Agenda

July 13, 2020

Building Water Safety for Schools

Indiana State Department of Health

Introduction	Mike Sutton (ISDH)
What happens when water sits still….	Dr. Caitlin Proctor (Purdue)
Ready school building water systems….	Dr. Andrew Whelton (Purdue)
Concluding Remarks	Sutton

Issue at Hand:

- **Building water systems that go unused due to extended periods of vacancy:**
  - **Annually schools, colleges, and campground facilities**
  - **Stay-At-Home Order due to COVID-19 Pandemic**

Stagnant water systems can experience several adverse impacts to water quality depending on the water supply and plumbing system

Public Health Risks

Exposure to Lead (Ingestion)

- Kids:
  Behavior and learning problems, lower IQ and hyperactivity, slowed growth, hearing problems, anemia
- Adults:
  Cardiovascular effects, increased blood pressure and incidence of hypertension, decreased kidney function, reproductive problems

Exposure to Copper (Ingestion)

Vomiting, diarrhea, stomach cramps, nausea, liver damage, and kidney disease.

Exposure to Bacteria:

- Legionella: (Inhalation)
  Legionnaires Disease or Pontiac Fever
- Mycobacteria: (Inhalation or Ingestion)
  Infections, chronic bowl diseases, allergies, pulmonary infections

What happens when water sits still in a building?

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Lilian Gilbreth Postdoctoral Fellow

Andrew J. Whelton, Ph.D.

Associate Professor

Lyles School of Civil Engineering

Division of Environmental and Ecological Engineering

Purdue University

Presentation Outline

1. Who are we? What do we do?
2. What happens when water sits still?
3. How complex is building plumbing?
4. PART 2 = Ready school building water systems and operate them under low water use conditions

Onsite Education & YouTube Channel

Full-Scale Testing Facilities

Plumbing Testing Facility at Purdue

Onsite Testing and Technical Support

More information here… www.PlumbingSafety.org

A Resource for All

- ✓ Plumbing news
- ✓ Plumbing education videos
- ✓ Plumbing explainers
- ✓ List of projects
- ✓ Scientific opinions
- ✓ Resources ➔ presentations
- ✓ Scientific reports
- ✓ External plumbing docs

COVID Specific Building Water Safety Support Resources

- ✓ Advice for building owners, health officials, utilities
- ✓ Building water safety education videos
- ✓ Guidance on how to create flushing plan
- ✓ Access to the Building Water Safety Study
- ✓ Guidance issued on building water safety
- ✓ We have also done on-site testing for schools

Restoring Water to Medical, Residential, and Commercial Buildings, Shutdowns, Unsafe Water

The COVID-19 pandemic has caused widespread building shutdowns, but also emergency restoration of water to previously closed medical facilities and homes. Several serious building drinking water safety risks exist. As people begin using the water again, they will encounter extremely stagnated water with excessive lead, copper, and bacterial concentrations, that may include harmful organisms like legionella that can cause disease outbreaks.

There are no national or industry guidelines for building reopening after extended shutdowns.

The U.S. National Science Foundation funded Purdue University researchers to rapidly address this serious public health concern. This rapid response effort involves partnerships with the American Society of Plumbing Engineers and International Association of Plumbing and Mechanical Officials and collaborations with other building water and public health experts from across North America.

[NSF government website description of this rapid response grant]

Questions

I am looking for...

- A list of your rapid response efforts in response to the COVID-19 outbreak
- Advice on what I should do as a public health official, building owner, or water utility
- Download a copy of the Experts Building Water Safety Study released April 7, 2020
- Guidance on how to create a building flushing plan
- Brief educational videos on building water safety topics

U.S. National Science Foundation RAPID Award 2027049

Shutdowns and Consequences - Extreme Plumbing Stagnation and Recommissioning

1. Support to the plumbing and public health sectors on building water safety guidance and decisions, ***ongoing***
2. Building water safety review due to prolonged stagnation with experts from 7 private and public sector organizations, ***ongoing***
3. Field testing to determine how impacted building water safety is in actual large buildings, ***ongoing***
4. Lab testing to determine how to fully recover contaminated building water system devices and equipment, ***initiating***
5. Help transform public awareness, ***ongoing***

Helping

IAPMO

American Water Works Association

astho™

NRDC

Washington State Department of Health

ASDWA

Ohio Environmental Protection Agency

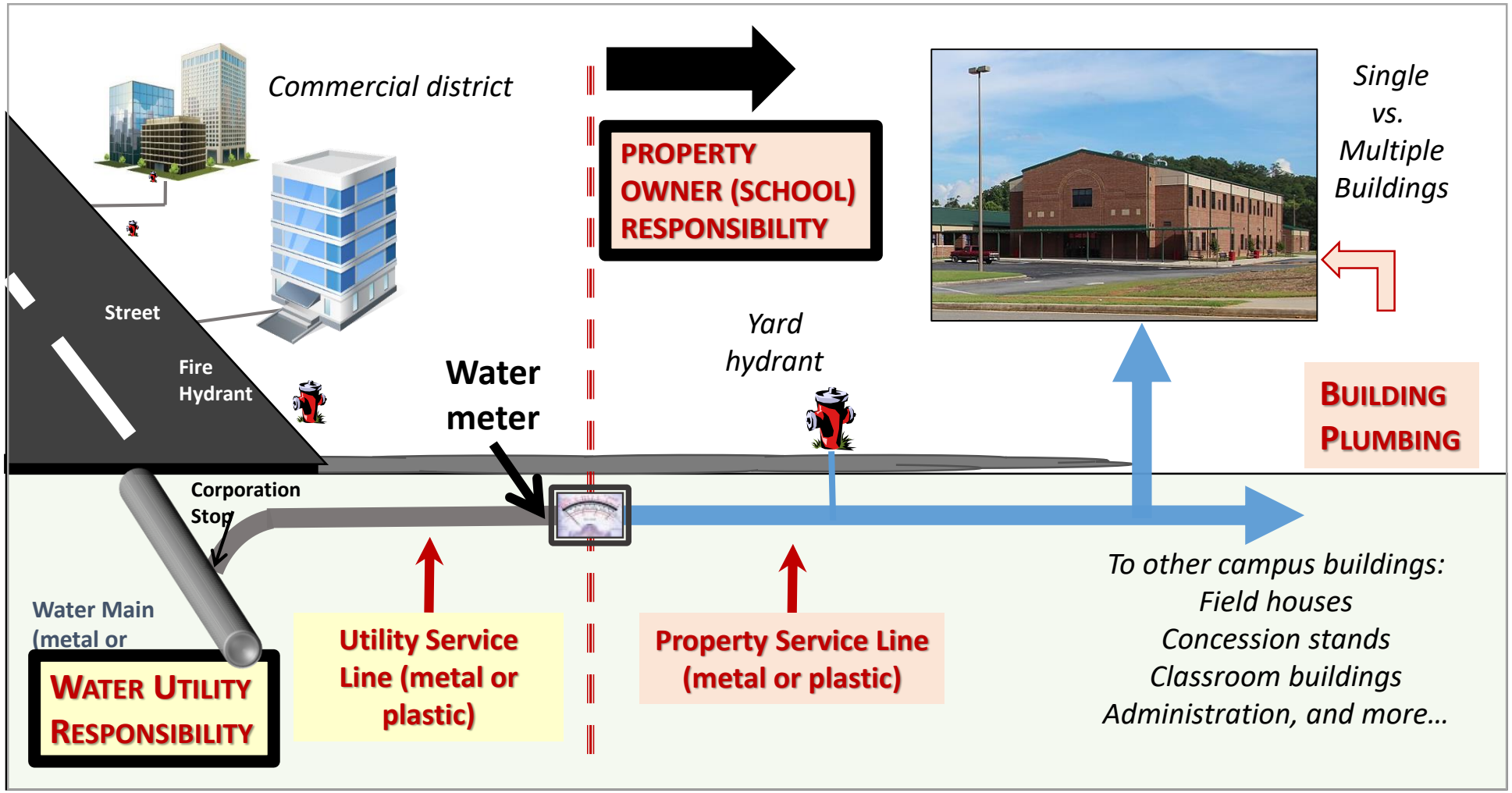
ASPE American Society of Plumbing Engineers

