



Hydrant and Main Flushing Flushing Program Elements:

- Plan
- Notify
- Track
- Evaluate



A water agency's flushing program serves many purposes, it keeps water safe and maintains the integrity of the entire pipeline network.

What is Water Main Flushing?

Water main flushing moves water systematically through sections of a drinking water distribution system, creating a scouring action to clean the line. The increased flow rate scours the water pipe's inner walls and helps to remove build-up of naturally occurring debris and sediment. The water is discharged through select fire hydrants onto local roads or other surface areas. If excessive water in curbs or cross gutters affects traffic, warning signage such as "Flushing in Process", "Flooded" or "Slippery When Wet" may be needed.



The flushing process is critical to the overall maintenance of a distribution system, and one of the most important practices carried out by public drinking water systems to maintain high water quality, sustaining the carrying capacity of pipes, and ensuring proper operation of distribution system components, such as hydrants and valves.

Flushing ensures fire hydrants are operational and allows the operator to assess the available water pressure and flow rate for firefighting purposes. Flushing at lower velocities can also be used to bring fresh water into part of the distribution system where the water main ends or dead ends. Main flushing is typically carried out through either conventional or unidirectional flushing (UDF). The type of flushing performed is based on the specific goals to be achieved within the distribution system.

Conventional flushing consists of opening hydrants in targeted areas and discharging the water until any accumulations are removed and the water becomes clear. The water moves freely from all directions to an open hydrant. Since there is less flow in each pipe, velocities may be too low to clean or scour the pipes.

UDF means that water mains are flushed systematically from areas closest to the source water to the outer edges of the water system. Certain valves are closed during UDF operations to minimize disturbance. Fire flow tests are not conducted during UDF because the closed valves alter the normal flow pattern and may not accurately measure results. Flushing may be done as an important part in maintaining

adequate chlorine residuals in outer areas of a water distribution system.

Goals for a Flushing Program

Districts should identify all dead ends in its distribution system. Dead end sites should be placed on the flushing list annually based on the diameter of pipe, time, and volume required to meet the minimum chlorine residual and bacteriological results.

Flushing normally is conducted during periods of low water demand. Prior to flushing, notify customers who may be affected of the dates and times of the flushing, through billing, leaflets, or by door-to-door information.

In some instances, specific areas of the distribution system may need to be flushed more frequently to correct problems. These problems may include but are not limited to the following:

1. **Sediment Removal** - Loose sediment and other deposits may slowly build up on the inside of the water mains over time causing discolored water. Flushing at the appropriate velocities can remove these sediments and deposits and will improve taste, odor, and color that may be problematic e.g., naturally occurring iron or manganese deposits in the distribution system may affect color.
2. **Biofilm Reduction** - Biofilm is a thin layer of microorganisms that can grow on the inside of the distribution piping. A proper scouring velocity must be achieved to effectively minimize biofilm.
3. **Maintains Proper System Operation** - Flushing requires the opening and closing of hydrants and valves to ensure that water moves through pipe segments for effective cleaning. This operational practice also provides the opportunity to identify broken or inoperable valves and hydrants that are important to ensure that they work properly in an emergency.
4. **Improve the Quality of Water in the Distribution System** - Flushing can remove water from areas of the distribution system that have low water use. Older water may no longer have the desired chlorine residual.
5. **Allows the Assessment** - Of the flow rate available for firefighting purposes.

A Flushing Program Will Ensure:

- a. Dead end and low usage mains are flushed periodically.
- b. Drinking water standards are met.
- c. Sediment and air are removed.
- d. The required free chlorine residual is maintained.

Following line repairs, main lines should be flushed to remove air and sediment from the repaired section of line. If disinfection is necessary to comply with the systems Leak Repair standard operating procedures, the line should be flushed to remove the high chlorine content. During flushing, water containing high chlorine concentrations will be flushed on flat ground so as not to contaminate a receiving stream or body of water.

