System Flushing & It's Hazards

Presented by: Mark Kroese, Backflow Program Coordinator

Pressure-Velocity-Head Relationships

Association Between Quantity of Flow Velocity and Area

\[ Q = V \times A \]

- \( Q \) = quantity, cubic feet per second
- \( V \) = velocity, feet per second
- \( A \) = cross-sectional area of flow, square feet

Total Energy = Elev. Head + Pressure Head + Velocity Head

\[ E = Z + \left( \frac{P}{w} \right) + \left( \frac{V^2}{2g} \right) \]

- \( E \) = total energy head, feet
- \( Z \) = elevation above datum, feet
- \( P \) = pressure, pounds per square feet
- \( V \) = velocity of flow, feet per second
- \( w \) = unit weight of liquid, pounds per cubic foot
- \( g \) = acceleration of gravity = 32.2 ft/(sec)^2

Pipe head loss as a result of friction

\[ h_L = f \times \left[ \frac{(L \times V^2)}{(D \times 2g)} \right] \]

- \( h_L \) = head loss, feet
- \( f \) = friction factor for pipe
- \( L \) = length of pipe, feet
- \( V \) = velocity of flow, feet per second
- \( D \) = diameter of pipe, feet
- \( g \) = acceleration of gravity = 32.2 ft/(sec)^2

Unit head loss as a result of friction

\[ h_U = \frac{(k \times V^2)}{2g} \]

- \( h_U \) = head loss, feet
- \( k \) = friction factor for unit (valve, bend, etc.)
- \( V \) = velocity of flow, feet per second
- \( g \) = acceleration of gravity = 32.2 ft/(sec)^2
Is this what you want out of this presentation?

My objectives for this session are...

- Discuss the importance of flushing
- Point out some key things to consider when flushing
- Discuss unidirectional flushing
- Speak on concerns with premise plumbing
- Staff Safety
- System Operation and Communication

Why would we need a backflow program?

To protect safe drinking water, plain and simple
WHY WOULD WE NEED TO FLUSH?

- Maintain water quality
- Remove sediments
- Respond to system contamination

Protect public health, plain and simple

What to consider when you flush

- Why are you flushing
- Where are you flushing
- What will the flushing impact
Why are you flushing

- Taste and/or odor complaint
- Sampling parameter violation
- Scheduled flushing program
- Repair and Service Work
- Contamination

Charlotte’s Contamination

What Happened

- Cross-connection made with fire hydrant
- 240psi of foam water mix back flowed under back pressure into water system
- The cause: outdated equipment and human error

Where are you flushing

- Identify
- Isolate
- Determine extent of impact
- Notification
- Decontamination
- Mitigation
- Documentation
What could flushing impact

- Property damage
- System damage
- Environmental impacts
- Water system contamination
- Planned movement of water one pipe segment at a time
- Elevated velocities 6 to 10 ft/sec
- Benefits in asset management

What is unidirectional flushing

- Planned movement of water one pipe segment at a time
- Elevated velocities 6 to 10 ft/sec
- Benefits in asset management

- Consider the following in your program:
  - assess your assets
  - perform criticality analysis & fix issues
  - Create plan
  - Communicate plan
  - Execute plan
  - Document results

Premise Plumbing

- Old or outdated materials/new designs
- Non approved materials
- Cross connections

- Communicate activities
- Warn of possible pressure situations

Staff Safety

- Ever had a FH cap blow off?
- Plan for the unexpected
- Use proper equipment and PPE

- Safeguard against pedestrian interference
- End of the day everyone goes home safe
**System Operation**

- Use system map
- Plan out process
- Communicate
- Pay attention to what's happening

- Repair any deficiencies or schedule it
- Document conditions as is and as left

**Communication**

- Sender and Receiver
- Get all the specifics up front
- Share info with group

- Share plan with all stake holder
- Maintain information updates
- Communicate debrief

**REMEMBER THE STEPS!**

- Identify
- Isolate
- Determine Extent
- Notification
- Decontamination
- Mitigation
- Documentation

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