NEHA

SLOAN

Whirlpool Corporation

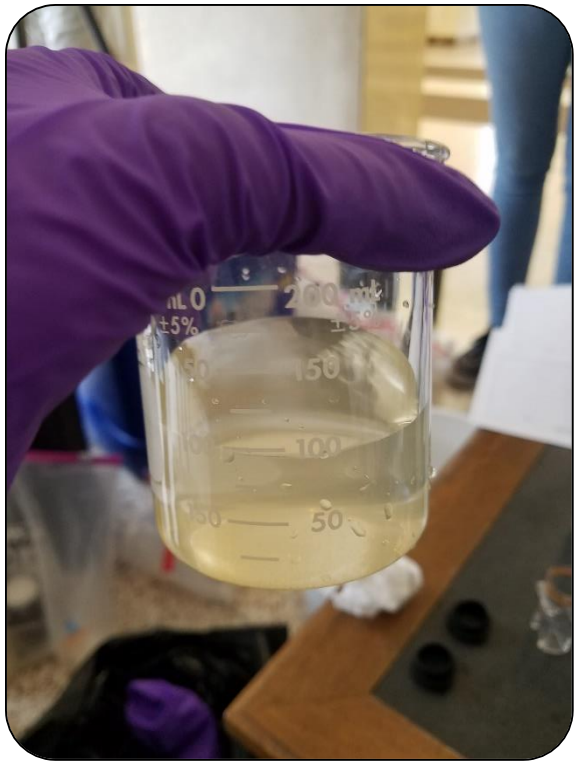
SAFE WATER ENGINEERING



Sometimes there are other water sources like onsite wells….

Stagnation

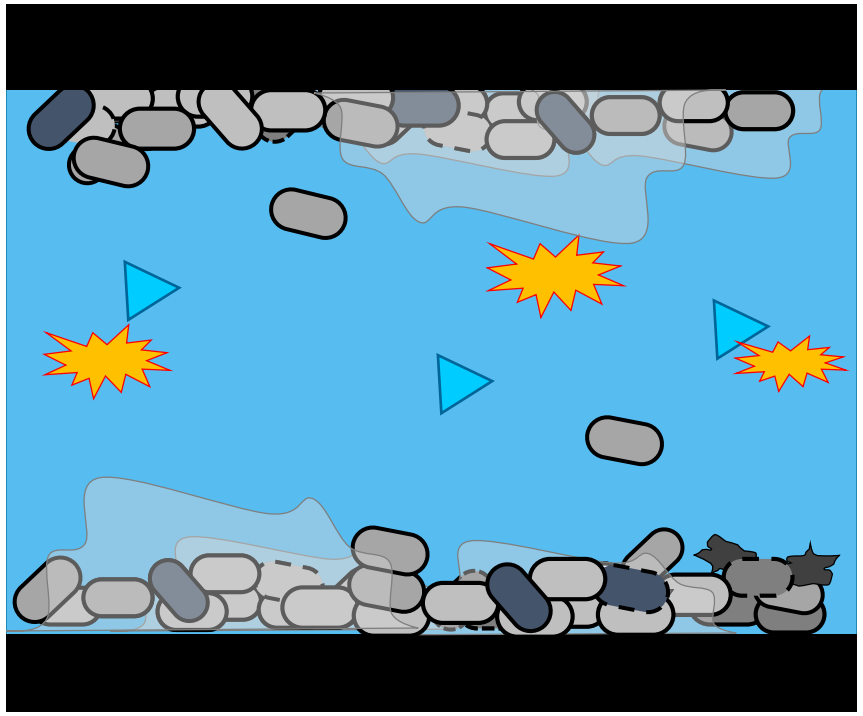
- "A state or condition marked by lack of flow, movement" [Merriam-Webster]
- Water can "sit still" anywhere
- This happens in MOST buildings
  - Overnight – no use
  - Weekends in office buildings
  - Taps in your home you only use on occasion
  - Outdoor spigots/irrigation systems
- This can also last MUCH longer



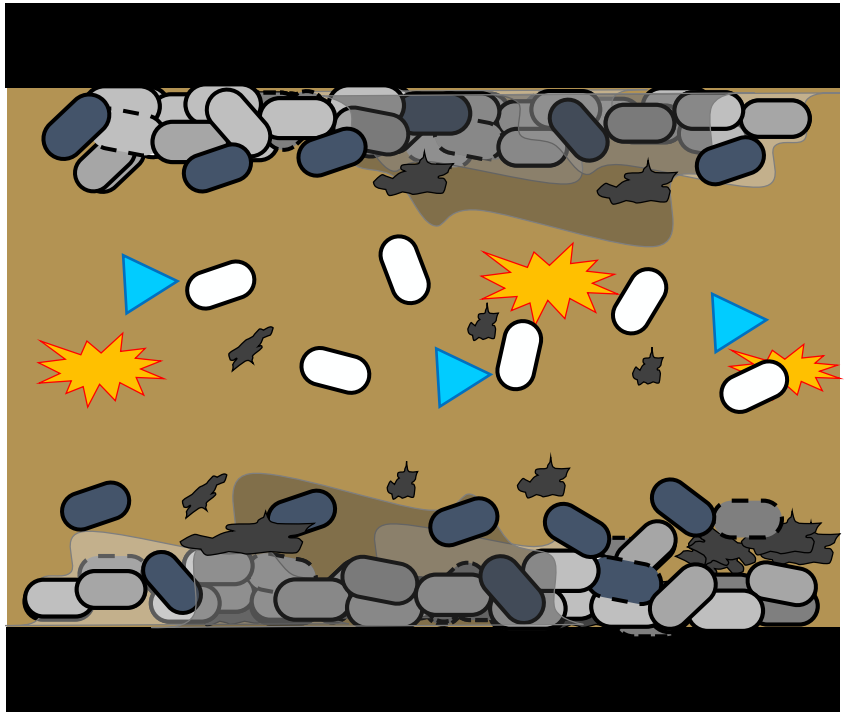
Stagnant water may (or may not) look different

Stagnation… can be problematic

Normal water use refreshes disinfectant residual & corrosion control



Old water (not refreshed) results in microbial growth & uncontrolled corrosion



Slide from our YouTube Videos

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Disinfectant in water – used to reduce microbial growth in water, typically chlorine

Corrosion control – used to reduce metals leaching, stabilizes pH and may add chemicals

Stagnation poses health **risks**

- **Copper** can leach
  - Nausea, vomiting, diarrhea, abdominal cramps
- **Lead** can leach
  - Nausea, vomiting, diarrhea, abdominal cramps, longer-term developmental issues with children
- **Scale** can be suspended – releasing other metals
- **Harmful organisms** (e.g., *Legionella pneumophila* and other opportunistic pathogens) can grow
  - Many organisms cause respiratory illness, and other infections can occur

A bit on microorganisms

Naturally present in natural and engineered water systems

Often cause **respiratory** infection (pneumonia)

