



Department  
of Health

# Flushing and Disinfection Guidance for Re-Opening Buildings during the Pandemic

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September 18, 2020  
10:00 – 11:00AM



# Shutdown Effect on Building Systems

- Plumbing
  - Microbiological and Chemical concerns
    - Metals (Pb, Cu, Ni, others)
    - Legionella
- HVAC
  - Mainly microbiological concerns
    - ASHRAE guidance-Legionella focused
    - OFCC guidance-*Ohio Schools and SARS-CoV-2: A Summary of HVAC and Plumbing Industry Guidelines*

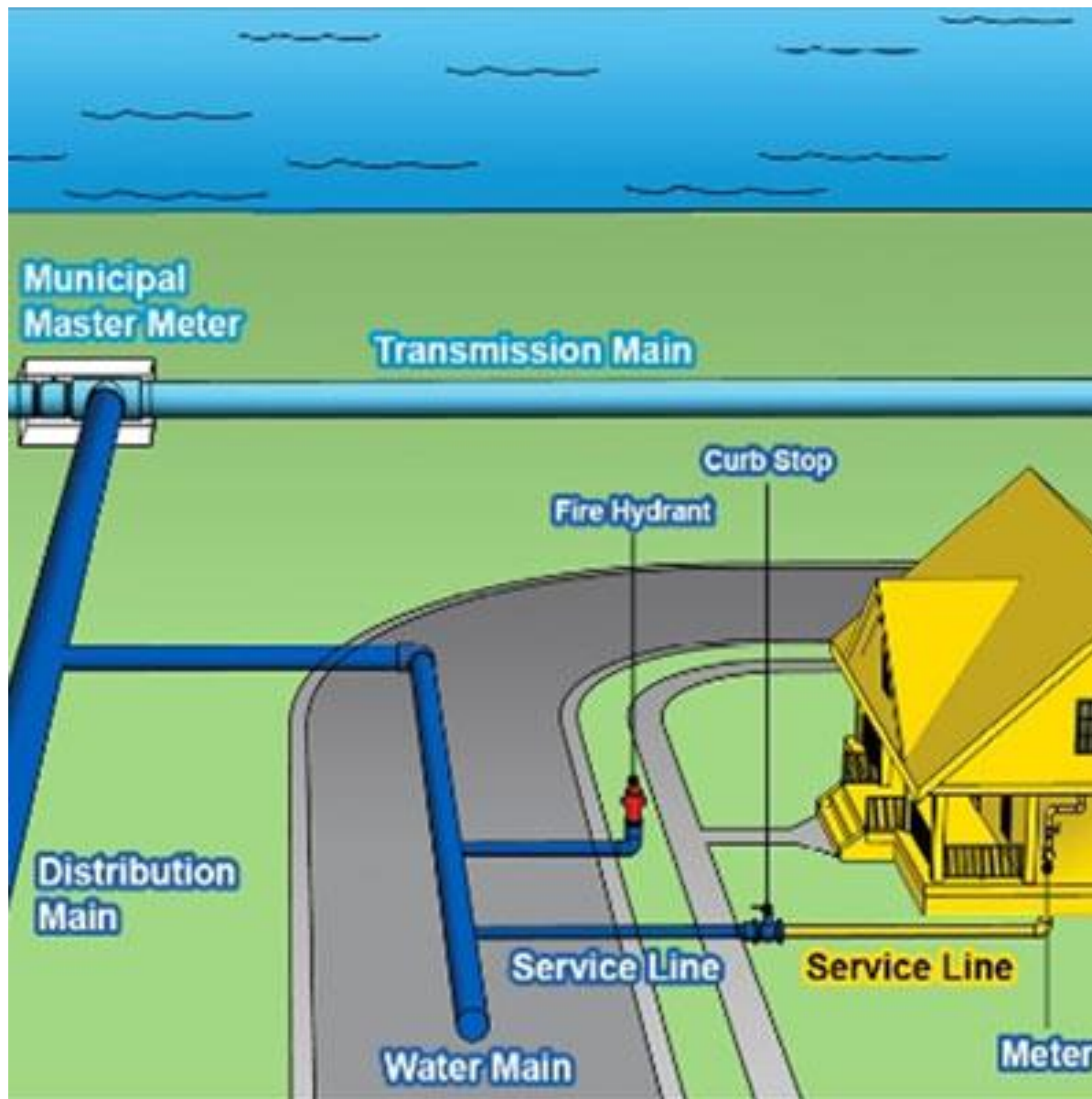
***This is a topic of active academic research and what we share today is applicable to more than just schools***