When flushing crews are working close to residences or businesses and customers may experience periods of extremely low pressure or even a complete stoppage of service. Customers who may be affected should be notified of the dates and times of the flushing through billing, leaflets, or by door-to-door information to reduce customer service calls.

Flushing Program Plan

The following will be needed to set up a flushing program:

1. System distribution maps (one overall map would be great) showing valve, hydrant, all dead-end mains, and blow-off locations.
2. Customer service/complaint records for bad water calls with problem resolutions.
3. Maintenance records that may show the location of valves that have been closed due to maintenance in the past year. This is a suitable time to start a valve maintenance/exercise program if you do not already have one.
4. Water quality records:
 - a. Location of any positive samples
 - b. pH level
5. Monthly production reports to determine low flow periods (one year preferred)
6. Any fire flow records
7. Identify sensitive customers:
 - Hospitals
 - Dialysis clinics
 - Restaurants, food processing
 - Bottling plants
 - Specialized manufacturing using water



Steps for a Flushing Program

Planning

- Obtain distribution maps
- Prepare flushing plan
- Locate and inspect valves, hydrants, and blowoffs
- Revise plan
- Prepare flushing forms
- Notify public
- Gather tools and supplies
- Create contingency plan for any repairs needed due to flushing

Field Work Flushing

- Isolate valves
- Flush 3.0 feet/second
- Monitor flow
- Record Information (flow rate, gpm, psi, chlorine residual)
- Inspect area for landscape damage, debris and repair
- Open previously closed valves
- Resolve flushing complaints

Program Management

- Review and evaluate hydrant flows, take action if needed
- Review flushing reports, take action if needed
- Record total gallons used on water loss report
- File and keep flushing reports for future system comparison

1. Valves are opened and closed slowly to prevent water hammer.
2. Direct water away from traffic, pedestrians, underground utility vaults, private lands, and traffic control signage used to warn of “Flushing in Progress”, “Flooded or Slippery When Wet” conditions.
3. Confirm that curbs, gutters, storm drains or natural water courses can handle the flow.
4. Flushing velocity should be at a minimum of 2.5 feet/second, but 5.0 feet/second is preferred to achieve suitable biofilm removal.
5. Open hydrants or blowoffs for a period long enough (5-10 minutes) to stir up deposits inside the water main, then flush until the water is clear (sometimes 30 minutes or longer).
6. Assure that system pressures in other parts of the distribution system do not drop below 20 psi (below 15 psi requires a boil advisory).
7. De-chlorination may be required in combination with line replacements or leak repairs.
8. Record data.

The Benefits of a Regular and Proactive Flushing Program

- Regular fire hydrant and valve testing ensures the ability to provide water at an acceptable pressure and flow rate for public health and firefighting operations. To ensure hydrants are operating properly, local districts should perform the necessary task of hydrant flushing **at least once a year**, most often in the spring. Fire hydrants should be flow tested at least every five years to verify the capacity and marking of the hydrant. (NFPA 291-4. 15.1)
- Flushing is a controlled procedure that is **vital** to the water quality and maintenance of a district's water distribution system.
- It ensures adequate water flow is available to residents, businesses, and firefighters.
- It can increase the longevity and improve water quality by clearing sediments and mineral deposits from the water system.



Additional Resources

Water Supply Operations: Flushing and Cleaning
JPIA Lending Library

AWWA Standard Disinfecting Water Mains
https://www.mwa.co.th/download/prd01/reference/AWWA_std/Disinfecting_Water_Mains.pdf

AWWA Staff Training
<https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/48359692>

Benefits of a Flushing Program
<https://www.youtube.com/watch?v=KqexR7EX3q8>

The JPIASource is not intended to be exhaustive. The discussions and best practices suggested herein should not be regarded as legal advice. Readers should pursue legal counsel or contact their insurance providers to gain more exhaustive advice.

Photos: Sacramento County Water Agency
Cedarburg Light and Water