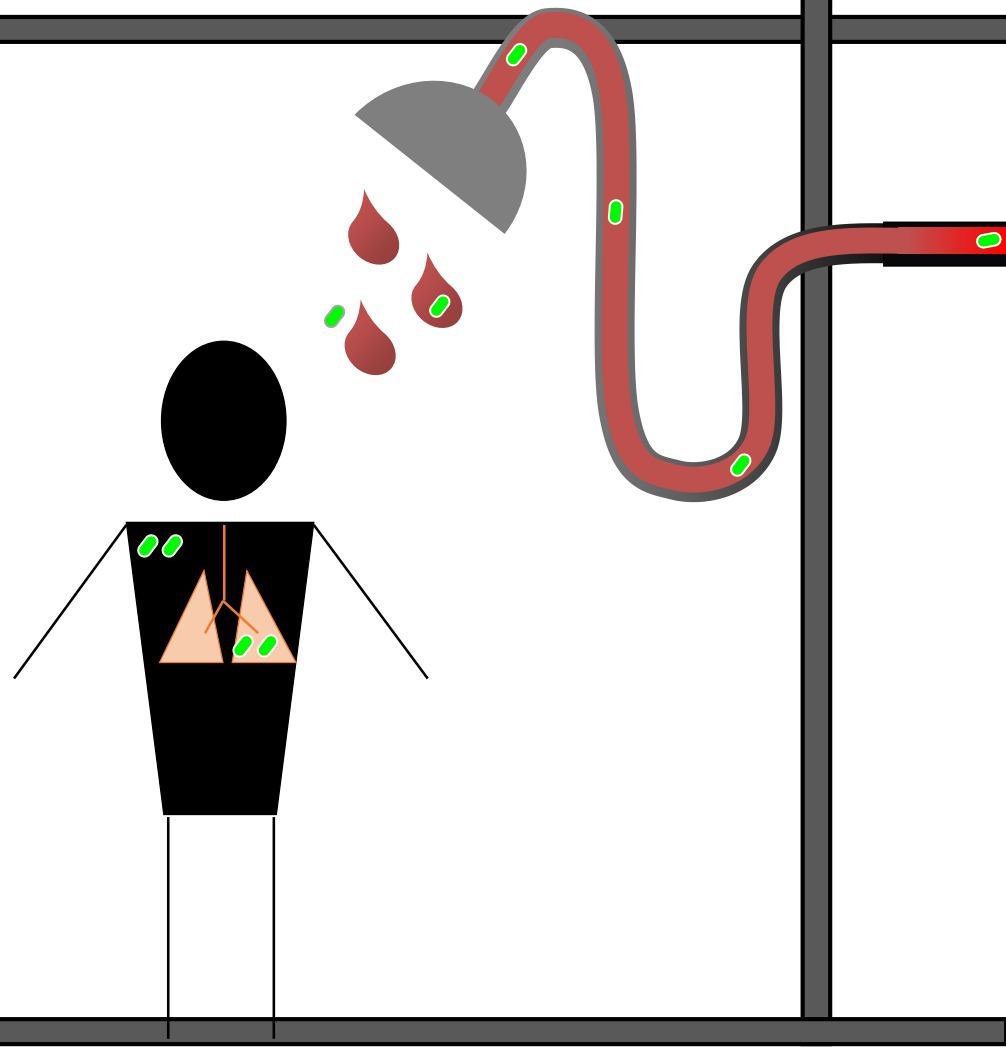
Exposure through inhalation, aspiration, and dermal routes (including eyes)

How can you be exposed to aerosols?

- Showering
- Decorative fountains
- Toilets
- Steam rooms
- Sprinkler systems, slip and slides

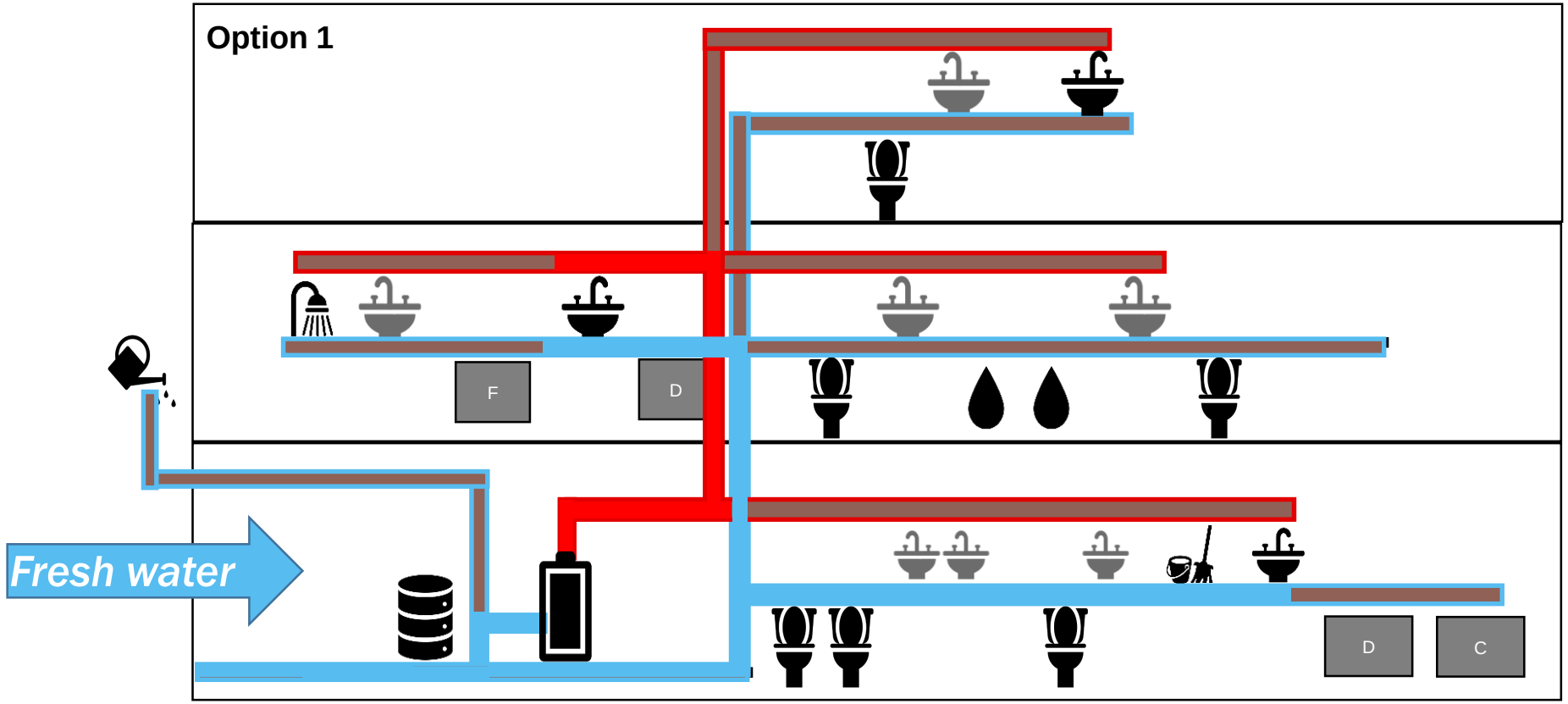
Immunocompromised persons are at higher risk for infection (elderly, pre-existing conditions)

Not just *Legionella pneumophila* – also nontuberculous Mycobacteria, *Pseudomonas aeruginosa*, various amoeba including *Naegleria fowleri* - the brain eating amoeba

