illnesses such as Legionnaires' disease…as it moves through a hospital's plumbing system to threaten the health and livelihood of our patients.

Hospitals NEED to take action.

It all starts with Point-of-Entry filtration.

Due to water being transported through a large and aging infrastructure, the quality of municipal water tends to be unpredictable

Point-of-Entry removes sediment and biofilm deposits from incoming water…before it enters your plumbing infrastructure.

This alone avoids corrosive damage to your pipes…and far worse damage to the now hospital water.

- Eliminates sediment and corrosion particulate
- Improves secondary disinfection
- Stabilizes incoming water quality removing most of the major cofactors that contribute to bacterial growth like sediment, dirt and its food sources
- Low operation costs – no consumables required
- Continuous flow – no service interruption during backwash
- Eliminates build-up of nutrients and incubation of bacteria/biofilm

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Barrier Two: Ultraviolet Disinfection

Any bacteria that bypasses the point-of-entry, must then come face to face with Ultraviolet Disinfection.

This stage utilizes UV lamps a non-chemical disinfection processes… and with a single blast of UV light can destroy 99.9% of the harmful microorganisms at bay.

Provides a continuous primary barrier to new bacteria entering your facility.

By combining with point-of-entry filtration to address corrosion particulate and copper silver ionization to address replicating bacteria, your facility would have the broadest spectrum approach for eliminating drinking water concerns in your building water system.

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Barrier Three: Copper Silver Ionization

For the remaining 0.1%, which at this point begins to grow into fatal bacteria, LiquiTech's Copper Silver Ionization, or CSI takes charge.

The safe and eco- friendly Copper Silver Ionization system has yielded the best results over a wide range of water conditions and temperatures and is **backed by more than 100 independent research studies.**

Systemic protection against *Legionella* bacteria in your domestic water system.

Utilizing a completely byproduct-free method, Copper Silver Ionization is regarded as the most clinically effective prevention and remediation solution for Legionella

Emits positively charged copper and silver ions, which bond with the negatively charged bacteria cells, ultimately breaking down membrane walls…and killing the bacteria versus merely suppressing it

Any trace of Legionella has now been eradicated, and the result is clean, quality water.

This means safety for your patients…it means peace of mind for your guests…and protection for your brand.

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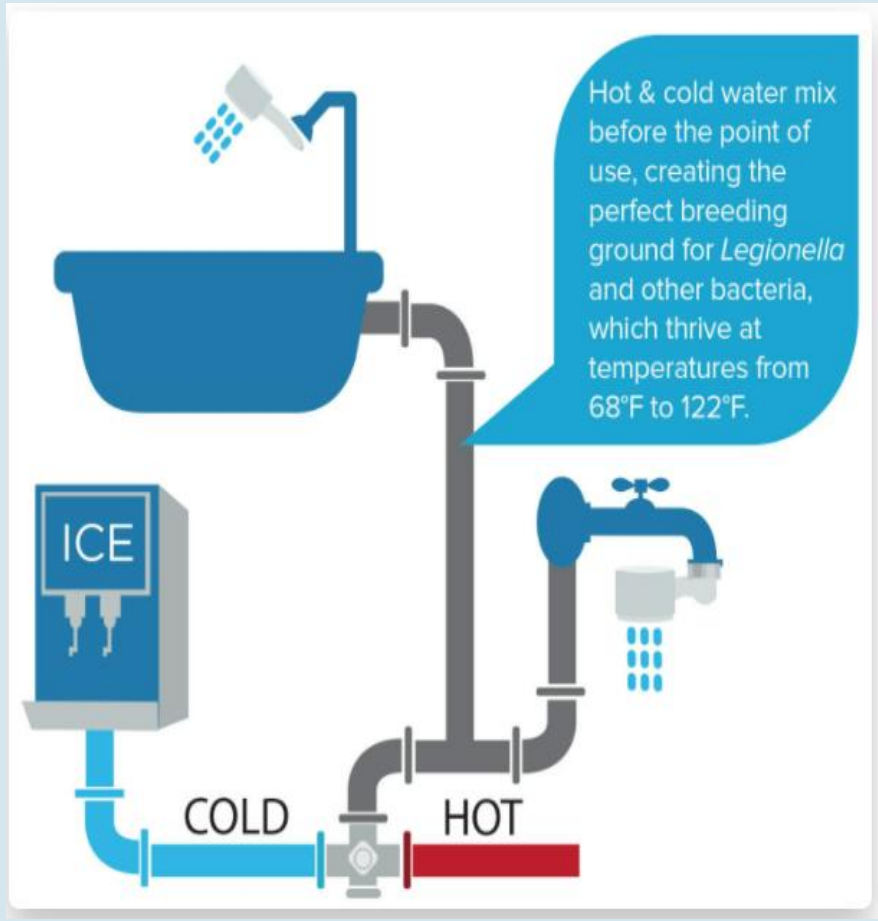
Barrier Four: Point of Use Filters

The point-of-use filters provide easy and reliable protection at the *last possible moment before water use.*



Point-of-use filtration is a final barrier to prevent harmful pathogens from contact with caregivers and patients, particularly the immunocompromised:

- Burn Units
- Bone Marrow Transplant
- NICU
- Hematology/Oncology

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Questions?

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Poll Questions

What are the two parts of the underutilized buildings problem?

A. Potable and Non-Potable
B. Stagnation and distribution pattern changes
C. Disinfection and filtration
D. Sediment and biofilm

What are the four changes in municipal water caused by underutilization?

A. Increase in water age, increased bacterial amplification, increase in risk and increase in stagnation.
B. Increase in water temperature, increase in disinfectant, lower rates of bacteria and lower stagnation
C. Decrease in water temperature, increased dead legs, decrease in sediment and increased disinfectants
D. Fluctuating water temperature, lower bacteria levels, lower stagnation and lower biofilm

Select the complex factors which increase risk?

A. Warm Water
B. Stagnation & dead legs
C. Bacteria
D. Biofilm, scale and sediment
E. Chemicals
F. All of the Above

What are the three cornerstones of sediment?

A. Heterotroph is a carbon eating organism. Sediment consumes disinfectants and the trojan horse.
B. Loose sand, clay and silt
C. Soil erosion, decomposition of plants and animals
D. Wind, Water and Ice

What are the four main steps to reduce risk associated with unused or underused buildings?

A. Test and flush, use a water management plan, include cold-water in your plan and use a multi-barrier approach.
B. Monitor, POU filters, hot-water treatment and a disinfectant
C. Continual flushing, monitoring, temperature control and disinfectants
D. Periodic testing, continual flushing temperature and flow control

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