# Ohio EPAs Role:

## Regulatory Context: Water Quality

- US EPA Safe Water Drinking Act
  - National Primary Drinking Water Regulations
    - Dozens of chemicals with contaminant limits
    - Long-term exposure
    - Treatment
    - Monitoring
    - Compliance





# Premise Plumbing: The Nexus of Regulations

- ODC
  - Plumbing code
    - No guidance on materials
    - Flush and disinfect
    - Vague follow up requirement
- ODH
  - Water management plans
  - *Legionella* efficacy
  - Conducted a survey of hospitals and care facilities on topics surrounding *Legionella*

# Premise Plumbing

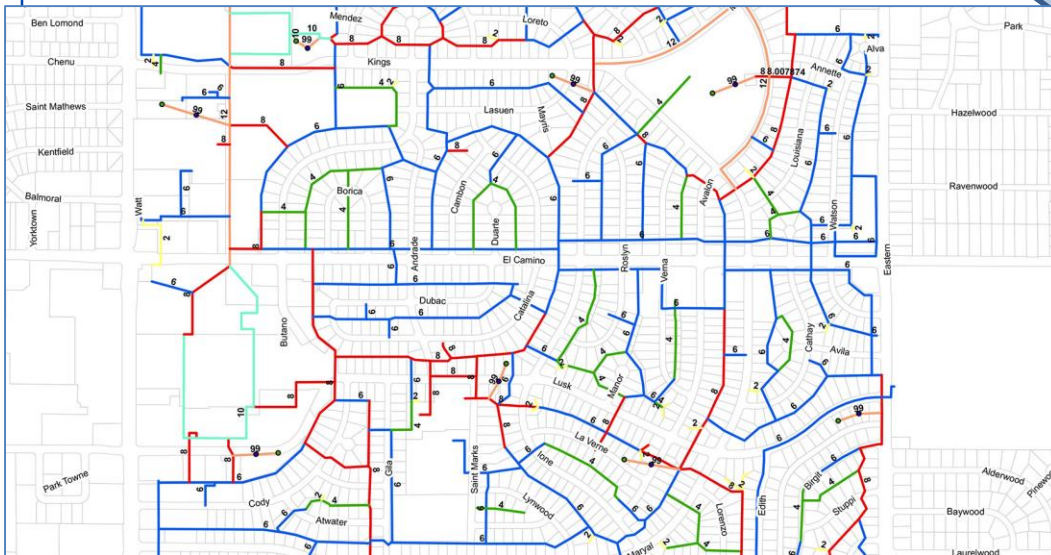
- Many different plumbing materials
- Different ages
- Complex hydraulics
- Temperature differentials
- Backflow
- SA to V ratio
- Water Age (LEED)

*=Low disinfectant residuals*

<https://engineering.purdue.edu/PlumbingSafety/resources/plumbing101>



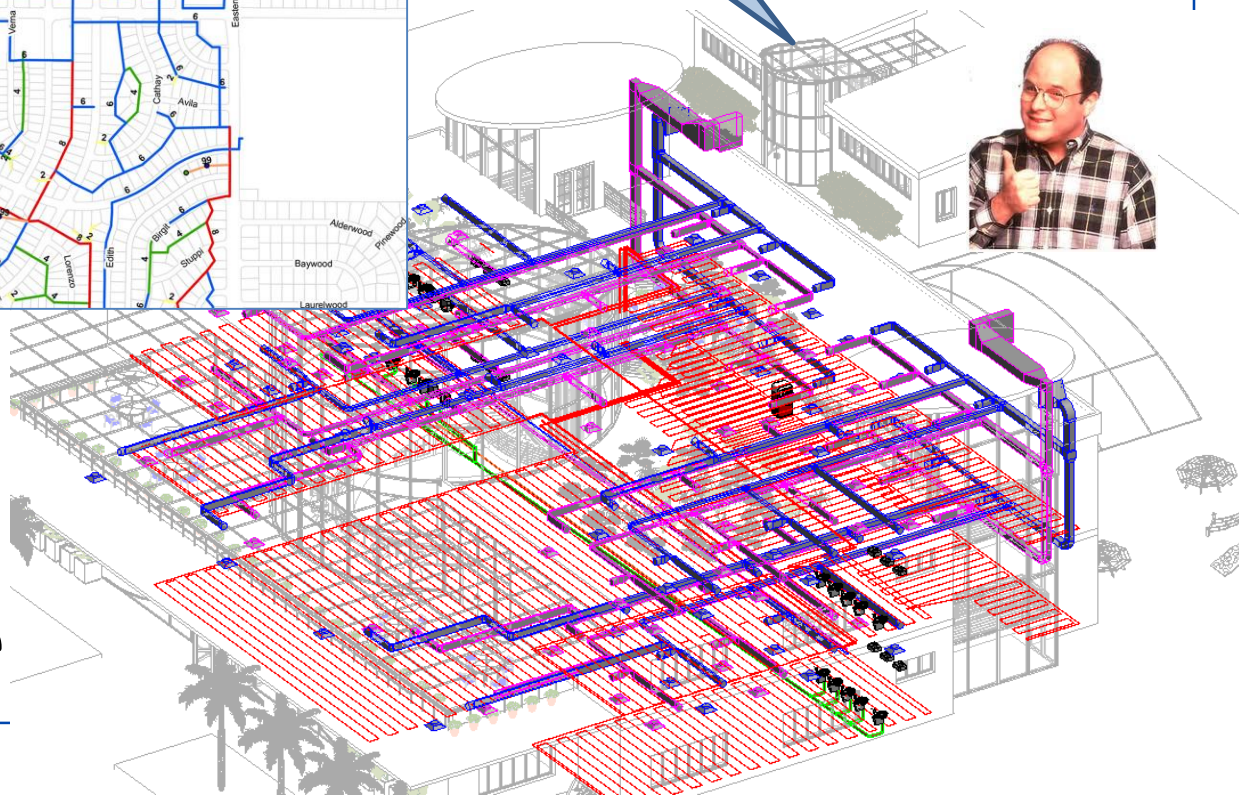
It's not you, it's me.