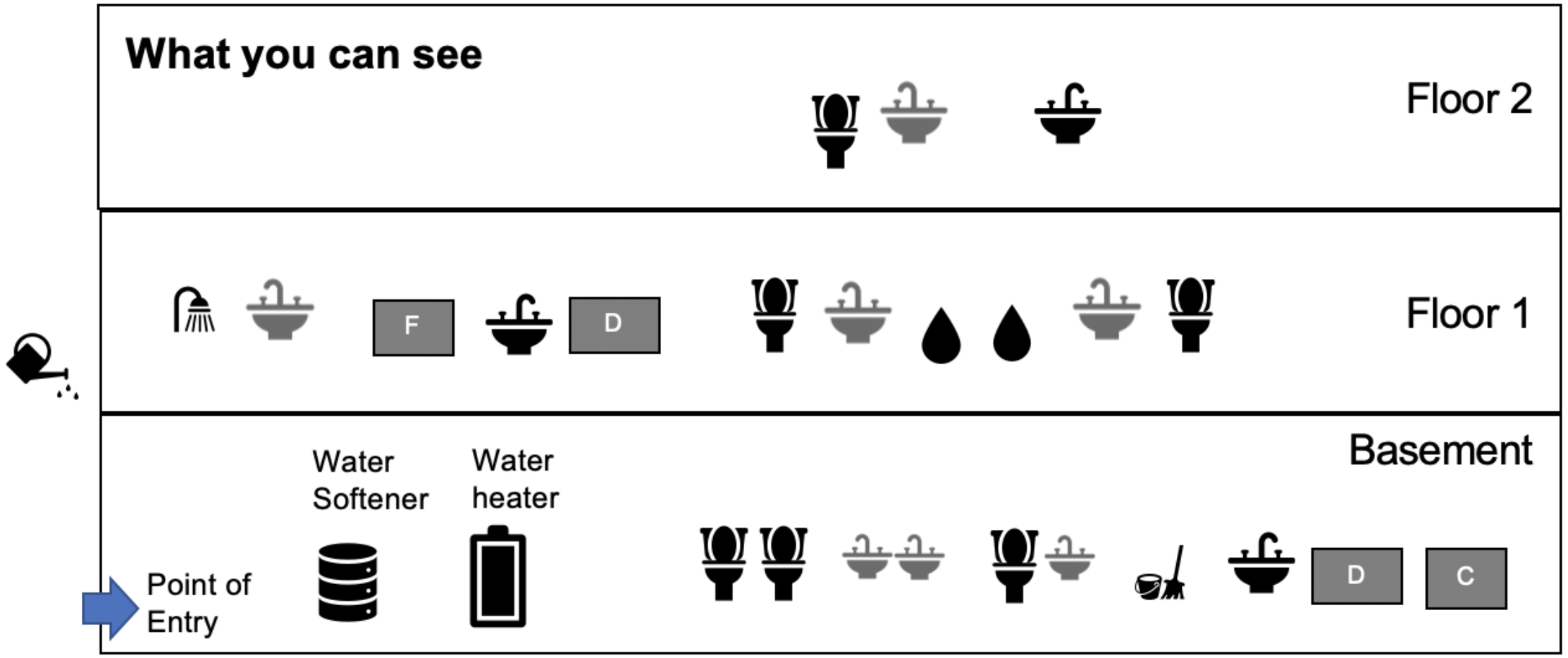


Refreshing water…

Requires understanding plumbing configuration



Understanding plumbing configuration



Legend

Pipes: Hot, Cold

Sinks: Kitchen, Bathroom, Janitorial

Toilet

Fountain

Shower

Irrigation

Appliances

F - fridge
D - dishwasher
C - water cooler

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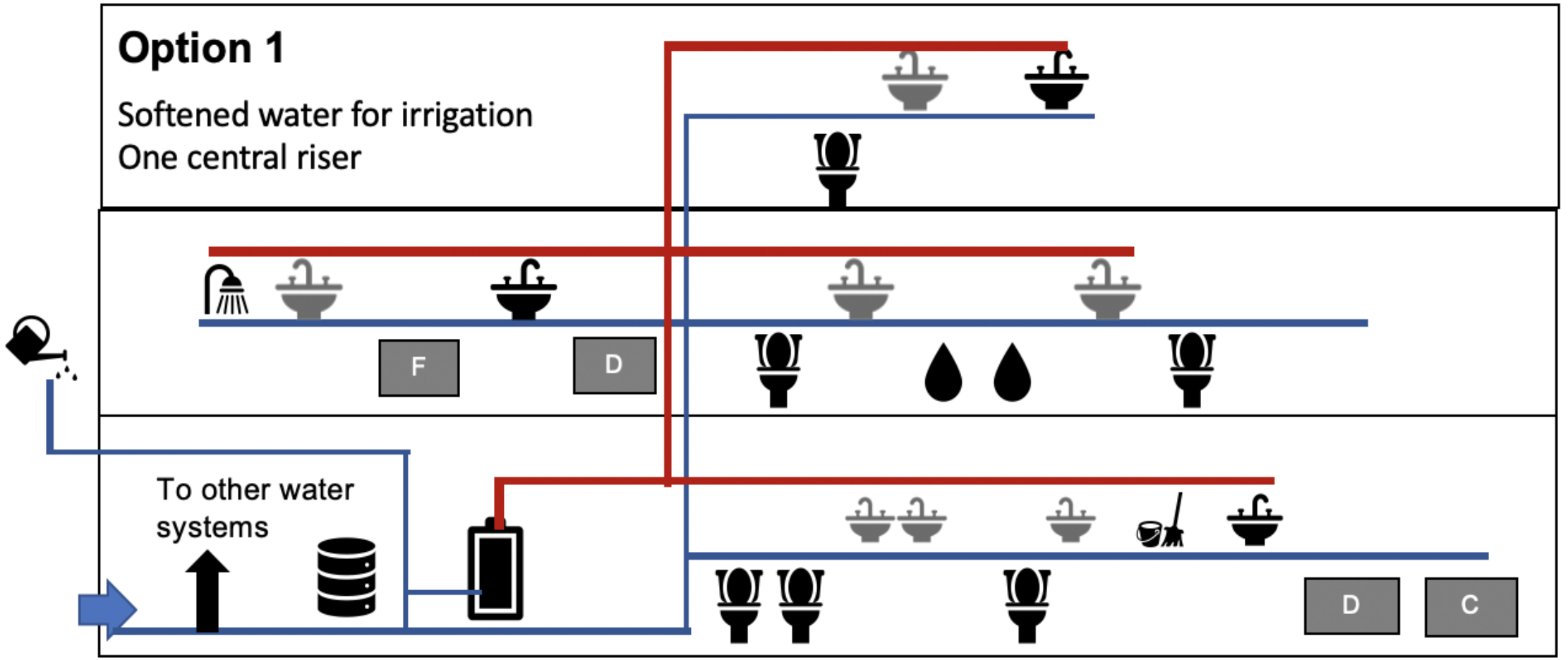
Understanding plumbing configuration



