DRAFT

Example Procedure for Flushing a Modified 3 Floor Office Building

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I. Background

Sometimes buildings are shutdown or experience long-periods of low occupancy and the water inside the property plumbing stagnates. Water can stagnate inside the building pipes and tanks, but also in the buried water service line that transports drinking water from its source to the building. Stagnation allows for contaminant levels of metals such as lead and copper to increase in the water. Microbes are also likely to grow. Under routine building water use, the amount of contamination in water is not typically a problem, but long stagnation periods can cause water quality to deteriorate to unacceptable levels. To remove this water from the property plumbing, a procedure was developed based on as-built construction drawings and experience inside the building. The procedure below is provided to help demonstrate the steps needed to flush the stagnant water from the plumbing and replace it with fresh water from the water utility main buried out in front of the property.

This guidance was developed using specific assumptions, stated below. ***Factors of safety were not applied.*** Due to non-ideal flows commonly encountered in plumbing, stated flushing times may need to be increased. In a prior study for flushing home interior faucets the factory of safety applied was 10. So, all flushing times may need to be 10% longer. No safety factors were applied.

Building Characteristics

Year Built 2010

Size:

- 3 floors, 20,000 square feet area

Water Use:

- A regulated public water system (PWS) delivers chlorinated drinking water to the property through a buried service line.
- The building only relies on PWS water for drinking, appliances, and hot water
- 1 shower exists in the building that includes a showerhead and shower wand.

Plumbing Characteristics:

- The buried water service line (111.25 ft, 30 gallon) consists of 3 different sections: 25 foot galvanized pipe + 72.5 feet copper pipe + 13.75 feet two copper pipe.
- Total volume storage in the service line = 30 gallons.

In-Building Devices:

- Point-of-entry water softener (19.2 gallon).
- 1 central water heater (100 gallons) with hot water distribution system.
- The following devices exist: Dishwashers [Basement and Floor 1], Refrigerator with water dispenser [Floor 1], ice machine [Floor 1], water bubblers [Floor 2].
- Standalone water cooler in the basement with treatment.
- Point-of-use faucet filtration device was located on Floor 2.

Plumbing Type:

- Soldered copper pipe

II. To Prepare for Flushing

1. Remove faucet aerators where possible and replace them after flushing is completed. Their removal will allow water flowrate to be faster and limit the amount of sediment to become trapped during flushing.
2. Remove point-of-use filters and replace them after flushing. This will limit the amount of sediment to become trapped during flushing and also a potential source of contamination.
3. Remove shower hoses and replace them after flushing.
4. Consider only opening 1 fixture at a time. The more fixtures you open, the slower the water will flow inside the building because pressure loss through multiple fixtures being open.
5. Consider turning on vent fans where present and opening windows and doors to maximize building ventilation.
6. Turn off the automatic motion fixtures where possible. These are the hands-free faucet functions. This will ensure the fixture continuously flushes and doesn't shutoff every few seconds. By allowing these fixtures to continuously run, this will reduce the amount of labor needed and time required. If this is not possible, someone should be physically present and make certain the actual flushing time exceeds the required amount.
7. Flush all toilets in the restrooms.

The goal is to replace water in the building starting at the service line and then moving sequentially from the bottom floor to the top floor. A major assumption is that the drinking water delivered to the property through the water utility main is fresh, meets all federal drinking water standards, and contains residual disinfectant.

III. **Step-by-Step Procedure (you may need 2 people to do this)**

- Fixture water flowrate is assumed 0.5 gallons per minute unless otherwise stated. Fixture flow rates may be faster this depending on the building, which would reduce the necessary fixture flushing time.
- A 0.5 gallon per minute flowrate can be measured by filling a 5 gallon bucket in 2 minutes and 30 seconds. The same flowrate would fill a 1 gallon milk jug in 2 minutes.
- This guidance assumes no fixtures were not clogged.

1. Begin in the basement [Includes maintenance room with Water Heater + Softener]

Preparing the water entering the building:

a. Connect a hose to the spigot located inside the building at the building entry point and then insert that hose into the janitor sink to drain the flushed water. Turn on the spigot to flush water and have someone monitor the spigot does not leak and janitor sink does not overflow or spill out. **Flush this location for 1 hour.** At the end, shut this off. This spigot is a high flowrate location and is immediately located after water enters the building through the service line.
b. Contact water softener manufacturer and request a new replacement for the resin. Follow manufacture's guidelines for draining softener bed.
c. Go to water heater connected after the softener. Flush the pipe between the softener and the heater tank. Follow manufactures guidelines on draining the heater tank.