26,000' DS

VS.

300'  $\frac{3}{4}$ " Premise





# Survey of green building water systems reveals elevated water age and water quality concerns†

William J. Rhoads,\* Amy Pruden and Marc A. Edwards

Widespread adoption of innovative water conservation strategies has potential unintended consequences for aesthetics and public health. A cross-section of green buildings were surveyed and compared to typical

- Survey of green buildings revealed high water ages
  - Associated with water saving fixtures and features
  - 2/6.7 months, fall/summer
- Healthcare suite
  - 60X lower than typical commercial buildings
- Small changes add big differences to water age
  - Solar water heater increased storage and age
  - <1 day to 2.7 days
- Conventional homes use 4X more water
- Green buildings v. Conventional homes
  - 2-4 orders of magnitude 16S genes
  - *Legionella* 1-2 orders of magnitude higher



# Maintaining building water quality after the meter: **You can do it yourself!**

1. Communicate with parents and employees
2. Assess your plumbing and identify fixtures
3. Develop a flushing/sampling plan
4. Collect samples
5. Review data
6. Take corrective actions
7. Communicate results and actions
8. Establish a routine with follow up

# Goal: Reduce risk

- Establishing a water management plan is about reducing risk
  - Localized risk
  - Systemic risk
- Water management plan identifies these types of risk

# Preventative/Mitigation-Flushing

- Bryce will discuss next.
- Many resources available but the main take away is every building is unique and you need to use guidance document as they are intended, as guidance.



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## **Guidance for Premise Plumbing Water Service Restoration**

*When buildings and homes are vacated, the stagnation of potable water within the premise plumbing can lead to water quality deterioration that may be associated with public health risks.*



# Follow the water outside



# Follow the water inside



# Check your faucets



# Determine flushing plan

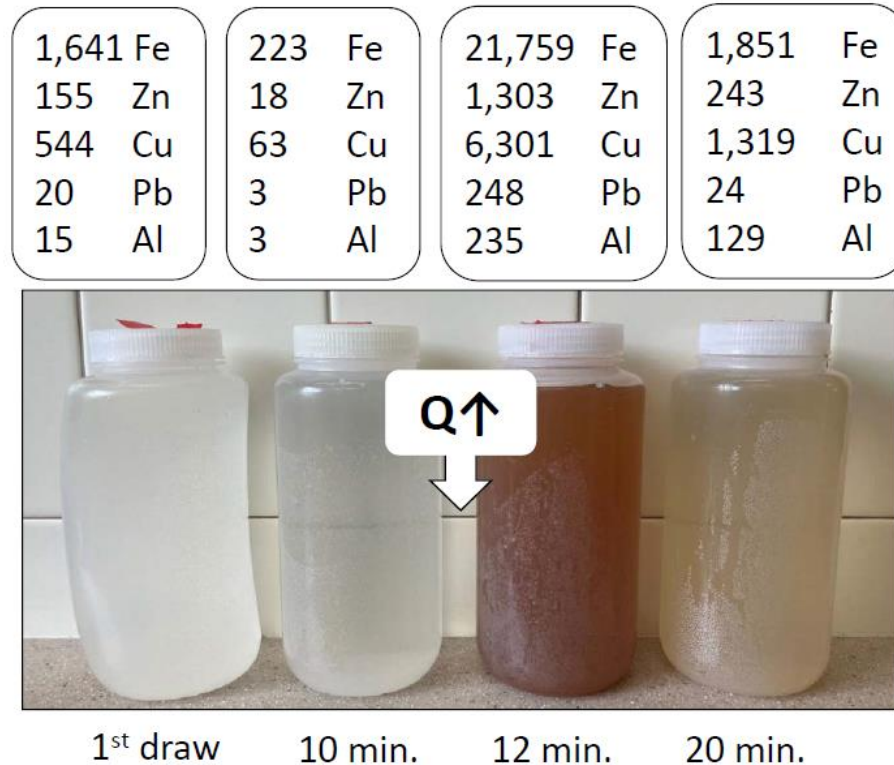
- Look at how your system is plumbed
  - Long lines without loops
  - Dead end faucets
  - High risk fixtures/features
  - Don't forget the cafeteria kettles
  - Grey water
  - Hot water
  - Backflow and cross connections