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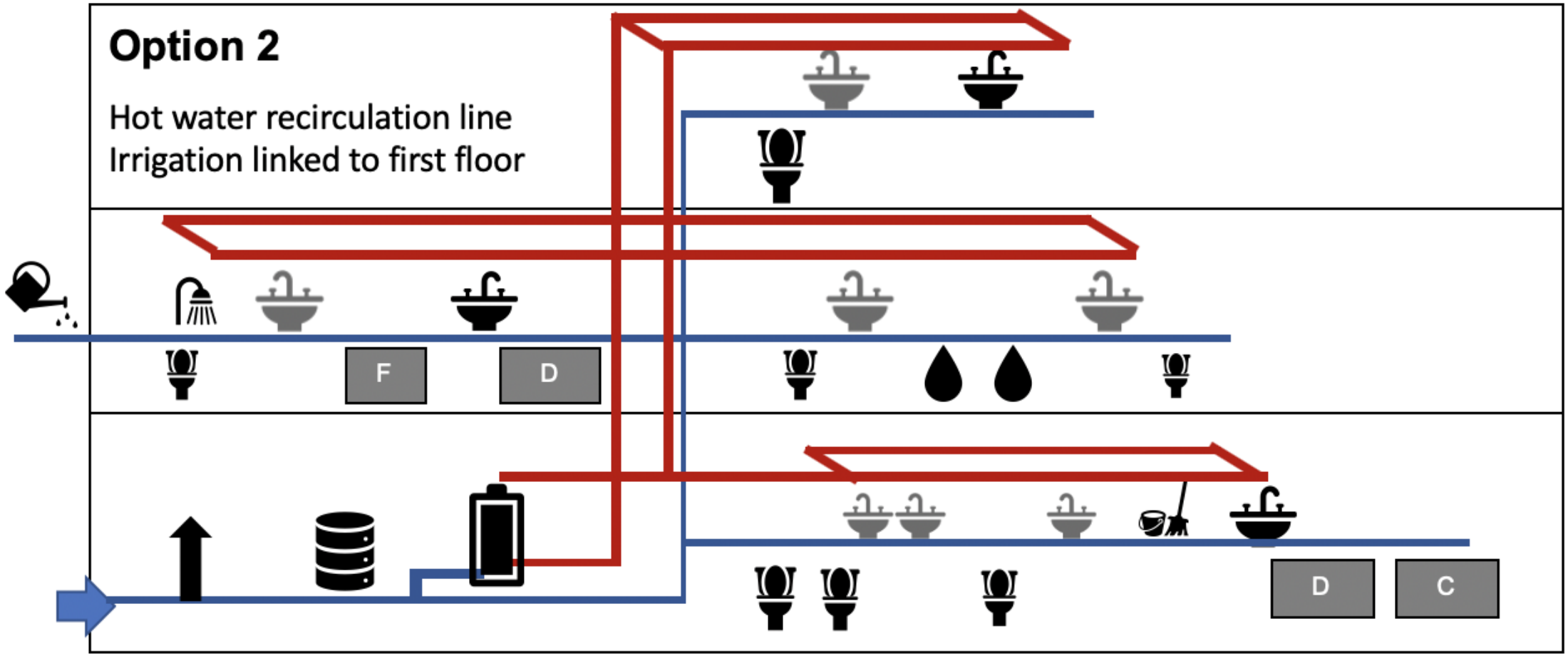

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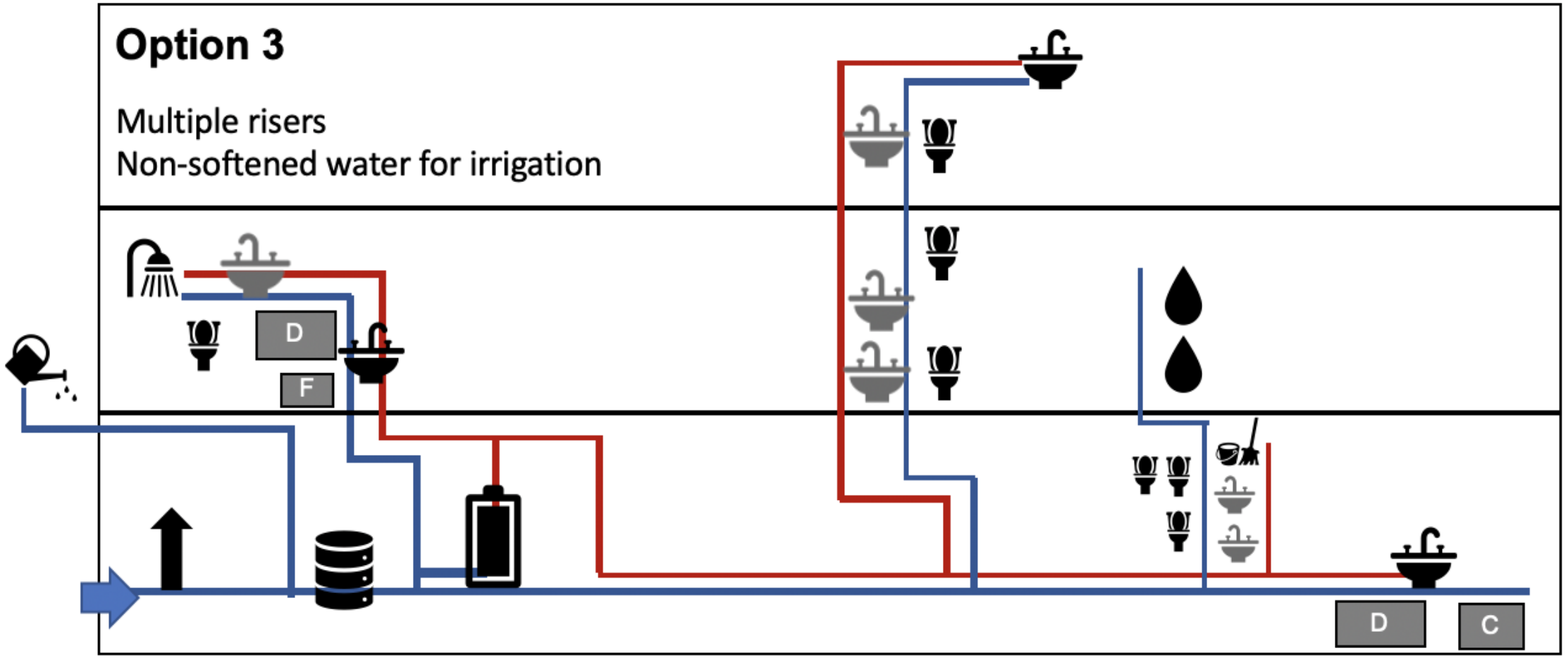

