Water Safety in Buildings: Issues at Hand

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Stagnation *noun*

stag·na·tion | \\ stag-'nā-shən

a state or condition marked by lack of flow, movement

When water does not flow well; areas of stagnant water encourage biofilm growth and reduce temperature and level of disinfectant

Merriam-Webster

Centers for Disease Control and Prevention

AWWA Virtual Summit

December, 2020
Prior to the pandemic, stagnation posed health risks. The time scale of concern can sometimes be just a few days.

**Copper** can leach
- Nausea, vomiting, diarrhea, abdominal cramps

**Lead** can leach
- Nausea, vomiting, diarrhea, abdominal cramps, longer-term developmental issues with children

**But other metals too!** Scale can be suspended.

**Harmful organisms** (e.g., *Legionella pneumophila* and other opportunistic pathogens) can grow - better
- Many organisms cause respiratory illness, and other infections can occur

**Exposure Routes of Concern:** Ingestion, Dermal, Inhalation
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, complete
3. Field testing to determine how impacted building water safety is in actual large buildings, ongoing
4. Bench-/pilot-scale testing to determine how to fully recover contaminated building water system devices and equipment, planned
5. Help transform public awareness, ongoing

Helping

American Water Works Association
astho™
NRDC
Washington State Department of Health
ASDWA
Ohio Environmental Protection Agency
ASPE
NEHA
Whirlpool
SAFE WATER ENGINEERING

AWWA Virtual Summit
December, 2020
2020: State-of-the-knowledge review about water safety impacts of prolonged stagnation

Collaborative effort
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Considerations for Large Building Water Quality after Extended Stagnation

Download FREE here:
https://doi.org/10.1002/aws2.1186
Some Ongoing Initiatives

11 buildings across 4 studies
All free chlorine disinfectant
3-5 months of low/no water use
Some served by the same utility
Some have recirculation loops, in-building storage, showers
All had indoor copper pipe
Up to 400 water outlets/building
Not all had as-built drawings

1. Elementary school, Indiana (Ra et al.)
2. Large residential building, Indiana (Angert et al., led by Proctor, Ph.D.)
3. Institutional buildings, Indiana (Ra et al.)
4. Elem/mid/high school, Ohio (Ley et al.)
Water management programs basically nonexistent at daycares, schools, colleges, and universities

Metal (Cu, Pb, Ni, Zn) health-based limit exceedances. Don’t just look at water fountains.

Legionella pneumophila detected in 3 of 4 studies
- 2 buildings where flushing applied, no legionella detected after flushing, 2 weeks later low levels (<10 MPN/100 mL)
- Highest levels found in cold water not hot water. Water fountain hot spots.

Super chlorination levels throughout building differed (est. 160-340 mg/L+ for 3 hours). Likely due to ineffective mixing, reactions, and/or decay
Preliminary Field Observations: A Few Gaps

Lack of clear Go/No-Go levels for *Legionella pneumophila* and other pathogens
- Some consultants invoke the zero MCLG, others invoke different numbers
- One health department invoked a conversation with CDC that zero is only acceptable
- CDC doesn’t have explicit Go/No-Go levels for buildings
- Risk-based levels can range from 1 to 1000s CFU/100mL depending on exposure route

Most of the time other pathogens are not being examined, legionella only

Some health departments discourage school water testing (lead, copper, legionella, etc.) because they claim CDC discourages water testing unless there’s a suspected outbreak.

Some consultants implement what they want (i.e., qPCR testing for legionella only ➔ followed by thermal disinfection ➔ then a 36 hr qPCR test only, not other follow-up)
Coming Soon: COVID-19 inspired building water safety testing results from many others