Flushing the building after point of entry:

d. Go to the Basement Kitchen Sink Faucet (Room 006). This is the furthest fixture from the basement entry point within the basement.
    i. Now flush on the highest COLD WATER flow rate **for at least 8 minutes.**
    ii. Then flush on the highest HOT WATER flow rate **for at least 8 minute**s.
e. Next, go to the women's restroom. There are 2 sinks in this room.
    i. Now flush on the highest COLD WATER flow rate **for at least 30 seconds.**
    ii. Then flush on the highest HOT WATER flow rate **for at 30 seconds.**
f. Next, go to the men's restroom, There is 1 sink in this room.
    i. Now flush on the highest COLD WATER flow rate **for at least 30 seconds.**
    ii. Then flush on the highest HOT WATER flow rate **for at 30 seconds.**
g. Go to the janitor sink closet in the men's restroom.
    i. Flush COLD WATER **for at least 1 minute.**
    ii. Flush HOT WATER **for at least 1 minute**.

2. Move to First Floor

a. Go to the fixture closest to the building entry on the first floor, which is the bathroom shower.
    i. For the shower, flush the shower head **for at least 3 minutes** on COLD WATER and **for at least 3 minute** on HOT WATER.
    ii. Next, flush the shower wand **for at least 1 minute** on COLD WATER and **for at least 1 minute** on HOT WATER.
    iii. Flush the single bathroom sink **for at least 45 seconds** on COLD WATER and **for at least 45 seconds** on HOT WATER.
b. Continuing moving away from the basement entry towards the next closest fixture to the first floor kitchen sink. Flush at maximum flowrate **for at least 45 seconds** for COLD WATER and then flush **for at least 45 seconds** for HOT WATER.
c. Go to the next closest fixtures which are in a first floor co-ed bathroom. There is one sink.
    i. Now flush on the highest COLD WATER flow rate **for at least 3 minutes.**
    ii. Then flush on the highest HOT WATER flow rate **for at 3 minutes.**

d. Next, go to the next co-ed bathroom on the first floor that contains one sink.
    i. Now flush on the highest COLD WATER flow rate **for at least 3 minutes.**
    ii. Then flush on the highest HOT WATER flow rate **for at 3 minutes.**
e.
f. Finally, go to the furthest fixtures and flush each of the two water fountains **for at least 1.5 minutes.** [Flowrate assumed to be 0.3 gallons per minute.]

3. Move to the Second Floor:

a. Go to the last location which is the second floor bathroom.There is 1 sink in this room.
    i. Now flush on the highest COLD WATER flow rate **for at least 1 minute.**
    ii. Then flush on the highest HOT WATER flow rate **for at 1 minute.**
b. Go to the bar sink and flush **for at least 1 minute** for COLD and then HOT WATER **for atleast 1 minute.**

c. Reinstall any aerators that have been set aside.

4. **Move to Outdoor Spigots:**
   a. Go to the water spigot on the roof. Connect a hose to the spigot and flush **for at least 2 minutes.** Be sure to drain where there won't be flooding or clogging.
   b. Go to the next water spigot on the side of the building. Connect a hose and flush for **at least 2 minutes.**
   c. Go to the last spigot on the other side of the building. Connect a hose and flush for **at least 2 minutes.**

Total estimated theoretical and idealistic flushing time

Basement*	120	minutes
First Floor	26	minutes
Second Floor	4	minutes
Outside	6	minutes
	156	*minutes (2.6 hrs.) of flushing time for the building*

**Time does not include water softener and water heater preparation.*

After flushing several additional actions for this building are needed.

4. Final Steps

a. Remove and dispose of all ice in the ice machine. Consider repeating this 2 more times.
b. Run and waste several cups of water through the refrigerator water dispenser.
c. Run dishwashers through a washing and rinsing cycle.
d. Consider replacing and installing new filter cartridges on the water cooler, refrigerator, kitchen sink, and bar sink.

V. Plumbing Diagram

The following rough diagram of plumbing was developed to demonstrate the conceptual plumbing configuration. Figures 1 and 2 are not to scale, but show a general plumbing layout.