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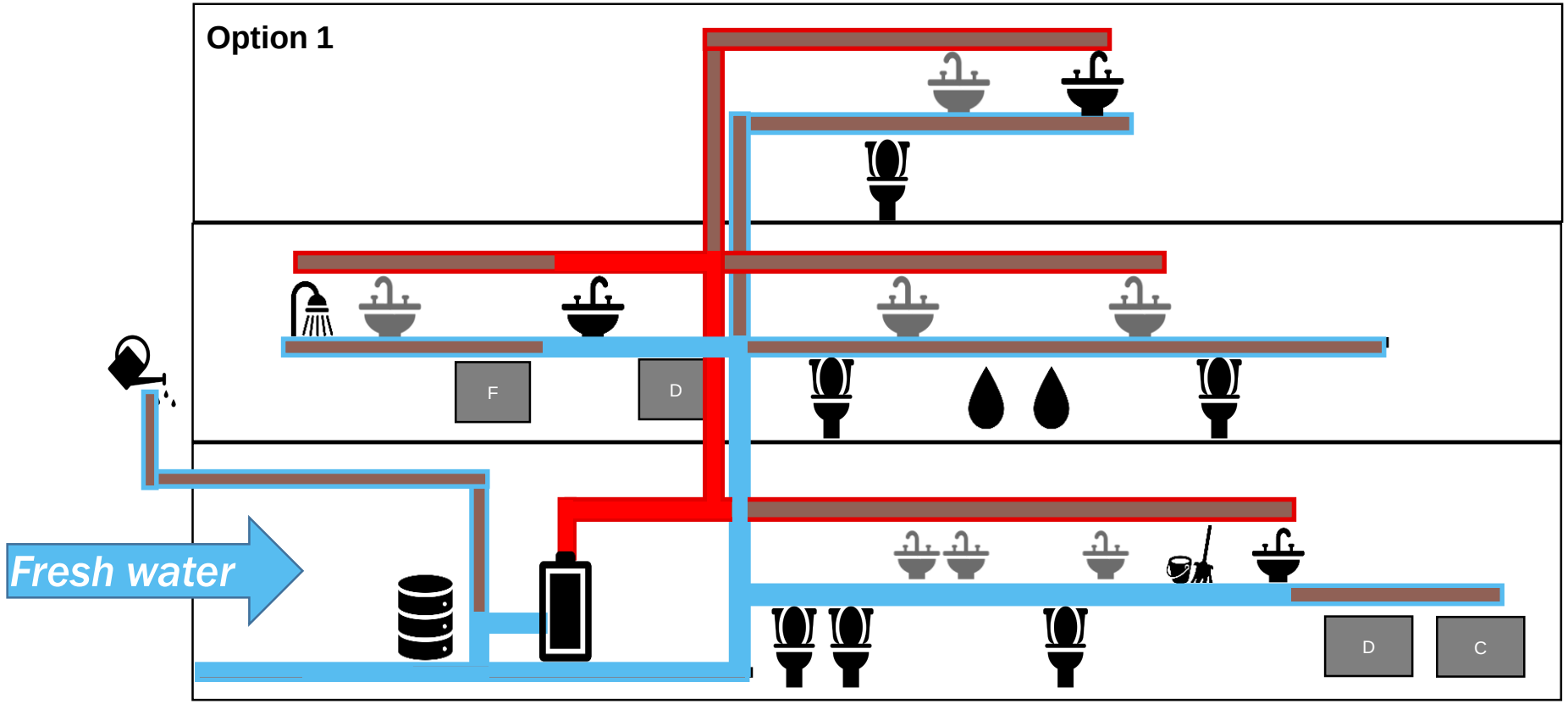
Refreshing water…

Requires consideration of ALL TAPS



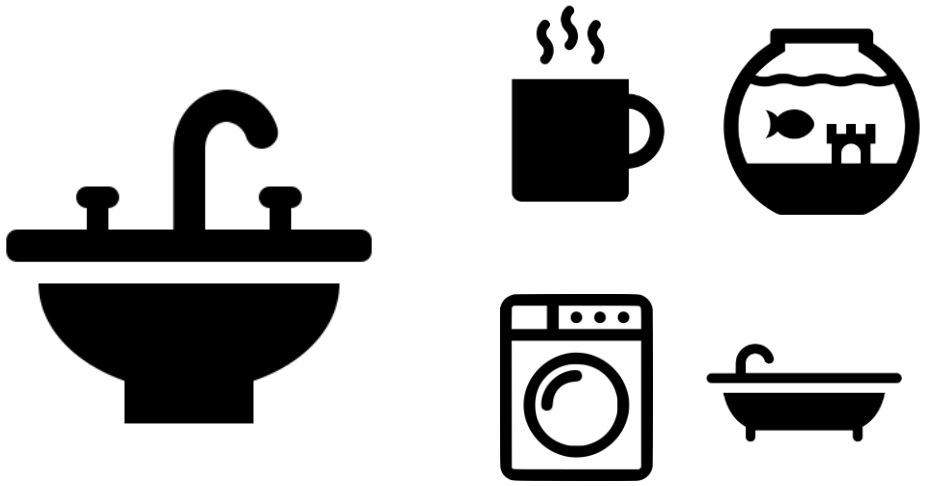
Potential sources of exposure

- Drinking water
  - Kitchens
  - Ice dispensers/use
  - Bathrooms
  - Plumbed water dispensers
  - Any faucet
- Domestic hot/cold water
  - Hand washing
  - Bathing (showers)
  - Dish washing
  - Toilet flushing
- Recreational water
- Equipment water
- Devices
  - Humidifiers
  - Cleaning equipment
- Irrigation
- Fire suppression systems (always stagnant)
- Heating/cooling water
  - Cooling towers
- Medical equipment

The good news…

There are strategies to mitigate water issues

www.Plumbingsafety.org



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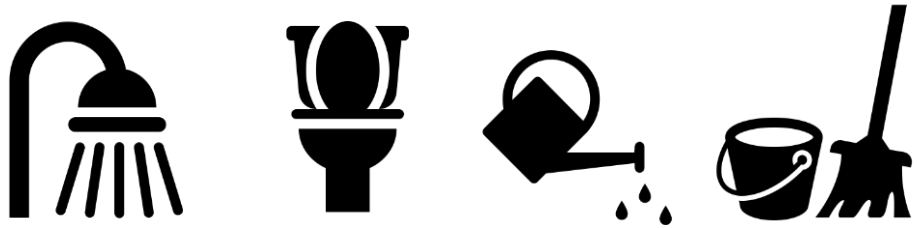

Ready school building water systems and operate them under low water use conditions