# Customize

There is a lot of discolored water in the **HOT** water system.

*Filtration of these samples indicate high particulate iron, copper, lead, and zinc levels.*



Levels  
are  
ug/L

# Mitigation-Disinfection

- Continuous
- Free Chlorine
- Chlorine Dioxide
- Chloramine
- Copper-Silver Ionization
  - Oligodynamic Effect
  - Softening
  - AgCl
- UV



# Regulatory Context

## Supplemental Disinfection

- SDWA Section 1411 and 40 CFR 141.3 are subject to federal drinking water regulations under 40 CFR Part 141.
- This part shall apply to each PWS, unless the PWS meets all of the following conditions:
  - a) Consists only of distribution and storage facilities (and does not have any collection and treatment facilities);
  - b) Obtains all of its water from, but is not owned or operated by, a public water system to which such regulations apply;
  - c) Does not sell water to any person; and
  - d) Is not a carrier which conveys passengers in interstate commerce.
- Treatment less than 60 calendar days
- HOT or COLD water

# Who Do I Call?

- Any School:
  - Water utility that you buy water from/operator
    - Test EP for disinfectant residual
      - May contact Ohio EPA
  - ODH
  - Consultant?
- If you school is a PWS:
  - Call your Ohio EPA inspector

# Do your research!

- Purdue's Center for Plumbing Safety  
<https://engineering.purdue.edu/PlumbingSafety>
- CDC document: *Considerations When Working with Legionella Consultants*
- Contact state support agencies
  - ODH, ODE, Ohio EPA, LHD



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## Considerations for large building water quality after extended stagnation

Caitlin R. Proctor, William J. Rhoads, Tim Keane, Maryam Salehi, Kerry Hamilton, Kelsey J. Pieper, David M. Cwiertny, Michele Prévost, Andrew J. Whelton

First published: 16 June 2020 | <https://doi.org/10.1002/aws2.1186> | Citations: 1



Volume 2, Issue 4  
July/August 2020  
e1186

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# Regulatory Context

## *Legionella*

- US EPA regulates *Legionella* under the Surface Water Treatment Rule (SWTR).
  - Treatment Technique for Giardia and virus.
  - Assumes if TT is met (3 and 4 log removal) *Legionella* risks will also be controlled.
  - Disinfectant residuals
    - Required minimum

# Pathogenesis and Epidemiology

- Between 2009 and 2012
  - *Legionella* accounted for 40 of the 65 waterborne outbreaks in the US.
- CDC identified premise (building) plumbing systems as the deficiency that caused 32 of the 40 *Legionella* outbreaks.



# Children

- In 2008, the US Centers for Disease Control (CDC) published a report of increasing incidence of Legionnaires' disease in USA.
  - Between 1990 and 2005, only 375 cases (1.7%) were pediatric cases,
    - 15-19 years old (44.3%)
    - < 1 year (18.1%)

Neil K, Berkelman R. Increasing Incidence of Legionellosis in the United States, 1990-2005: Changing Epidemiologic Trends. Clin Infect Dis 2008; 47:59

# Children

- 72% of cases were hospital-acquired, i.e. the disease was contracted after the child was admitted to the hospital for other medical problems (Alexander NT, ICAAC 2008).
- When compared to children in the community, children with hospital-acquired Legionnaires' disease were sicker and experienced higher mortality (41% vs. 23%).
- The source of the infection was the hospital water supply in 88% of cases when environmental cultures of the hospital water were performed.

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