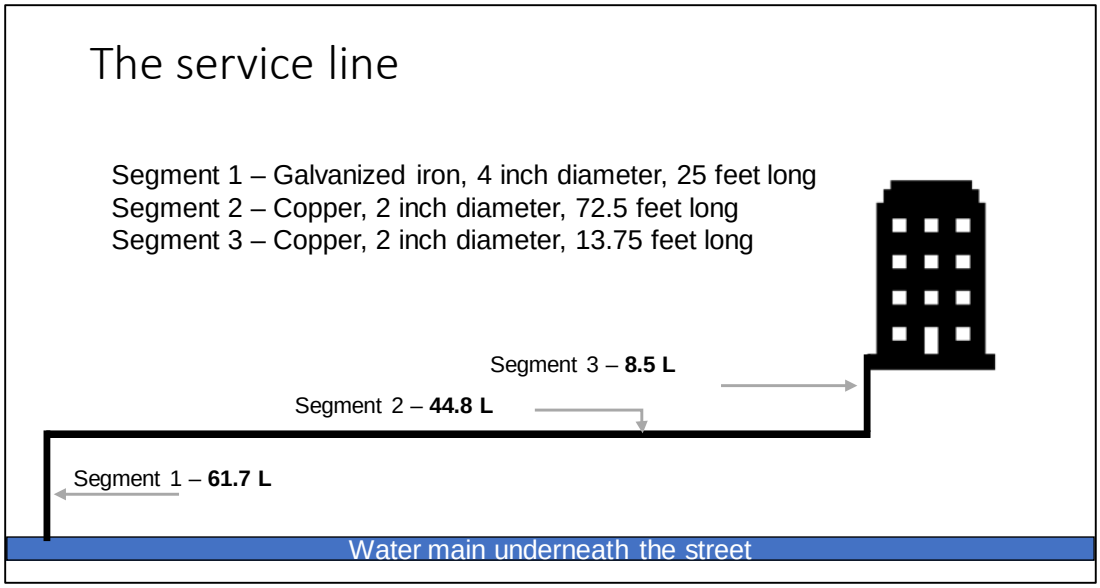

Figure 1. Drinking water travels through a utility water main underneath the street and enters the property service line. This service line links the water main to the building. This example service line has 3 segments.

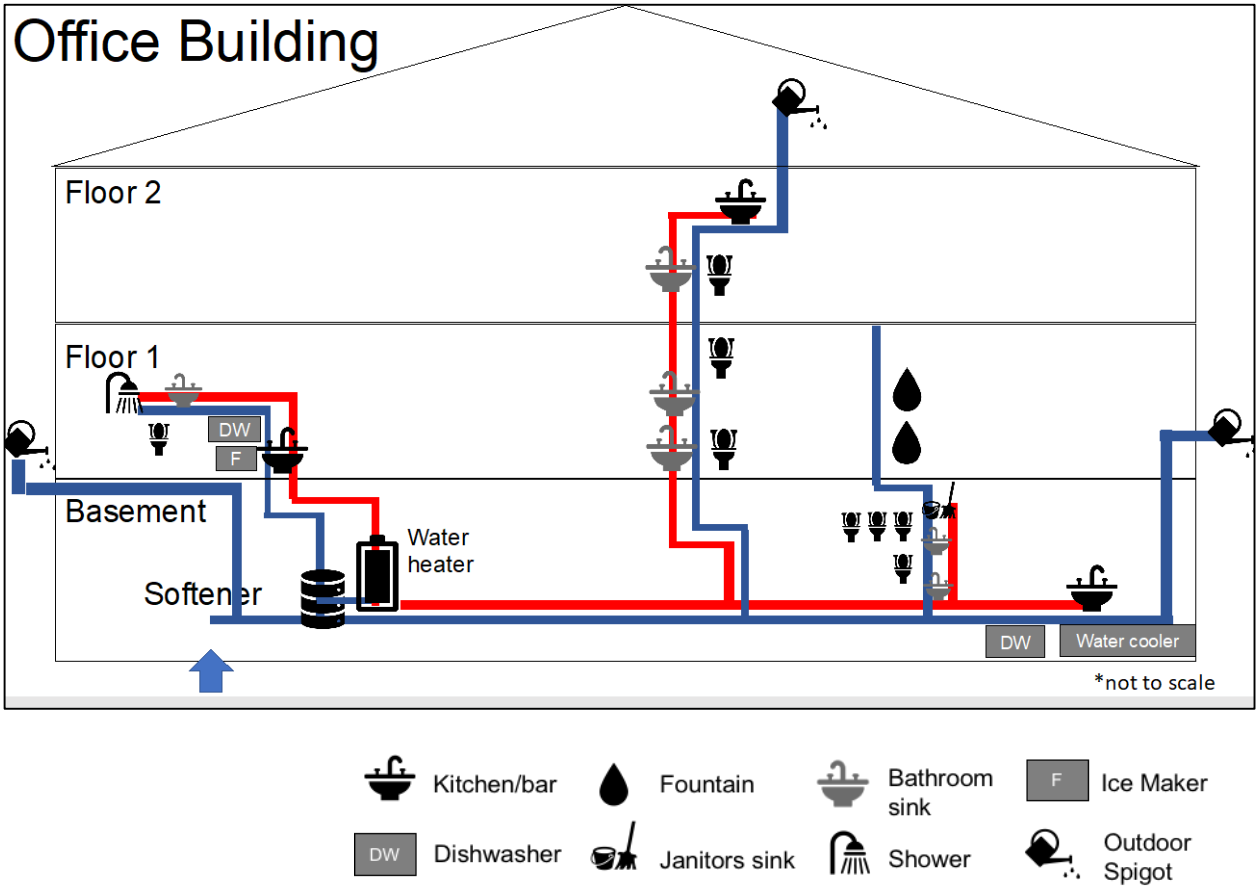

Figure 2. Drinking water enters the building from the service line near the water softener. Next, the drinking water travels through different pipes, valves, and tanks to fixtures throughout the building.

IV. Prepared By

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