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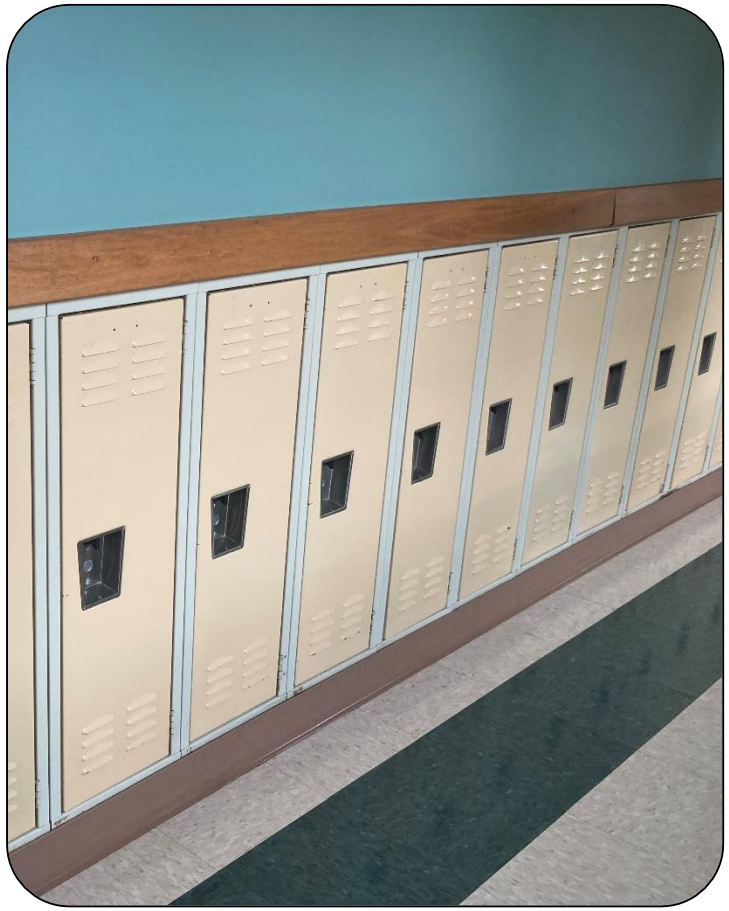
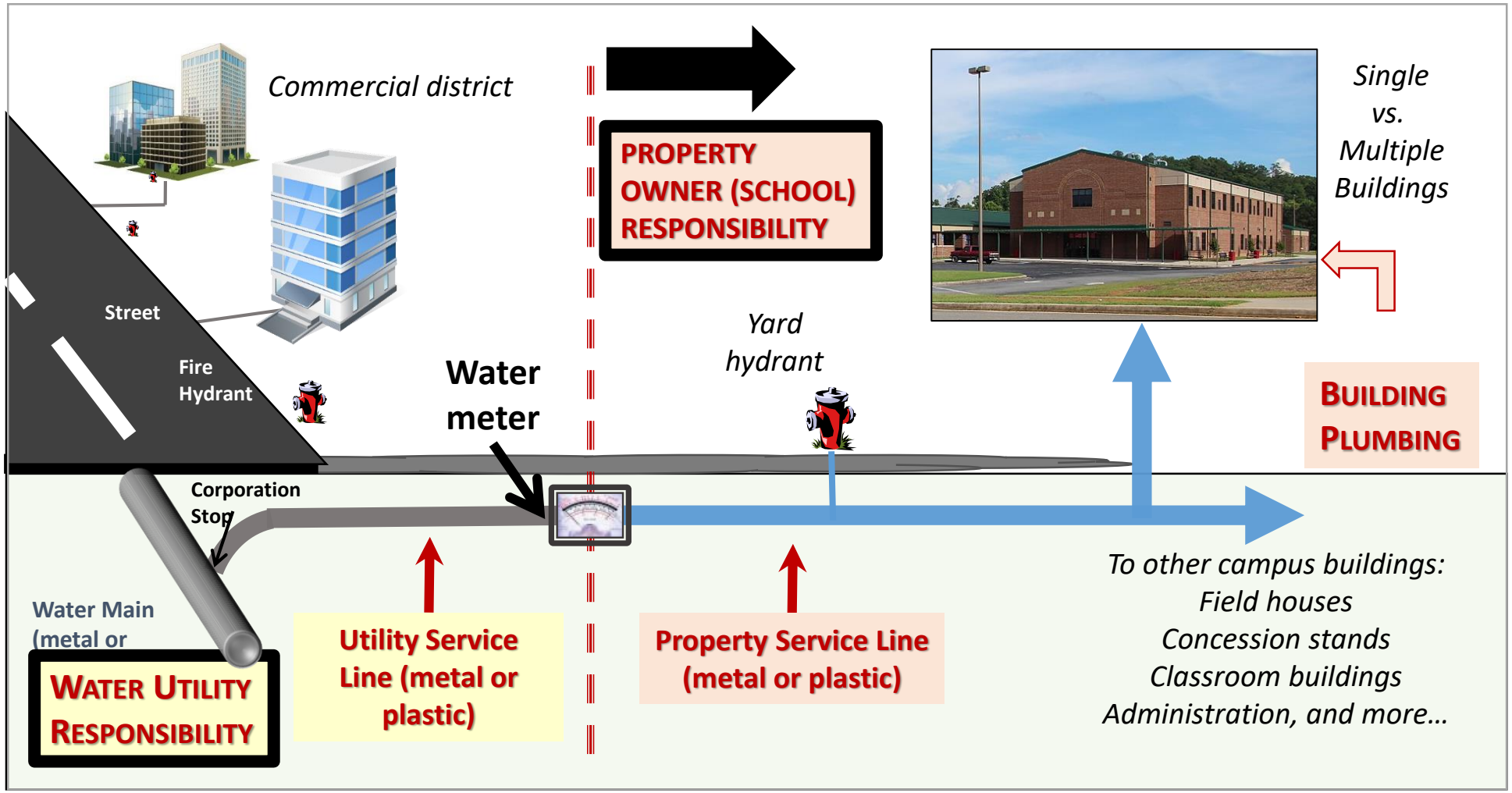
Learning objectives



1. Identify plumbing components that require evaluation
2. Describe how to determine if the school building contains stagnant water
3. Explain the general process for flushing a building water system
4. Define water testing considerations
5. Identify actions to take to maintain system under low occupancy / low water use

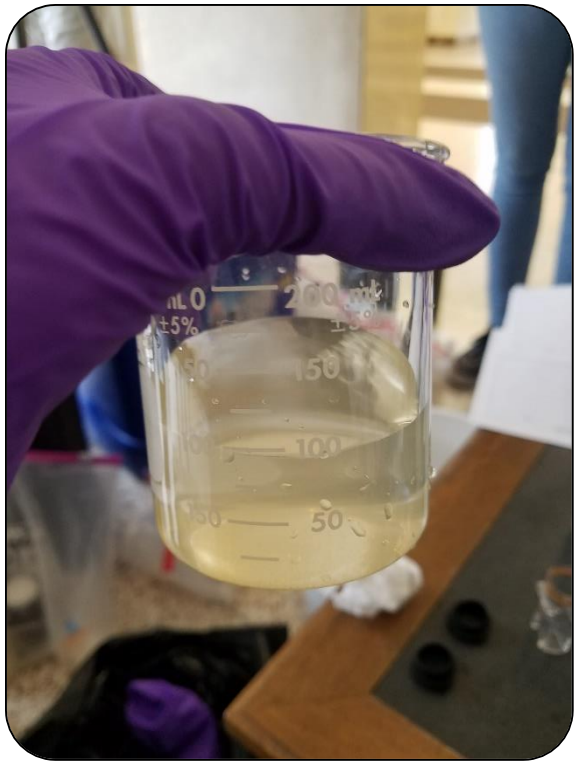


Sometimes there are other water sources like onsite wells….

Describe your building water system

To address your system, you must know your system.

1. What is your water supply source?
2. What is the physical location where the water enters the campus?
3. Is there irrigation?
4. How many buildings on campus use water and where are they?
5. Where does water enter each building, the point-of-entry (POE)?
6. Does the building have a water softener or other treatment device at the POE?
7. Where are the water heaters? How many do you have? What temperatures are they set at?
8. How many recirculation loops do you have?
9. How many pressure zones do you have?
10. Do you have showers? Decorative fountains? Cooling towers?



Stagnant water may (or may not) look different

Determine if you have stagnant water

Has every water outlet been used/flushed repeatedly in each building?

- No? Likely have stagnant water. But, to what degree?
- Just a weekend can sometimes cause water to be unsafe.
- Entire building water system should be flushed out before occupants return.

SAFETY is very important. Stagnant water can pose inhalation risks. It is generally assumed that legionella can be present and workers should considering wearing fit-tested N95 respirators according to OSHA for flushing activities. This requires medical clearance. Goggles, gloves, and other PPE also recommended.

- The longer the stagnation period the greater potential legionella concentrations in the stagnant water will be higher.

Do not shut off building air conditioning. This can enable uncontrolled microbial growth in stagnant water during hot months.

Determine how you will flush the building water system

Step 1. Contact the water supplier. Tell them you are going to flush your building(s). Are they delivering highest quality water with disinfectant residual? What chemical and level should you expect to find?

Step 2. Bring “fresh” water to the building. Flush water out of the buried pipe that moves water from the meter (or well) to the building(s).

Step 3. Determine if you have “fresh” water. Test using inexpensive onsite chemical disinfectant residual and temperature kits. Appropriate kit determined by the chemical used by the water supplier.

Faucet aerators should be removed and cleaned

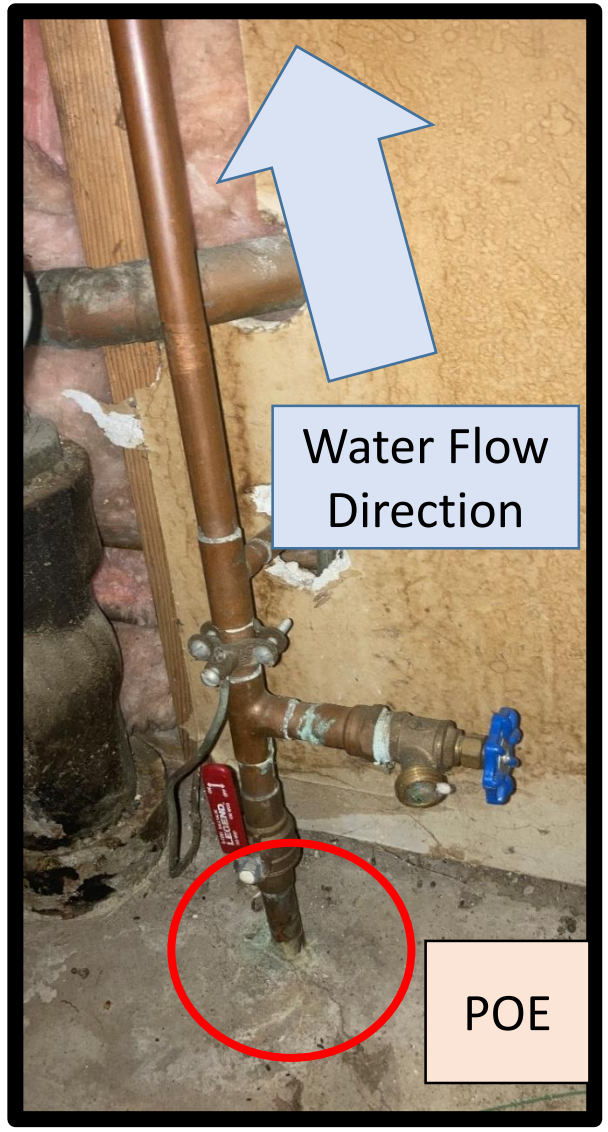
Digital Disinfectant Residual Analyzer

HACH DR300
~$500/each

Digital Thermometer

Thermapen
~$90/each

Here are just 2 examples. NOTE: Do not use pool disinfectant test kits. Test strips can be misleading.



Step 4. Remove and clean faucet aerators. Flush **COLD water** outlets first and start at the Point-of-Entry (POE), where water enters the building. March through the building to the farthest outlet.

Toilets, urinals, faucets, water fountains, showers, outdoor spigots

Step 5. Go back to the POE. Now, flush **HOT water**. First, start with the water heaters –and– hot water recirculation loops. Then march through the building again. If you shutoff heaters/loops you can use temperature to monitor flushing.

Step 6. Address appliances (refrigerators, dishwashers, icemakers, coffee-makers, POU/POE devices like softeners, filters)

You may need specialized expertise: cooling towers, water heater tanks, fountains, recirc loops, POE devices, POU devices, and more…

KEEP A LOG. Write down every action.

Define water testing considerations

Risk factors = Population, stagnation duration, building specific issues, exposure potential

Locations = At the POE, outlet type, distance from the POE, cold and/or hot systems

Level 1: Disinfectant residual and water temperature. *If not doing this now, please start.*

Level 2: Copper, lead for ingestion exposure locations – fountains, breakroom faucets, cafeteria faucets, etc.

Level 3: *Legionella* and other microorganisms. Applicable for inhalation (and dermal) exposure locations – showers, decorative fountains, cooling towers, etc.

Once the building water system is prepared…
Keep water fresh

Low occupancy / low water use may mean a greater chance for stagnant water (and being back to where you started).

Make certain the water heating systems are set at the correct temperature.

Selectively *and inexpensively* test water for disinfectant residual and temperature. If any concerns, may need specific support.

Keep flushing water through the building at under-utilized areas.

KEEP A LOG. Write down every action.

Special attention must be paid to decorative fountains, pools, tubs, showers, cooling towers, and more…

Thank You… www.PlumbingSafety.org

If you want help contact us.

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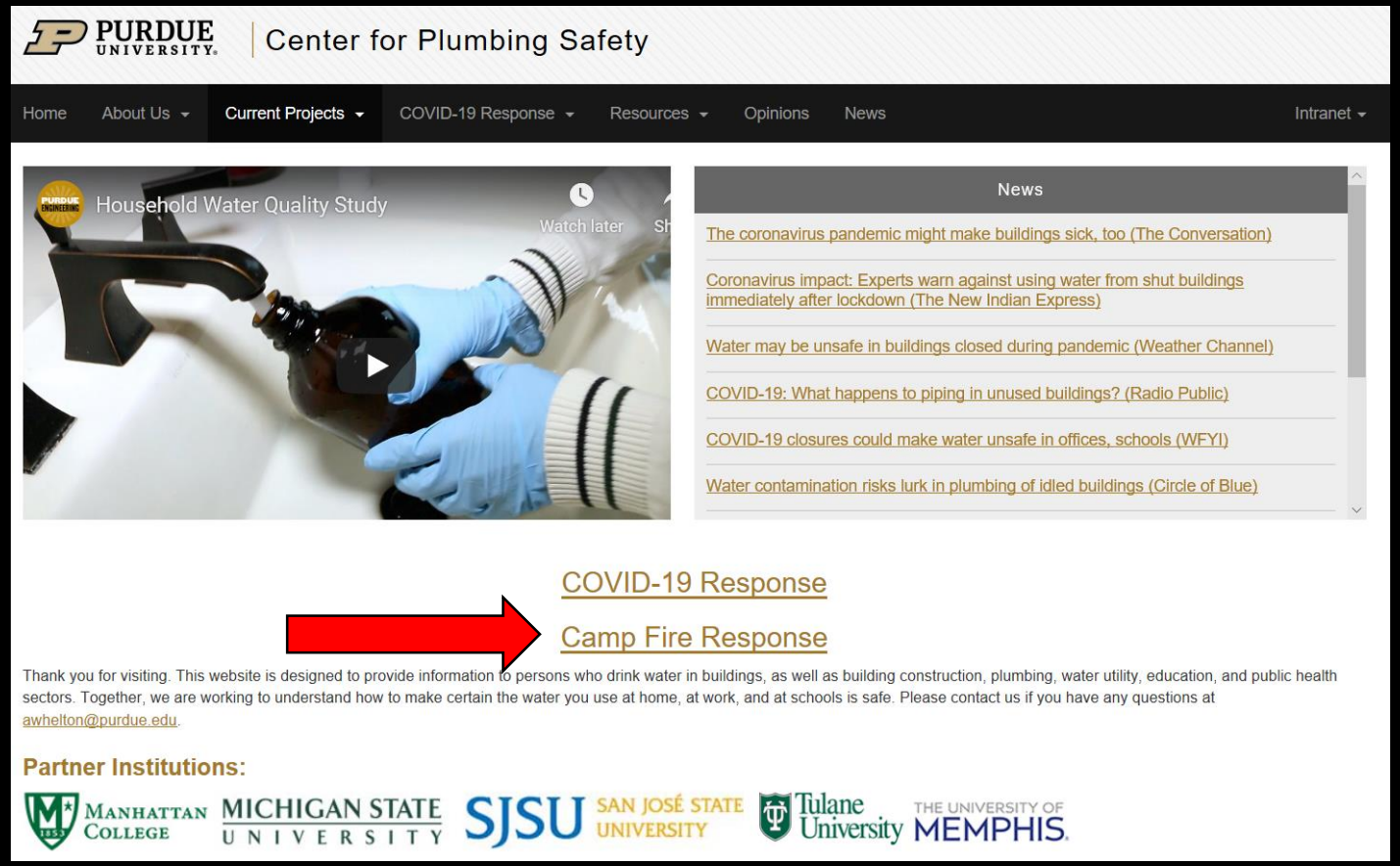

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Resources found at www.in.gov/isdh/20408.htm
Building Water Startup Guidance
Building Water Safety for Schools Webinar
- Link to Webinar
- PDF of Slide Deck

Q&A Session Link – July 23 at 10am